Organic Agriculture

SUSTAINABILITY, MARKETS AND POLICIES

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Organic Agriculture: Sustainability, Markets and Policies

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FOREWORD

The OECD Workshop on Organic Agriculture, hosted by the United States authorities, was held on 23-26 September 2002 in Washington DC. The Workshop was part of the OECD work programme on agriculture and the environment under the auspices of the Joint Working Party on Agriculture and the Environment (JWP). It offered an opportunity to share knowledge and experiences on a range of issues regarding organic agriculture, in particular:

- *defining organic production and analysing how organic farming systems differ from "integrated" or "conventional" systems in terms of structure, characteristics and environmental effects;*
- *reviewing the current and projected growth in the supply and demand for organic products;*
- *improving knowledge of the conditions under which organic agricultural systems are economically efficient with least risk to the environment (i.e. sustainable) on the basis of empirical evidence comparing it with other systems;*
- *identifying market and policy successes, and market and policy failures hindering the development of organic agriculture;*
- *outlining policies, including market-based approaches, that have been used to develop organic agriculture (from conversion assistance through to output subsidies), and to regulate organic food (accreditation, certification and labelling); and*
- *identifying trade issues arising from domestic policy measures to develop organic products, including impacts on developing countries.*

Over 140 participants, including representatives from 21 OECD countries and one non-OECD country, attended. In addition, there were participants from academia, and a range of international government and non-governmental organisations, representing farmers, consumers, organic associations, agri-business and environmental interests.

The Workshop covered three broad themes: examining organic agriculture's contribution to sustainability; the market for organic products, including issues facing agents along the product chain from producers to consumers; and policy approaches, including market-based initiatives. Each of the themes was explored in depth, with a general overview paper supported by specific country examples. Plenty of time was provided for interaction and discussion among participants. Included in the Workshop was a one-day study visit to a United States' Department of Agriculture research station and an organic farm.

In this collection of papers, the reader will find a wealth of material relating to organic agriculture in OECD countries. We hope that it will contribute to the current and future debate on organic farming, particularly in the context of policy reform and the advancement of policies for sustainable development. It is not an exhaustive analysis of the issues. Many questions and issues remain, with the need for further multi-disciplined analysis. This work is published under the responsibility of the Secretary-General of the OECD.

Stefan Tangermann
Director
Directorate for Food, Agriculture and Fisheries

ACKNOWLEDGEMENTS

These proceedings bring together papers from the OECD Workshop on Organic Agriculture, held in Washington DC, on 23-26 September 2002. The Secretariat gratefully acknowledges the voluntary financial contributions from the host country, the United States, as well Belgium, Denmark, Korea and Japan, which made this Workshop possible.

The Workshop was organised by the OECD in close collaboration with the United States' Department of Agriculture. For the OECD, Darryl Jones was responsible for the organisation of the Workshop, with initial preparations being undertaken by Outi Honkatukia, and assistance provided from Wilfrid Legg and Laetitia Reille. Catherine Greene and Carolyn Dimitri of the USDA Economic Research Service co-ordinated the American input, with the help of Cathi Ferguson and Leslee Lowstuter. Thanks to all those who provided papers and contributed to the success of the discussions. Darryl Jones edited the papers, with the assistance of Theresa Poincet, Michèle Patterson and Françoise Bénicourt, who also prepared the final publication.

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CONCLUSIONS AND RECOMMENDATIONS[1]

Main conclusions and recommendations
Organic agriculture is expanding in all OECD countries to meet increasing consumer demand, although it still only accounts for a relatively small share of agricultural production and food consumption. It is no longer limited to those farmers for whom organic production is a holistic life-style, selling through specialist outlets, but has extended into the mainstream of the agri-food chain as an economic opportunity to satisfy a niche market at premium prices. Organic farming is generally more environmentally friendly than conventional agriculture but may require more land in some countries to provide the same amount of food and often requires more labour in place of purchased fertilisers, pesticides and animal health care products.
In most OECD countries, organic farming information, standards, certification and labelling are in place or being developed by the organic sector and governments, intended to aid consumer choice. But the proliferation of labels and standards can confuse consumers, and differences between schemes can impede international trade. In most countries, market forces largely drive the development of the organic sector but a number of governments, mostly in Europe, offer financial incentives to farmers to convert to, and continue in, organic production on the basis that some environmental benefits are not captured in the market. Such incentives are higher than would otherwise be the case where existing support to agriculture raises the cost of entry into organic production. There has also been some shift in publicly financed agricultural research towards organic systems, while in a few countries procurement policies feature the purchase of organic food by public institutions.
The OECD could contribute to the identification of appropriate policy practice by monitoring and evaluating developments in policy approaches to organic agriculture, including market-based approaches, and facilitating dialogue with stakeholders.

Background

The focus of the Workshop was on **policy approaches** to organic farming, including market-based instruments in contributing to the economic, environmental and social dimensions of **sustainable agriculture**. The organic sector is changing rapidly and the Workshop was an opportunity to take stock of developments by bringing together a wide range of stakeholders and to share experiences of how policies in different countries are influencing those developments.

The development of organic agriculture

The **organic sector** at the turn of the century is broadly estimated to be worth USD 26 billion world-wide and is generally the most rapidly growing sector of agriculture, at anything between 15-30% annually, albeit from a very low base. Organic agriculture on average accounts for about 2% of total agricultural output across the OECD, but varies considerably, from under 0.2% in the United States to over 10% in some European countries. The main organic markets are in fruits and vegetables, fresh poultry and eggs, and fresh milk, butter and cheese, although cereals are important in some countries.

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1. These conclusions and recommendations have been prepared under the responsibility of the OECD Secretariat and do not necessarily reflect the views of OECD Member countries and participants at the Workshop.

Growth has largely been led by demand from **consumers** in high-income countries who favour organic produce for a variety of reasons, including perceived benefits to health and the environment, perceived improvements in food quality and taste, accessibility of fresh produce, and helping small-scale local producers, communities and markets. But the recent food safety scares in some countries — BSE and foot and mouth disease in particular — and concerns among some consumers about genetic modification in agriculture, have also had an effect in boosting demand for organic produce.

The organic sector is **not homogenous** either in terms of production or marketing. There is a continuum of motivations for farmers to engage in organic agriculture, ranging from the purely philosophical at one end of the spectrum to the purely agri-business at the other. For some producers, organic farming is both a way of life, involving a holistic ecosystem approach to agriculture production, and an economic enterprise. They tend to be smaller, family-run enterprises, have been farming using organic methods for a long time, and market their produce through specialist retail outlets and on-farm shops. For others, organic farming is viewed primarily as an economic activity responding to consumer preferences, and marketed as niche foods at premium prices through supermarkets. In some countries, this has meant that large corporate farming operations are now using organic methods. This presents a challenge for some in the organic movement, who are concerned about the social and environmental impacts of business practices and structural characteristics of mainstream agriculture but also want to encourage the spread of organic farming principles and facilitate greater consumer access to organic food.

In many countries, organic agriculture is starting to move into a "mature" phase of development — integrated into the **mainstream agri-food chain**. Moreover, across the farming spectrum there is a range of systems, from low-input organic to high-input industrial farming systems, with integrated farming systems in between. In some circumstances non-organic farmers have taken up certain farming practices employed by organic agriculture. Technological developments and the strengthening of agri-environmental measures will also influence the relative performance of different farming systems.

Organic agriculture and sustainability

The strong balance of evidence from research, field trials and farm experience is that organic agricultural practices are generally more **environmentally** friendly than conventional agriculture, particularly with regard to lower pesticide residues, a richer biodiversity and greater resilience to drought. Organic farming systems also hold the potential to lower nutrient run-off and reduce greenhouse gas emissions. But sweeping generalisations need to be avoided. There are situations where intensive management within organic farming regimes can impoverish biodiversity and animal manure can be applied in excess of requirements. More land may be needed in some countries to produce a given level of output, which has an alternative value in terms of its potential use as, for example nature areas, depending on its current and historical use.

Evidence concerning the **economic** performance of organic compared to conventional farming systems is mixed. While yields tend to be lower on organic farms, and labour costs higher than on conventional farms, profitability is generally higher, due to price premiums and — in many countries — support payments. But differences in yields and price premiums vary between OECD countries and between agricultural products. Returns to organic farming are also affected by changes in the farm production mix, for example due to increased use of crop rotation. Generalised economic performance comparisons between organic and conventional farms are not always meaningful — there can be as much variation within each farm system as across them. In some cases costs of family labour are not included in organic agriculture, while environmental costs imposed off-farm (*e.g.* water pollution clean-up) are not always accounted for. A key policy challenge is to ensure that the various environmental externalities, both positive and negative, arising from different farming systems are clearly taken into account so that farmers can make decisions as to the most appropriate system to adopt.

The analysis and understanding of the **social** aspects of organic farming are least well developed, and comparisons with conventional agriculture are not easy to make. Organic agriculture is based on a holistic view of the integration of farming into nature. Its proponents maintain that this foundation promotes "social justice" issues by recognising the essential role of farmers, improving labour conditions, work place health and safety, the contribution of farming to rural communities, and engaging in "fair trade". The organic movement is developing international social justice standards for organic farming systems.

Policy approaches to organic agriculture

There is a wide range of **policy approaches** for addressing issues in organic agriculture. Policy options include those that are *enabling* — *e.g.* providing certification and labelling frameworks, research and extension services; *enforcing* — *e.g.* establishing regulations and standards; and *encouraging* — *e.g.* providing financial incentives, bringing together agents along the production chain to establish partnerships and procurement policies.

Governments justify policy intervention in the organic sector on the basis of the "infant-industry" argument and/or market failure and the provision of public environmental benefits. The infant-industry justification is based on the costs of converting from conventional to organic production. This conversion can take several years, during which time farmers must produce using organic methods but cannot sell their product as organic. When yields decrease and/or costs increase, the loss of profits can impede that adjustment. This can be the case in particular for small-scale farm operations. The market-failure justification is based on cases where the market does not remunerate environmental benefits generated by organic farming systems. This is compounded where farms — organic or conventional — are not held to account for any environmental damage they cause. However, the valuation of such environmental externalities, whether beneficial or harmful, is fraught with difficulty. A further example of market failure can occur where there is imperfect information available to market participants, leading to potential misallocation of resources.

Market-based policy approaches, including certification and labelling schemes are now in place in virtually all OECD countries. In some countries, standards are established to inform domestic consumers, while in others they are in place so that exporters can satisfy the import requirements of other countries. While traditionally established by organic organisations or governments, marketers are also beginning to enforce on production and processing standards on farmers that are over and above these requirements. But the plethora of different labels can be confusing to consumers. Differences in certification and labelling schemes, both public and private, can inhibit trade flows, even within the European Union where there is one harmonised standard for organic agriculture. Government approaches to equivalency assessments may also hinder trade.

Several governments have undertaken information campaigns and promotional activities to encourage consumption of organic products. In a few countries, notably in Europe, government procurement policies encourage or require the purchase of organic food by public institutions such as schools and hospitals. One difficulty in assessing the potential for market-based approaches and for evaluating existing measures is the lack of statistics regarding the organic market, including information on trade flows and prices, such as the transparency of prices along the production chain to understand who is getting the premium.

In many OECD countries **financial support** is specifically provided to organic farmers, usually on a per-hectare basis. This support is provided on a short-term basis to help offset the costs of conversion or on a continual basis as payment for the provision of environmental benefits. Over recent years, the number of countries introducing such measures has been increasing, particularly in Europe. While such payments may mean the difference between converting or not, there is a risk that such payments will increase production of some organic foods above the level of demand, leading to surpluses and a reduction in the market premium. Such polices may also reduce the competitiveness of organic producers in other countries, constraining the development of organic agriculture there.

While organic producers can benefit from traditional agricultural support policies such as price support, such policies are likely to impede the development of the organic sector. This is because such policies provide incentives to adopt farming practices that increase production (quantity) rather than those, like organics, which stress quality. Moreover, much of the support is capitalised into land prices, which impedes new entrants, including organic farmers. Moves to reduce the dominance of these forms of support will be of benefit to organic producers.

While more publicly funded **research** efforts are now devoted to organic systems it still only accounts for a small share of overall research on agriculture. Some of the results of farm experiences and research into organic farming systems have been adopted by non-organic farming systems (*e.g*. ways to control pests without chemicals).

Governments need to address the **externalities** in conventional agriculture to provide a better use of resources and a more level playing field for organic systems. Furthermore, policies that reward farming (both organic and non-organic) for any environmental benefits must be based on verifiable evidence, monitored and evaluated, and adapted in the light of changing evidence. It is unlikely that one policy will fit all cases, given the diversity of situations. While in principle it is the environmental *outcomes* that policy needs to address irrespective of which system generates them, it is often farming *systems*, defined by a set of characteristics, that are the targets of policies due to the diversity of farms and the dispersion of environmental effects. There is also a need for governments to co-ordinate their policy approach to organic agriculture, particularly when a number of different measures are being used. This is reflected, for example, in the development of integrated action plans for organic farming incorporating a number of different policy measures.

Recommendations for future OECD work

The Workshop made some suggestions for further work that could be undertaken by the OECD. These included:

- identifying significant emerging policy issues in relation to organic agriculture (perhaps aided by a panel of experts);
- filling gaps in methodologies and indicators of relevance to policy analysis, including statistics relating to the size and changes in organic markets and the setting of prices, along the whole organic food-chain;
- monitoring and evaluating policy options to identify appropriate policy practice including the sharing of experiences; and
- facilitating dialogue between stakeholders.

Introduction

Introduction

ORGANIC AGRICULTURE, SUSTAINABILITY AND POLICY

Darryl Jones[1]

Abstract

The significant growth in the organic sector, coupled with its potential contribution to sustainable development, has resulted in considerable interest from policy makers, including OECD Environment Ministers. While recognising that there is more than one agricultural system that has the potential to be sustainable, organic farming can contribute to an economically viable, environmentally sound and socially acceptable agriculture sector. However the actual impact, particularly on the environment, depends a great deal on the management practices of the individual farmer. The OECD has identified five essential elements for creating a policy framework that would encourage the adoption of sustainable agricultural practices: reforming support policies, adopting an ecosystems approach, addressing externalities, enhancing the dissemination of information and devising appropriate structural adjustment policies. Implementing these elements would benefit organic farming systems.[2]

Introduction

This paper provides an introduction the OECD Workshop on Organic Agriculture, being held as part of the work programme on agriculture and environment under the auspices of the Joint Working Party on Agriculture and Environment. In particular it examines why organic agriculture has become an important issue for policy makers, how it fits into the concept of sustainability and what an appropriate policy framework for approaching organic agriculture might be. As such, the first section reviews some of the recent developments that have raised the policy profile of organic agriculture and the decision taken by OECD Environment Ministers in 2001 to undertake work on organic agriculture. The second section outlines the concept of sustainable agriculture and how organic agriculture may contribute to sustainability. The following section then discusses how the essential policy elements defined by the OECD for developing sustainable agriculture relate to and impact on organic agriculture. The paper concludes with some important questions that the Workshop should address.

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2. The author wishes to thank Wilfrid Legg, Kevin Parris and other OECD colleagues, along with Ronnie Horesh, for comments and assistance in preparing this paper. Any errors in the paper are the responsibility of the author.

Organic agriculture: an important policy issue

A number of factors have contributed to the growing policy interest in organic agriculture. These include:

- ***The significant production growth in the sector:*** Industry and government sources indicate that global organic production has increased 20% annually over the past 10 years. Australia, the European Union, and the United States are currently the largest global organic producers but interest in organic production is increasing world-wide. In Mexico, for instance, land dedicated to organic products increased 140% from 1996 to 1998. Though this reflects land of only 55 000 hectares (as compared to 6.1 million hectares under organic production in Australia), Mexican production of organic goods has resulted in USD 70 million worth of exports in 1999 (USDA, 2000).

- ***Growing consumer demand for organic products:*** While organic food products provide only a small share of total food consumption in OECD countries, this share is higher in some countries, notably in Europe, and for certain products, such as fruit, vegetables and dairy products. This growth has been influenced to some degree by food scares associated with non-organic products (for example, BSE) and the perceived health benefits of organic products.

- ***Public concern for sustainability:*** Organic agriculture is seen to provide a more sustainable farming system, offering alternative economic opportunities for producers, a production system more in tune with the environment, along with greater social responsibility. Section 2 covers these issues in detail.

- ***Trade issues relating to the development of organic standards:*** Around 15% of the USD 14-17 billion global market for organic produce are traded. The United States (47%), the EU (42%) and Japan (11%) are the major importers. Concerns have been raised about the cost and ability for exporters, particularly from developing countries, to meet the certification requirements of organic standards.

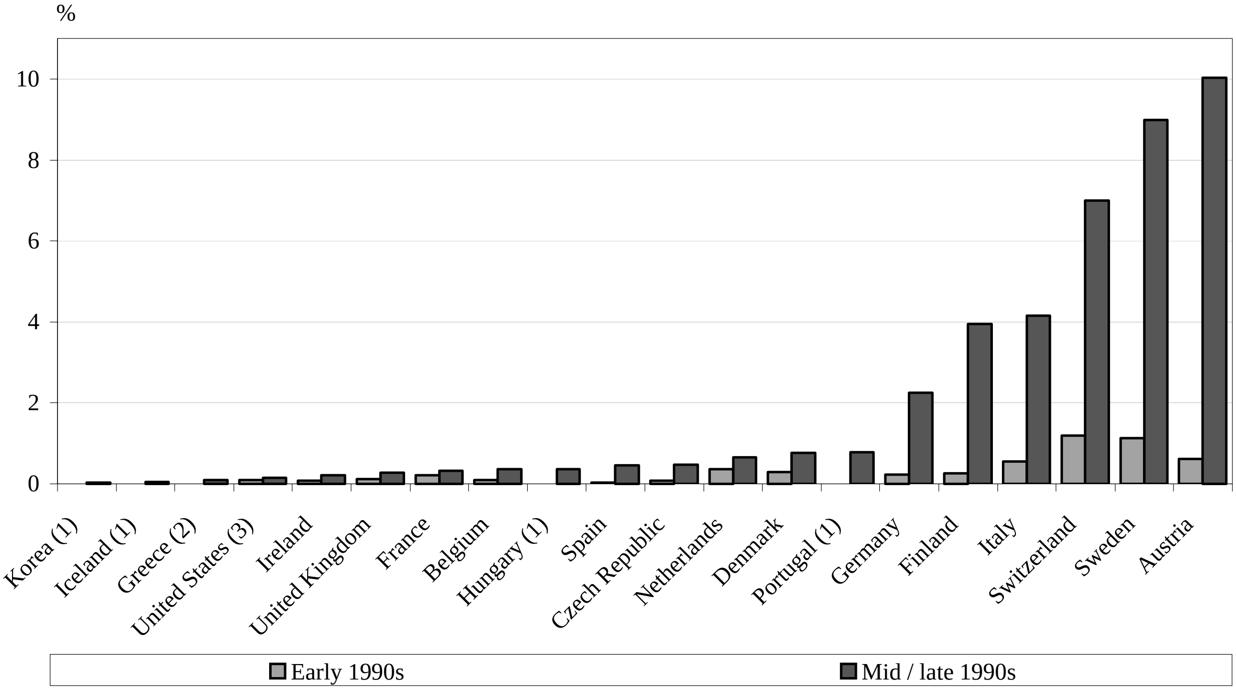
Box 1. What is organic agriculture?

There are many definitions of organic agriculture. At its simplest, it is food that is produced without artificial fertiliser or pesticides using instead only organic-based fertilisers, like manure and vegetable-based compost, and natural pesticides, such as predator animal species. It uses antibiotics and other animal health-related products only to cure sick animals and not to enhance yields (Legg and Viatte, 2001). Other definitions go much further. The International Federation of Organic Agriculture Movements (IFOAM) goes beyond biophysical aspects to encompass matters such as animal welfare, biodiversity and social justice (IFOAM, 1998). IFOAM’s statement of aims includes that of processing organic products “using renewable resources”, and some organic standards, such as the Australian National Standard insist that animal feeds, for example, should be 100% organic (May and Monk, 2001).

In general, compulsory and voluntary standards are more prescriptive about on-farm production methods than about how the necessary input supply, processing and transport of produce should be performed. This reflects the fact that incorporating wider concerns than production methods into definitions of, and standards for, organic farming is highly problematic. “Standards are far more able to refer to prohibited inputs than to specify precise criteria for the assessment of whether producers and processors are acting in a manner that is ‘socially just’ or ‘ecologically responsible’” (Rigby and Cáceres, 2001).

One of the environmental indicators for agriculture used by the OECD measures the share of agricultural land in organic farming (OECD, 2001*a*). The cultivated area under organic farming has increased significantly in OECD countries over the past ten years (Figure 1). In the United States, the area under certified organic farming systems increased by over 60% between 1995 to 1997. The importance of organic farming varies within the countries of the European Union, where around 2% of the total agriculture area and 1% of all farms are under organic production. Fodder production is by far the most important use of land devoted to organic farming, though organic horticulture is important in Southern Europe.

Figure 1. Share of the total agricultural area under organic farming in some OECD countries: early 1990s and mid-/late 1990s



Notes:

1. Data for the early 1990s are not available.
2. Data for the early 1990s equal 0.003%.
3. Data for the United States are taken from Welsh (1999).

Sources: OECD Agri-environmental Indicators Questionnaire, 1999; EEA (1998); Welsh (1999).

Organic agriculture included in the OECD Environment Strategy for 2000-2010

In recognition of its growth and potential contribution to sustainability, organic agriculture was specifically included in the OECD *Environmental Strategy for the First Decade of the 21st Century*, adopted by OECD Environment Ministers in May 2001 (OECD, 2001b). The Strategy is intended to provide clear directions for environmentally sustainable policies in OECD countries, and to guide the future work of the OECD in the field of the environment. It makes the following specific references to organic agriculture (emphasis added):

- National governments are to "promote a broader adoption of sustainable farming systems and environmentally sound management practices, including ***organic farming***, by the majority of agricultural producers, paying special attention to ecologically vulnerable areas."

- The OECD will "review the environmental, economic and social effects of sustainable agriculture, including ***organic agriculture***, and assess the policies and market approaches to sustainable farming."

This Workshop plays an important contribution to meeting the above objectives by reviewing the relationship between sustainability and organic agriculture in Part I, Chapters 1-3, and considering the various policy approaches in Part III, Chapters 7-9. Part II, Chapters 4-6, provide a link between the two by examining the issues faced by players along the product chain from farmers to consumers which are relevant for identifying and designing effective policy measures.

Organic agriculture and sustainability

The growth of organic farming indicates some disenchantment with "conventional" agriculture and its products. A recent OECD report on sustainable development noted that an "expanding proportion of consumers regard food produced through organic or "biological" means as safer to eat, and the methods used to produce it as less polluting, better for the soil, respecting the welfare of animals, and more hospitable to wildlife than food produced through conventional means" (OECD, 2001c). Some of these attributes will be high priorities for some people; for others they will be luxury items; while for others they will be irrelevant. Their relative values will vary markedly from person to person, and they will change over time, as social attitudes, incomes, information and technology change, in ways that cannot be predicted.

Sustainable agriculture

While sustainability is a complex and wide-ranging concept, the basic objective is to optimise agriculture's net contribution to society, by making better use of physical and human resources. Sustainable farming systems are those that contribute to long-term welfare by providing food and other goods and services in ways that are:

- ***economically viable:*** responding efficiently and innovatively to current and future demands for adequate, safe and reliable supplies of food and raw materials;

- ***environmentally sound:*** conserving the natural resource base of agriculture to meet the reasonably foreseeable needs of future generations, while maintaining or enhancing other ecosystems influenced by agricultural activities; and

- ***socially acceptable:*** meeting the wider values of society, such as supporting rural communities and addressing cultural/ethical issues such as animal welfare concerns.

There are a number of well-documented issues in the context of sustainable agriculture (OECD, 2001c). On the economic side, the agricultural sectors of the OECD have achieved significant growth in the output of food and non-food commodities in recent decades. But the growth in output has created environmental problems. For example, some agriculture practices, like monoculture or reduced crop rotations, have led to a greater homogenisation of the landscape and a decline in biodiversity and wildlife habitats. Farmers across the OECD have displayed a capacity to adopt new agricultural practices to address environmental concerns, particularly in areas where environmental pressures have been the greatest. Improvements in the efficiency of input use have been observed and progress has been made in adopting farming practices that enhance environmental performance, such as nitrogen management plans, integrated pest management and conservation soil tillage.

Consequently, since the mid-1980s there has been a decrease of more than 10% in both nitrogen and pesticide use in many OECD countries and soil erosion rates have also declined in some instances. However, the absolute levels of pesticide and nutrient run-off is still high in many countries and problems of soil degradation remain evident (OECD, 2001a). Some rural communities have had to cope with significant adjustment as technological developments and the trend towards increasing size of farms have reduced farm employment opportunities. But modern technologies are also opening possibilities for the formation of new types of rural networks. In addition, there is increased consumer demand for higher standards in areas such as food safety.

While the debate surrounding farming systems often tends to be characterised in terms of the contrast between industrial or intensive farming and organic systems, it is important to note that there is a range of other farming systems that fall between these categories. One emerging farming system, sometimes known as "integrated farming" encompasses elements of both conventional and organic farming systems. Integrated farming generally involves the utilisation of locally available resources, such as feeds, wastes and other outputs from internal subsystems, and a high level of nutrient recycling to the maximum extent possible, thus reducing waste, improving overall efficiency in the use of resources. The use of synthetic chemicals for fertilisers and pest control is limited to the maximum extent possible, but not excluded altogether.[3]

One of the conclusions of the OECD Workshop on the Adoption of Technologies for Sustainable Farming Systems held in Wageningen, the Netherlands, July 2000 was that:

> *"…all farming systems, from intensive conventional farming to organic farming, have the potential to be locally sustainable. Whether they are in practice depends on farmers adopting the appropriate technology and management practices in the specific agro-ecological environment within the right policy framework. There is no unique system that can be identified as sustainable, and no single path to sustainability. There can be a co-existence of more-intensive farming systems with more-extensive systems that overall provide environmental benefits, while meeting demand for food. However, it is important to recognise that most sustainable farming systems, even extensive systems, require a high level of farmer skills and management to operate."* (OECD, 2001*d*)

Sustainable agriculture is not linked to any one particular prescribed approach. The question therefore is not whether organic agriculture is the only sustainable farming system, but how and to what extent it contributes to sustainability. Over the past decade, a large number of studies have been carried out in an attempt to evaluate the possible advantages of organic agriculture relative to other farming systems in the context of sustainable agriculture. The following sections outline some of the key issues that need to be considered in determining the contribution of organic agriculture to sustainability.

Is organic agriculture economically viable?

A major factor affecting the economic viability of organic production is the market **premium** they receive for their products. The premiums reflect the perceived benefits of organic farming practices. In most European countries the farm-gate price for organically produced wheat has

3. See, for example, the recently released report *Integrated Crop Management Systems in the EU* which discusses the environmental and economic benefits of such systems: http://europa.eu.int/comm/environment/studies.htm.

typically been 50-200% higher than for conventionally produced crops. Premiums for livestock products are generally lower, with organically produced milk receiving a premium of 8-36% in Europe (Offermann and Nieberg, 2000). What happens to the premiums as the organic sector expands is an important issue. If the organic sector grows in a manner similar to other food and fibre sectors, we could expect to see the production, processing, delivery and retail costs per tonne to decrease over time. Anecdotal evidence suggests that this is happening as the industry expands (OECD, 2001e). Examples range from economies in production systems, *e.g.* more effective pest control, to increased efficiency in transport, *e.g.* full transport vehicle loads, and more efficient use of processing plants.

Another major factor is the **yield** obtained by organic production. On crop farms yields per hectare are generally lower on organic farms although comparative yields vary between crop and region. Yields per hectare are also lower on livestock farms. Lower yields reduce the volume of product that can be sold and increase the costs of production. On the other hand, yields on organic vegetable farms tend to be as high as on non-organic (Häring *et al.*, 2001). Yields have also been raised as an issue in relation to the contribution of organic agriculture to **food security**, *i.e.* can organic agricultural systems provide the amount of food necessary to feed both the current and future world population? However, in developing countries, organic yields can be higher than under traditional management practices which can include the mining of nutrients (UNCTAD-UNEP, 2002). According to the FAO, when international markets can be accessed, organic agriculture improves food security in developing countries by increasing income opportunities (FAO, 2002).

Overall, the premiums are offset to varying degrees by the extra production and certification costs of organic farming but appear to be providing some parity between gross margins for organic versus non-organic producers. In Europe, an analysis of the **profitability** of organic production concluded that on average profits are similar to those of comparable conventional farms, with variations between products and countries (Häring *et al.*, 2001).[4] For many organic farmers in Europe, this level of profitability is dependent upon support payments, which contribute between 16-46% of farm profits depending on the country and the product.[5] The study also found that over time profits of organic and comparable conventional farms exhibit a remarkable similarity, indicating that factors such as the climate, market developments and agricultural policy influence farming systems in very similar ways. However, it is important to recognise that in comparing prices, yields and profitability across farming systems, no account is taken of the environmental impacts associated with different systems which may be significantly different in some instances.

Is organic agriculture environmentally sound?

Organic systems, as with all other types of farming, have an impact on the natural environment. There are two main features of organic systems that lead to potentially different environmental impacts when compared to conventional systems. An obvious feature of organic farming is the limits placed on the use of chemical **fertilisers**, **pesticides and fungicides**. Those permitted for use on organic farms are less hazardous than those used in conventional systems, although there are some exceptions (Edwards-Jones and Howells, 2001). This is likely to lead to a reduction in pollution from agricultural practices. On the other hand, certain practices associated with

4. For additional EU results see (OECD, 1999a) and (OECD, 1999b), and for the United States see (Walsh, 1999).

5. Non-organic producers in Europe are also dependent to varying degrees on government support for their farm income and profit.

organic systems (such as the ploughing in of legume crops, crop rotation and use of animal fertiliser) have pollution risks if incorrectly managed.

In terms of the actual impact on **water quality**, studies in Europe conclude that organic farming generally results in lower pesticide, and lower or similar nitrate leaching rates than integrated or conventional agriculture, particularly on a per-hectare basis (DEFRA, 2002). Consequently, some water authorities in the United Kingdom and Germany are assisting in the conversion to organic farming in catchment areas where the nitrate content is high. However, with increasing implementation of water protection policies affecting agricultural production, the differences may become smaller. Conclusions about the impacts on **climate** and **air quality** are hard to draw because of a lack of data and differences between calculations per unit of land as against per unit of output. The actual impact depends on the management practices adopted by individual farmers, particularly in relation to animal housing systems, the level of mechanical weeding undertaken, and the storage and handling of manure.

A second feature of organic farming systems is the reliance placed on farm-internal nutrient supply. This has a potentially positive impact on the natural resource base. Evidence suggests that organic farming tends to conserve **soil fertility** better than conventional farming systems and have a higher level of biological activity in terms of the abundance of earthworms but that there is no difference between the farming systems with regard to **soil structure** (Häring *et al*., 2001). However, it is suggested that the higher levels of organic matter, and practices of minimum tillage in organic systems, increase the water percolation and retention ability of the soil, reducing **irrigation** needs (FAO, 2002). Again, much depends on the farm management practice, as more frequent ploughing to replace pesticide use, on some soils, compacts deep layers of soil, reducing yields and increasing the risk of **erosion**.

In terms of **biodiversity**, a considerable body of research reveals that there is higher abundance of arthropods (insects such as spiders, mites, centipedes, millipedes etc.) in organic agriculture systems compared with other production systems (OECD, 2001a). This appears to be linked to the absence of pesticide, the lower density of crops and the higher incidence of weeds providing a food source. The greater abundance of microbial activity, anthropoids and weeds encourages other wildlife higher up the food chain, such as birds although more frequent mechanical weeding on organic farms can damage nesting birds, worms and invertebrates (Trevawas, 2001). Evidence also suggests that organic systems perform better in respect to floral and faunal biodiversity (Stolton *et al.*, 2000). Through the use of crop rotations, organic farming can encourage **landscape diversity,** which in turn enables a diversity of habitats to the benefits on local wildlife populations although the actual impact of organic systems on the landscape is very difficult to quantify. With the current yields obtained under organic farming, a significant expansion of organic farming could involve an increase in the area under cultivation that may be a threat to the conservation of biodiversity and habitats.

Is organic agriculture socially acceptable?

As noted above, there is a strong consumer perception that organic food is safer, healthier and produced in a more animal friendly manner. In terms of **food safety**, empirical evidence suggests that organically grown foods have fewer and generally lower pesticide residues than conventionally grown food. A study of data collected by the US government found pesticide residues on 23% of organic fruits and vegetables and on nearly 75% of conventionally grown produce, though the residues in all the samples were well below statutory limits (Baker *et al.*, 2002). An extensive survey of research results concluded that consumers of organically produced food would at the very least consume fewer types of residues (Bourn and Prescott, 2002). Others raise food safety concerns associated with organic products, such as the use of improperly composted manure. The possible **nutritional value** of organic food has been difficult to substantiate, with studies generally showing no significant differences or contradictory results with considerable variation in study designs and duration. Recent surveys have identified two possible exceptions: a higher Vitamin C content in organic vegetables (DEFRA, 2002) and a lower nitrate content in organic crops (Bourn and Prescott, 2002).

Most organic certification schemes feature **animal welfare**, with an emphasis on extensive livestock farming and general aspects relating to nutrition, housing, health, breeding and rearing. Routine prophylactic drug use, particularly antibiotics, is typically avoided. Research indicates that organic standards have a positive impact on animal welfare, although animal health on organic farms is not necessarily better than on non-organic farms (EU, 2002). The potential for nutritional problems has been pointed out with respect to animals solely grazing on forage plants, particularly a lack of selenium, sodium, cobalt and iodine (Saunders *et al*., 1997). Questions also persist as to whether alternative remedies used by organic farmers are adequate substitutes for chemical interventions.

Another issue is the contribution of organic farming to the viability of **rural communities**. Organic farming generally requires a higher level of labour input than more conventional forms of farming, mainly due to the substitution of chemical inputs by labour, and a higher proportion of labour intensive activities. The growth in organic farming to date has not generally had a significant effect on employment levels in rural regions in Europe due to the small scale of organic production. However, it has been observed that there may be more substantial benefits arising from the positive image associated with organic farming for tourism and for small businesses closely related to organic farming (Häring *et al.*, 2001).

Is organic agriculture sustainable?

The overall impact of organic farming on sustainability compared to other farming systems is difficult to evaluate. In addition to the technical difficulties of defining appropriate scales and benchmarks for measurement and comparison, policy makers are confronted with the difficulty of having to make trade-offs both within and between the economic, environment and social dimensions of sustainability. The situation is relatively easy when the effects are all in the same direction. For example, a study of three apple production systems (organic, integrated, conventional) in Washington State assessed their impact on some factors in all three dimensions of sustainability. They concluded that organic production systems were more profitable, had a lower environmental impact, and produced sweeter and less tart apples (Reganold *et al.*, 2001). But when the factors move in different directions, the task is much more difficult. The OECD report on sustainable development suggested that “the overall long-term effects of organic methods of food production on the sustainability of agriculture require more investigation, given the use of more land to produce a given quantity of food, the greater skills required of farmers, and high costs of food to consumers” (OECD, 2001c).

Organic agriculture and policy

The OECD has identified five essential elements for any concerted policy action that aims to place agriculture on a sustainable path: agricultural policy reform; an ecosystems approach; internalising externalities; dissemination of information; and structural adjustment (OECD, 2001c). While they relate to agricultural policy in general, they provide a very useful framework for considering the policy issues relating to organic agriculture.

Agricultural policy reform

The first element of a sustainable action plan is to reform current agricultural support policies. Total support to agriculture in OECD countries amounted to USD 311 billion in 2001 (OECD, 2002), of which USD 231 billion is directed at producers individually. Such policies have generated production surpluses; led to a misallocation of resources both between agriculture and other sectors, and within agriculture; helped larger-scale farmers significantly more than small-scale farmers; raised food prices to consumers; diverted budgetary funds from expenditure on health, education and social welfare; and, limited the possibilities for many poorer countries to develop their agricultural sectors.

Recognising the problems associated with high levels of support, OECD Agriculture Ministers have committed themselves to a progressive reduction in the level of support and a move away from the most distorting forms of support (OECD, 1987). However, progress towards reform has been slow and variable. There has been some reduction in the level of agricultural support as measured by the Producer Support Estimate, which has fallen from 38% of gross farm receipts in 1986-88 to 31% in 1999-2001 at the total OECD level. Market price support, output payments and input payments, the most distorting forms of support, have fallen from 91% of producer support in the mid-1980s to 78% in recent years.[6] However, the average conceal wide variations among countries and commodities (OECD, 2002).

Further reform would have implications for organic agriculture. Organic producers benefit from the same market price support in the form of tariffs and tariff-quota protection provided to non-organic producers.[7] The lowering of border protection as part of a reform programme would reduce prices in these protected markets for both organic and non-organic production. How relative prices change between organic and non-organic products, and therefore the incentives for different production systems, is difficult to determine. However, reductions in the most distorting forms of support may encourage a shift toward more extensive production systems, including organic agriculture.[8] With less use of purchased inputs, the soil fertility and structure would become a higher proportion of the value of farmland, increasing incentives for farmers to maintain and improve it. To the extent that reform reduces land prices, the costs of entry for organic farming would decrease. Moreover, some payments to encourage organic agriculture in the context of high levels of support may not be required. Reductions in support would also free up funds that consumers, taxpayers or government could use to buy, *inter alia*, goods and services including those associated with organic agriculture.

OECD countries' agricultural policies, and the associated levels of support over a considerable period of time, have made their agricultural sectors very much like an intensively reared crop or animal system: an environment dependent on purchased inputs and continuous intervention from outside the sector for survival. By contrast a reformed policy environment would be characterised as for organic farms: an environment free from the artificial stimulants and interventions that have protected agriculture from competition

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6. For the results of OECD work on identifying the most distorting forms of support see (OECD, 2001f).

7. As one exception to this, the US provides a tariff-rate quota for organic sugar. For details see: www.fas.usda.gov/itp/imports/speciality.html.

8. See, for example, Pietola and Lansink (2001) conclude that an important policy implication of their research "is that an income-neutral policy reform (decrease of output prices and compensation through direct subsidies) will increase farmer incentives to switch to organic farming".

An ecosystems approach

The second element is to adopt an ecosystems approach. This refers to an "integrated strategy for the management of land, water and living resources that promote conservation and sustainable use, by both current and potential users. It stresses the application of scientific methods focused on levels of biological organisation that encompass the essential processes, functions and interactions among organisms and their environment" (OECD, 2001c). Such an approach requires a change in the objectives and institutions of management of natural resources, which for the past decades were chiefly orientated to improving on-farm productivity. Output and input subsidies encourage farmers to take risks with the resource base. Farmers that rely on their own resources rather than government are more likely to be attentive to the ecosystem services that affect agricultural productivity. Organic agriculture can fit within an ecosystems approach. The core ethos of organic farming is to work in harmony with nature to create a healthy environment in which animals and plants are naturally viable and resilient.

Internalising externalities

The third element is to address the market failures associated with the negative and positive externalities of agricultural production. Different policy instruments used to address externalities have different implications for organic production. Historically, policy makers have given greater attention to addressing agriculture's negative externalities. Subsidising the reduction of pollution, as is done in a number of OECD countries, does not create an incentive to consider other alternative production systems, including organic production. On the other hand, the application of the polluter-pays-principle (PPP), whereby farmers integrate the costs into their production decisions creates an incentive for farmers to consider alternative forms of production. The PPP has to date been applied with mixed results across the OECD and organic producers (assuming that they pollute less) are disadvantaged when the PPP is not fully applied.

More recently, policy makers have been giving increasing attention to the positive externalities of agricultural production. Again, the policy instrument used has implications for organic agriculture. When market price support policies are justified on the basis that they are required to achieve the positive externalities such as water retention services, then the incentive to switch to organic production is reduced. Whatever the target, a crucial question for policy makers to consider is whether it is better to promote organic agriculture which has a much broader environmental impact or to directly target the specific environmental concerns in a given locality.

Innovative markets solutions can reward farmers for the benefits they provide. In this regard, organic production has benefited from the development of standards and certification schemes, both private and government operated, which allows the market to recognise at least some of the environmental and social benefits of organic production. By March 2002, 56 countries had implemented, finalised or initiated the drafting of organic regulations (Organic Standard, 2002). The danger is that a proliferation of public and private sector standards for organic food, as well as complex and cumbersome government regulations and import procedures, could reduce consumer confidence and create further problems for exporters, including those from developing countries.[9]

9. Experts at a recent meeting (UNCTAD-UNEP, 2002) emphasised the need for mutual recognition and equivalency, and suggested that developed countries should, *inter alia*:

- recognise group certification in the importing country's regulations of organic produce;
- have transparent and understandable rules and procedures governing imports; and
- not use official organic labels to discriminate between domestic and imported organic products.

Government can help by recognising private accreditation bodies, speeding up equivalence agreements, and ensuring that the conformity assessment and customs clearance procedures for organic products are not more bureaucratic than they need to be.

Dissemination of information to farmers

The fourth element of a policy framework for the development of sustainable agriculture is to enhance the dissemination of information to farmers. It is not only consumers who need to be well informed. Most farmers depend on the integrity of the ecosystem, including such ecological services as nutrient recycling by earthworms and soil micro-organisms, which gives them self-interest in environmental stewardship. Understanding and recognising this self-interest can help them overcome their resistance to change, and reduce the costs of monitoring and enforcing any environmental measures. For that to occur most efficiently, farmers need to have access to good information. "Essentially, the policy challenge can be conceived as one of strengthening the links all along the chain between the creation of knowledge and its application" (OECD, 2001c).

Again, moves in this direction are likely to benefit organic agriculture. In the past, research into agricultural technologies and practices was largely directed at increasing the *quantity* of production. Research is now beginning to respond to the demand for output of higher *quality*, produced in environmentally and animal friendly ways, but there may be considerable scope to enhance this process. For example, the yields achieved by organic farming practices may be improved with a greater research emphasis on organic farming systems. Bridging the gap between research and farmers is as much a challenge for organic as it is for non-organic agriculture. However, the existence of strong communities and support groups for organic producers may make it easier. OECD work indicates that community-based groups (variously known as landcare groups, or ecological co-operatives) seem especially well-suited to addressing issues that are local in nature but extend beyond the borders of a single farm (OECD, 1998).

Structural adjustment

The final element is to devise appropriate support structures recognising that the policy changes required to place agriculture on a sustainable path could have major implications for the structure of agriculture and agriculturally dependent communities. As such, some temporary assistance may be needed to enable those who could remain viable to remain in the sector and for others to exit. To try and encourage a shift in the structure of agricultural production, some countries are providing organic farmers with financial assistance. There is a time dimension and cost involved in changing to an organic system, which can be high for small, specialised farms. In Europe, payment levels, eligibility conditions and the length of time over which support is provided (*i.e.* just for the conversion period or for longer) varies significantly between countries. For example, payment levels for arable land in the first two years of conversion range from EUR 100/ha/year in the UK, to EUR 470/ha/year in Finland. This compares with more than EUR 800/ha/year in Switzerland.

Many persons farm organically for reasons other than profit maximisation. Government policy aimed at stimulating organic farming, especially when it provides financial incentives to do so, could "crowd out" some of these altruistic or civic-minded motivations. Some farm organically as a positive reaction against what they see as the excessive government and corporate control of agriculture. Again, more government intervention would conflict with this ethic, and lower these farmers' feelings of self-determination and self-esteem (Frey, 1997). Payments for conversion to organic agriculture, and for continuing organic farming, can undermine the cognitive outlook that sees organic agriculture as an undertaking worthwhile in its own right, rather than as a cost for which compensation and payments must be paid by taxpayers and consumers.

Key issues for the Workshop

In order to consider the possible role of government to promote organic farming practices in the context of sustainability objectives it may be useful for the Workshop to consider the following questions:

- What is the available evidence on the economic, environmental and social costs and benefits of organic farming relative to other farming systems?

- Where are the major gaps in our understanding in determining the contribution of organic agriculture to sustainability and what further research is required?

- Are there significant institutional barriers in OECD countries hindering the adoption organic farming practices? In particular, is there a bias in terms of the existing agricultural infrastructure — including marketing channels and institutions, research, education and information — in favour of non-organic farming practices?

- How and to what extent should the government be involved in the development of organic agriculture — in influencing demand, for example by way of standards or the provision of information to consumers, or shifting supply through payments, research and education etc?

- To what extent are organic standards inhibiting trade in organic products, and what is the scope for the harmonisation of these standards?

- How can governments enhance information flows to enhance the capacity of farmers to adopt more sustainable farming practices?

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WHAT IS ORGANIC AGRICULTURE?
WHAT I LEARNED FROM MY TRANSITION

Bill Liebhardt[1]

Abstract

This personal description of the "transition" from agricultural chemical salesman to organic agriculture research manager pays homage to the many who, through hard work and courage of conviction, bring meaning to the concept of organic agriculture. It encourages a systems analysis of this human enterprise by understanding and imitating natural principles like building soil and plant health with ecological balance and diversity. Finally, the author urges an outcome-based definition for a movement that continues to struggle towards an evolving target.

Introduction

If I had been speaking to you 15 years ago you might have heard one of a variety of different titles for this talk — agro ecology, ecological agriculture, nature farming, sustainable agriculture, regenerative agriculture as well as organic agriculture — all with a variety of definitions and criteria.

Now, thanks to the United States' Department of Agriculture's (USDA) National Organic Standards Board, the word "organic" has an official definition in the United States:

> *An ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain and enhance ecological harmony.*

This is a fine definition — one, I'm sure, that took many people, many hours to agree upon. But for me, beginning any discussion of organic agriculture without establishing the perspective of the speaker as well as identifying the framework for analysis is somewhat like reading a scrap of newspaper blowing across a parking lot — you don't know whether the piece came from *The New York Times* or *The National Enquirer* (a sensationalistic tabloid that reports on UFO invasions and Hollywood star "secrets").

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The "O" word

By training, I’m a scientist with a Ph.D. in soil science from the University of Wisconsin. I grew up in Wisconsin on a small dairy farm and my first job after completing my undergraduate degree in the 1950s was as a fertiliser salesman. After my Ph.D., I spent time in Honduras where we injected fertiliser and pesticides through the irrigation system and where I was literally bathed in *Nemagon*, a chemical nematicide. Then I spent a year with Allied Chemical, consulting with large growers in south-eastern US on agronomic problems — always with a company product in mind. Therefore, you can see that I did not come *naturally* to organic agriculture.

I was a typical American agricultural scientist of that time — filled with post-World War II concerns about feeding the hungry and proud of American agricultural science’s role in the development of the machines and chemicals that had made farmers’ work easier and their fields abundant. At the University of Delaware in the 1970s, however, my research clearly showed that farmers were paying for fertiliser nutrients that were not necessary for increased production. Having been raised on a farm, I could guess that this was not an expense that farmers, especially small- and medium-sized farmers, could afford. Now Delaware, you may know, is a small state behind the “Nylon Curtain” — home to the Dupont Chemical Company. Therefore, you can guess that most industry representatives — several of whom had a line to the University’s Board of Trustees — did not welcome my research results. What surprised me, however, was that they were also dismissed by some of my colleagues in academic agriculture, even though they could not fault my reductionist experimentation.

After eleven years and tenure with the University of Delaware, Dick Harwood offered me a position as Assistant Director of Research at Rodale, as we sat in the shade of a wagon following a farm tour. So, in 1981 I began an odyssey into the world of “alternative” agriculture.

In a sense I was like many of the organic farming “newcomers” of the 1980s who were drawn to organic agriculture because they could no longer afford chemical inputs — I saw the economic benefits of reducing chemical inputs but did not fully understand the principles and practices of organic agriculture. However, I had good teachers and generous colleagues and in 1987, a journey that took me to the University of California as director of the first state-wide, Land Grant University programme in this field.

I am telling this personal story because as a newcomer to “organics” more than 20 years ago I remember how marginalising it was for me with my scientist colleagues. In addition, I remember how much I had to learn about the practices and understandings of organic practitioners — practices developed largely by organic farmers themselves. So during this period I was like the religious convert — a renegade from one denomination, but not well enough acquainted with the new one to be fully accepted. For instance, even though I was trained in soil science and recognised differences in soil physical character and nutritional value, I saw soil as essentially a medium for plant nutrients. I did not appreciate the full importance or complexity of a healthy, dynamic living soil system. But although I was still learning the principles and methods of organic technology, I did know replicated experimental design and helped set up Rodale’s Farming Systems Trials, now in their 22nd year.

I will talk about research from this long-term experiment as well as other such systems research programmes and some of the most important lessons I learned from the organics movement as I made this personal *transition* from conventional chemical agriculture to ecological agriculture. Along the way I will pay homage to organics’ early pioneers who, although their work was not published in peer-refereed publications, set forth the principles practised by organic farmers today.

Then let's begin with all the unknowns in the East — China, Korea and Japan — who farmed for forty centuries using the organic principles documented in Professor King's 1911 book (King, 1911).

In addition, while I am at it, let me salute our European colleagues for the many advances that European countries have made in recognising and promoting organic agriculture. There are many reasons we in America may have been laggards in this regard — our geographic separation, our migrations, our vast natural riches and our youth. But perhaps it is another example of our hubris.

In any case, I believe American supporters of organic agriculture have reason to be optimistic at this time. And those pioneers in this movement, with little reward, and often ridicule, deserve our recognition and thanks for all their work. The future for organic agriculture in this country is bright. First, there is mounting evidence of the damage that conventional agriculture practices have done to our ecological resource base as well as to human health. In addition, there is growing scientific evidence of the promise for organic agriculture to meet production goals while maintaining these resources. All of this may signal that American, perhaps world, agriculture is poised to make this "transition" to a more ecological understanding. The question for us today is: "How can we help?"

Where do we stand?

The passage of the US organic food standards this past year marked a milestone for the growing sustainable food movement on this side of the ocean. It indicates not only growing consumer approval but also an evolving American ethic about how our food should be grown. Land area certified under an organic label grew an estimated 30% a year from 1991-1997 while the number of organically certified farms doubled in this country. In 2000, according to the USDA, more than 12 000 farmers managed 2 million acres under organic rules. Yet these numbers represent only about 3% of the US fresh produce market. The United States — the so-called "bread basket of the world" — ranked only fourth in global organic production, where 42 million acres were under organic standards at the time, and it is also behind Europe in developing standards and policy incentives.

Organic farms in this country, according to studies, are usually small, averaging 76 ha in size, and half of them gross less than USD 15 000 yearly. Three-quarters of these farms are all organic and 87% of them owned by single-family partnerships. Vegetables are grown on 57% of these farms, accounting for 12% of organic cropland compared to just 1% for conventional agriculture. However, organic farming provided less than half of the family income for two-thirds of these farmers.

US organic food and fibre producers are moving from small farms to sophisticated entrepreneurial businesses with emerging local and global marketing opportunities, yet many in US agriculture have progressed little in understanding "organic" from the day a Secretary of Agriculture offered this: "When you hear the word 'organic', think 'starvation'".

However, the recent passage of the organic food standards has called attention to what the word "organic" *means.* My message today is that this "alternative" food production system is about *much more* than the use of environmentally safe, non-toxic materials or even particular soil building practices.

Organic agriculture I believe, is a holistic way of looking at the world and the role of human activities in it. It is the integration of our responsibilities to others — present and future generations — in the way we produce the food and fibre we all require and our duties to enhance and maintain the natural environment which is both our resource base and our own personal setting. It extends beyond the farm gate to the community, local and global. As a movement, it is a goal not fully *realised and still evolving as the criteria continue to change along with our understanding of human and ecological needs.*

Developed from both farmer and researcher experience over the past three-quarters century, organic agriculture today offers both agriculture practitioners and policymakers important lessons for creating a safe, secure global food system for the future. But let me go back to "frame" this discussion. As I was learning the practices of organic agriculture, I learned a guiding model, a method for analysis that has proven to be critical to addressing this in the field. In fact, I cannot discuss organic agriculture without using systems analysis or systems thinking as it is often called. This holistic approach has become an essential tool for me and many in problem solving at all levels.

Systems analysis

Most of you, I'm sure, are familiar with systems thinking as it has been used in many fields, and its theoretical power has grown through applications in both the natural and social sciences, business and applied technology. It has become an important tool in international development where natural and human systems are often fragile. A point I want to make, however, is that long before it was labelled with "systems", this holistic approach was an important aspect of the organics field. In addition, it is alluded to, if not named, in organic literature going back more than a half century.

In fact, it appears that it was the wife of Sir Albert Howard, Gabrielle — like him, a botanist and his partner in work as well as marriage — who proposed this approach when she wrote to him in 1905 while still in college: "...(T)he plant knows no division of science, in growing and carrying out its functions it uses all. Therefore men with good insight in all will be most likely to make real advances in the biological sides which after all is agriculture" (Howard, 1954, p. 39).

In the field, on the farm, and in the focus of policymakers, holistic framing has been important to addressing the needs of farmers, consumers, and the community. The usefulness of this analysis is, in fact, its focus on relationships and hence, its ability to raise new questions and suggest new answers. Rather than isolating critical components, the model exposes connections between these components and other complex systems for use in further investigation. A functioning system, in fact, is more than the sum of its parts; it is self-regulating and, over time, expresses new "emergent" properties — patterns that become platforms for new understanding and investigation.

In the past, organic proponents' use of holism has made it difficult to subject to experimentation under the rules of reductionist methods and therefore suspect to many in conventional science. The scientific method I was taught attempts to eliminate all but the variable under consideration so that a direct cause-effect relationship can be established. In contrast, systems experimentation is designed to understand how intact systems function and evolve over time. The organic farmer, without the help of university research, was the on-site agronomist, entomologist, geneticist, economist and marketer. These early practitioners learned by observation and the belief that nature was the model and teacher. Furthermore, they were good neighbours who shared their understanding with other farmers. This collective wisdom was gathered by the biodynamic followers of Rudolf Steiner in Germany; in Japan by Fukuoka, and early supporters of "organic husbandry" in this country like J.I. Rodale and later his son, Bob, who published *Organic Gardening* and *Prevention*, and by John Jeavons, who took up the Chadwick French intensive method.

Holistic research

Like this on-farm research, academic systems research is inherently multidisciplinary, with experts in many fields examining the “same elephant” in an attempt to produce a whole picture of how the system is operating and then to speculate and test how it might be improved. Such work had been going on in other countries — the work at the Rudolf Steiner institute in Germany and at Rothamsted in England. Then in 1981 Bob Rodale set up a twelve-acre experiment in Pennsylvania representing real-life crop rotations to compare two organic systems — one using animal manure and one using legume green manure — with a conventional, chemically-based grain cropping system.

Entitled “The Farming Systems Trial”, the experimental design called for eight replications arranged in random blocks. The set of specific practices for each treatment differed in crop rotation, fertility source and tillage schedule, following the cultural methods based on farmers’ practice. Data gathered from this multifaceted effort continue to yield a wealth of information that would have been impossible to get from conventional greenhouse or short-term field experiments.

This systems research — and now many more instituted at agricultural research programmes in this country — often has repeated the experience of farmers as they have attempted to make the transition from conventional agriculture to organic methods. These organic “newcomers” may have difficulty with an initial reduction in yield during the first few years. For those who were attracted to the technology for economic reasons — the price premium or savings from reduced inputs — this initial reduction in yield can be disheartening.

Like human organisations undergoing a new behavioural regime, cropping systems must adjust to new practices. So the soil and the farmer are both “learning” — adjusting to different patterns of behaviour, inputs, and conditions until a new, stable pattern has been established. Soil management history is important in determining crop yields. For instance, when no-tillage methods are used on soils that had been tilled conventionally for years, changes in carbon and nitrogen cycling can reduce yields until the system regains stability. Likewise, these cycles are affected by the shift from chemical nitrogen to organic amendments. Now, with experience with two other long-term experiments in California, I can almost see a “learning curve” before either the natural system and the human system can operate optimally.

The soil needs time to re-establish equilibrium before true differences can be noted. In the case of the Rodale Farming Trials, yields were reduced in the beginning from nitrogen shortage and weed competition on corn, although not on oats or soybeans. Rodale researchers tested this “weed” hypothesis and others by setting up a series of experiments using sub-plots within the larger experiment and manipulating a single factor including measures of soil organic matter and nutrient cycling effects on yield. Later work showed that smaller roots in the conventional corn were caused by the herbicide used. Organic farmers on their own farms within their own cultural context to test their own observations and speculations also use this “reductionist” design. Indeed, organic farmers and their on-farm experience are an important part of systems multidisciplinary teams. In addition, as increasingly academic agriculture incorporates such holistic, long-term experiments into their research programmes, they are teaching their students another approach to science. Moreover, this methodological hybrid — the combining of the two research approaches — is being integrated into all kinds of experimentation (Drinkwater, 2002). In addition, with these experiences, we have learned about making the transition to organics easier. I believe now applying what we have learned we can design systems to manage rotations with little or no reduction in yield.

What have we lost by ignoring holism or systems analysis in approaching agricultural research in the past? We might have foreseen that what is applied to our soils, what is taken into our bodies passes through to other systems through our waterways and air. We may have recognised that changing the nutrient diet for plants would affect the biotic life that surrounds them. And, like the health experts that remind us to eat our fruits and vegetables to stay healthy and avoid cancers and heart disease, agriculture may have found that good health in soil cannot be left to vitamin pills and antibiotics. We would not have rested with testing single additives to drinking water but addressed what components were *already in* our water and tested how the *synergy* of these combinations negatively affects the health of other systems, particularly sensitive developing systems like the young or unborn.

Healthy systems

Another principle of organic agriculture is the understanding that the creation of a healthy balanced system, modelled on nature — a "prevention" approach — is superior to piecemeal remediation in case of disease or insect attack. This maxim too, goes back to the beginnings of organics. Sir Albert Howard points to his Cambridge professor, Marshall Ward for the idea: "…that freedom from disease is secured by the living organism's natural capacity, if in good health, to repel attack, and its inevitable decline and defeat in the face the bacterium, virus, fungus or parasite if any way weakened or out of condition" (Howard, 1954, p. 161). As medicine has found with the human body, agriculture — another clinical science — is finding today that preventing disease is easier than curing it. Faced with pesticide-resistant insects and mounting evidence of damage from chemical pesticides, research is beginning to look at the natural balance of ecological systems. In addition, often, the way a plant is fed says a lot about its health. For beneath it all, as Sir Albert reminds us, is the soil.

The foundation of organic health has always been the condition of the soil. The first goal of an organic farmer is to improve soil tilth with organic matter — decomposing residue from plants or animals. Here the farmer assists the natural recycling process by incorporating into the soil system inputs, waste collected from other living systems. This might mean leaving residue from last year's crop on the soil, mulching with plant material or amending the soil with composted plant or animal waste material. As these organic materials decay, they release their nutrients back to the soil where they are used to support the biotic life of soil and the growth of the next crop.

Soil organic matter — humus — is a major determinant in soil health. A living system, soil is in continuous change, as new organic matter breaks down from the action of bioactivity, the insects, worms and micro-organisms that live in healthy soil. The amount of this activity and the quality of organic matter in soil depends upon the biomass added — food for the soil — a natural process.

In 1913, the discovery of the Haber-Bosch process converting inert nitrogen gas and hydrogen to ammonia, a reactive form of nitrogen that plants can use without the help of soil micro-organisms, ushered in a new era — industrial agriculture. Scientists found that boosts in this form of nitrogen could greatly increase crop production, and so, synthetic fertiliser, one of the greatest achievements of modern science, was launched.

Although nitrogen is an essential element for the crops that feed the world's six billion people, it is not the only necessary component for healthy soil, as Howard's early research on soil organic matter points out. Organic carbon is also necessary for the soil's microbial life. Around the world, farmers have found that abandoning the plough (no-tillage agriculture) greatly enhances soil fertility by conserving carbon that would have escaped into the air as carbon dioxide, contributing to global warming. However, a problem with no-tillage is weed competition and growing corn and soybeans has meant reliance on herbicides. A major challenge to sustainable agriculture research is finding ways to cope with weeds without the use of toxic chemicals.

The USDA's new National Organics Program closely reflects existing organic certification protocols and incorporates this legacy of understanding to include soil-building practices such as careful selection of rotation crops, cover cropping and the application of plant and animal residues along with low-solubility natural minerals. These tools have been shown to not only maintain or improve soil organic matter, but also to improve water penetration and retention, manage excess or deficient nutrients and protect the soil from erosion. The synergistic properties of organic matter in the soil enhance root development and support the balance of the microbial life necessary for nutrient release and the suppression of disease and pests. Not surprisingly, organically rich soils with better infiltration and deeper water-holding capacity perform better in drought and in flood, adding to the natural water table rather than eroding precious topsoil.

This holistic preventative approach continues across the field and throughout the farm, building habitat variety and species health. Organic management relies on close observation for indications of disequilibria in the system. Only when a pest population gets markedly out of control and threatens crop damage does the farmer resort to remediation with natural materials or the introduction of predatory insects. Ironically, an effective tool for organic insect control, *Bacillus thuringiensis (Bt)* — a natural toxin from the insect-killing soil bacterium, — has been genetically incorporated into the seed of several widely-used GM crops. As of 1998, there were more than 14 million acres of Bt corn, 2.3 million acres of Bt cotton and 0.05 million acres of Bt potatoes and, like over-used antibiotics, it may soon become ineffective against evolved predators (Creamer, 2001).

Differences in the management of soil fertility, namely the use of organic material versus the application of chemical nutrients, marked the beginning of the organic movement and separation from the mainstream of agriculture. But, from the beginning, the design and management of the farm as part of an integrated whole, including the energy flow from soil, crops, animals and humans, formed the core of organic agriculture research. Of his work at Pusa, India, Sir Albert wrote: "The basis of research was obviously to be investigation directed to the whole existence of a selected crop, namely the plant itself in relation to the soil in which it grows, to the conditions of village agriculture under which it is cultivated, and with reference to the economic uses of the product" (Howard, 1954, p. 42). Therefore, the relationship of agriculture to its human context was a founding concern and Sir Albert took great pains to learn the wisdom and practices of peasant agriculture in India. This understanding of the interface between human and natural systems in the agricultural process continues to evolve as proponents take in new information and social values change.

Diversity

Another principle, again following nature: organic growers promote diversity at all levels. Nature knows better than to put all her eggs in one basket. Ecology, mostly through modelling, has demonstrated the insecurity of monocultures. *A well-integrated diverse ecosystem is more resilient, that is, it recovers equilibrium more easily when disturbed.* Farmers intuitively know this, and a century ago in this country they would have planted a variety of crops and kept a variety of animals in case it was "a bad year" for any one of them. However, that was before the days of government subsidies and guaranteed price supports.

Diversity on the farm is preserved and encouraged, literally from the ground up. A variety of components including mulch, compost, minerals and natural fertilisers provide habitat for a variety of macro- (insects and worms) and micro-organisms naturally present in the soil. Then, through annual and perennial crop and variety selection, cover cropping, rotations, companion planting and diverse habitat development and flora and fauna, a web of natural processes keeps going. Trees and hedgerows attract birds and other small animals. “Host” plants provide for beneficial insects. “Trap” plants draw pests away from crops. All are used to keep pest damage below economically damaging levels.

The ecological farmer walks the fields, observing this natural activity rather than riding above it. Management of this diversity is particularly important so the organic practitioner must be aware of the characteristics and patterns of behaviour of the plants, insects and crop diseases on the farm. Understanding this ecology and allowing natural cycles and processes to work with human goals permits an integration of natural and farm functions.

This attitude of “allowing nature to express itself” — predatory insects to eat pests, keeping them in balance without going over the field with sprays — is the “co-operation rather than control” organic philosophy and one of the reasons that organic farming is called “nature farming” in Japan. In fact, organic farmers say they like to see some pests to provide for the beneficials.

A well-managed system saves resource inputs, including human energy, by integrating farm component activities with farm functions. Another example of this integration is pasture management, where cows on pasture get food and exercise grazing, while distributing their own wastes and adding to the soil’s productivity in the same paddock. Contrast this with feedlots where food must be brought in and wastes removed, using fossil and human energy, while animal health is maintained with drugs.

But the bucolic scenes of cows grazing and the contrasting textures of diverse fields and woods changed with the specialisation of agriculture and all its market and policy influences. Without detracting from the major advances of the Green Revolution and the production miracles wrought by research scientists in engineering, genetics, plant nutrition and pest control, we have learned that there is danger in transferring the mechanistic factory model to a living system, the farm.

Nature is basically conserving and recycling and is ingenious, when thwarted, in finding new ways to establish equilibrium — ways that may not suit human purposes. We have some examples that stick in our minds: the potato blight that devastated the potato-eating Irish, or the Southern Leaf Corn Blight that wiped out much of the heartland’s corn crop in the 1970s due to reliance on one hybrid seed form. But monoculture agriculture, relying upon varieties touted for their superiority, came in with chemical agriculture under the industrial model and the label of *production efficiency*.

In fact, it has been shown many times that the level of efficiency is reached very soon up the scale, and that small- and medium-sized diverse farms are more efficient than factory farms, especially when considering the industrial model’s reliance upon fossil fuel for energy, transport, and chemical fertiliser.

Failed efficiency

If we recalculate the real cost of food production we see that America’s cheap food policy costs plenty. To understand this nation’s food system we must look beyond the grocery cart to calculate the real cost of food to Americans not only as consumers but also as taxpayers. If we used a systems analysis of the costs of present day agricultural production, we would have to include:

- Productivity losses due to the erosion of key nutrients through topsoil erosion and drought;

- Medical costs to society of pesticide poisonings and chronic health problems of farmers, farm workers, and members of rural communities;
- The cost of developing new antibiotics due to over-use in animal production;
- Health costs due to improper diet, obesity, and animal fat consumption, as well as the poor availability of fresh, healthy food to the poorest among us;
- Energy and transportation costs, the non-renewable fossil fuel used to secure inputs, then to grow, transport, and preserve our food;
- Social welfare costs for displaced workers — farmers who leave the land because they do not have the scale advantage of large corporate farms to purchase their inputs directly from large suppliers at a discount — and for the rural communities which depend upon revenue from these farmers and can no longer support their infrastructures;
- Farm subsidies Americans pay as taxpayers, the bulk of subsidies going to the largest corporation farms;
- Externalised costs for cleaning up pollution from pesticides and fertilisers in our water and air.

Let's look at nitrogen, the central player in industrial agriculture: although nitrogen is an essential element for plant growth, by itself it does little to enhance the biotic life essential to soil health or the soil organic matter necessary for water infiltration and nutrient use. In fact, nitrogen is a major global pollutant. According to experts at the Second International Nitrogen Conference last year, 90% of the nitrogen in fertiliser is wasted, leaching into our soil and waters causing algal blooms and in the air, smog. According to biogeologist Jim Galloway, "Once (nitrogen) is out there, it just keeps circulating" (Kaiser, 2001). The Gulf of Mexico's Dead Zone, south of the Mississippi River delta — 5 500 square miles of water with so little summer oxygen that it is unable to sustain aquatic life — is thought to be a result of fertiliser poisoning.

Now that we are aware of the many detrimental consequences of modern farming practices to the ecology and human systems, and given emerging evidence about the effects of such practices on young and developing systems (children) such as endocrine disruption by pesticides (Watts, 2000) and the persistence of these pollutants in soil and water, shouldn't a precautionary approach to meddling in naturally-evolved systems be supported? Clearly, conventional agriculture, as practised, is not sustainable.

The yield question

Going back to that former Secretary of Agriculture's concerns about yields — can organic agriculture keep pace with population increases and healthy food preferences? Modelling work, as well as information from mature, well-managed organic research and on-farm experience, support my contention that the use of ecological farming methods can support world food production demands.

Results from scientifically replicated research from six major state universities (California, Iowa State, Michigan State, South Dakota State, Nebraska and Wisconsin) as well as private research demonstration farms, such as the Rodale Institute and Michael Fields in Wisconsin, support this claim. Work on major crops — corn, soybeans, wheat, and tomatoes — grown under experimental controls for conventional and organic farming practices over the last 10 to 15 years concludes:

- For corn, with 69 total cropping seasons comparing high input and organically grown crops, organic yields were 94% of conventionally produced corn.
- For soybeans, data from five states with 55 growing seasons' data, organic yields were 94% of conventional yields.
- For wheat, two institutions with 16 cropping year experiments showed that organic wheat produced 97% of the conventional yields.
- In California, 14 years of comparative research on tomatoes showed no yield differences between conventionally and organically grown crops.
- To summarise, for a total of 154 growing seasons for different crops, grown in different parts of this country on both rain-fed and irrigated land, organic production yielded 95% of crops grown under high input conditions (Liebhardt, 2001). In fact, organic yields are considerably higher during drought, according to several studies.

Two other studies done with ecologically based farming trials give international support to this conclusion. A recent comparative report on 21 years' experience comes from Europe. The Swiss authors found that pesticide use was reduced by 97% and nutrient input (NPK) in the organic system was 34-51% lower than conventional systems. The mean crop yield was just 20% lower in organically managed systems, indicating more efficient use of these nutrients.[2] They conclude that the use of organically manured or legume-based crop rotations utilising organic on-farm resources is a "realistic alternative to conventional farming systems" (Mader *et al.*, 2002).

The most far-reaching study, commissioned by UK Department for International Development, Bread for the World and Greenpeace (Germany), audited 208 projects involving 4.4 million farmers from 52 countries all over the developing world. (Pretty and Hine, 2001). It concludes:

> *Sustainable agriculture can be complementary for rural people's livelihoods. It can deliver increases in food production at relatively low cost, plus contribute to other important functions. Were these approaches to be widely adopted, they would make a significant impact on rural people's livelihoods, as well as on local and regional food security.*

New thinking

Einstein was reported to have said "We cannot solve our problems by using the same mentality that created them." Monoculture of the mind is as short-sighted as monoculture production. In addition, the issue of *human diversity* is important when we consider the resilience of our food supply system. A study by the Organic Farming Research Foundation in 1997 shows that 21% of organic farmers are women, 56% have college degrees and the average age is 47.5 years (Walz, 1999) — quite different from the white, past-middle-age, male-dominated conventional farmer profile. Another study showed that half of both organic and conventional farmers have college degrees but, while half of the conventional farmers had majored in agriculture, only 9% of organic farmers had agriculture degrees (Duram, 1997).

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2. Much of the yield loss in this study comes from potatoes, a difficult crop to grow organically. See Pollan, M. (2001), *The Botany of Desire*, Random House, New York.

This diversity within the ranks of organic farming itself may explain why these farmers not only do their own research but in many cases have creatively modified or built their own farm machinery and tools, and have created their own niche markets. Organic products are still sold at farm stands, of course, but many such farms have become pick-your-own operations where, like the cows in the earlier example of functional integration, customers go out to the field to harvest what they purchase. These farmers have developed value-added products using organically grown produce to create everything from jams to salsa, jerk sauce to sachets, pesto to pasta. Today, farmers' markets are found each weekend in communities across the country and organic food is found on store shelves from community co-ops and natural food stores to mainline supermarkets.

The fastest-growing US outlet for organic farms in recent years has been the CSA — Community Supported Agriculture. Under this European-inspired system families subscribe to purchase a farm's organically grown products and each week receive a seasonal variety, often delivered, farm-fresh, directly to their homes. Sometimes these families are involved in the activities on the farm, learning about the practices and conditions under which their food is grown.

A public role

Organic agriculture is information- and management-intensive, goods available to all, rather than product-intensive, available at a price, as much of conventional agriculture has become. Organic farmers (and their consumers) support organic research, largely through their own on-farm experience shared with other practitioners, or through information from privately supported institutes like Rodale, Ecology Action, or the Organic Farming Research Foundation. While the 2002 Farm Bill did contain USD 3 million a year for research on ecologically based systems, it is small compared to total research — from USD 120-200 million a year over the 10-year life of the Bill (Harkins, 2002).

In recent years, many state universities have set up programmes in sustainable or ecologically-based agriculture. They have instituted both university-based, multidisciplinary systems work and on-farm, co-operative work with organic farmers. These established tax-supported research programmes have begun to contribute to our cropping systems knowledge base, helping farmers and policy-makers look realistically at options in technology. Here then, is the traditional role of government, a role reaching back 150 years to the establishment of the American Land Grant research and education system to generate information useful to citizens and government.

However, such research is expensive to establish and maintain and the information, although vital, does not draw the dollars or attention that industry-supported, product-oriented research, especially biotechnology, has attracted. In fact, partnerships between university and industry have become the norm for research universities, allowing industry, with a relatively small amount of money, to leverage the research programme and co-opt the curriculum.

Despite these handicaps, organic agriculture has made major strides so that in *quantity* (yields) and *quality* (nutrition and cosmetics) mature, well-managed organic systems are equal, or nearly so, to conventional practices without the externalised costs. In fairness, to increase the diversity of the US agricultural production system, for safety and security reasons and to capitalise on the promise shown by organic agriculture here and globally, ecological agriculture deserves parity with conventional agriculture in research support and policy rewards for past and future stewardship.

I have referred to the organics "movement" because this word indicates that this, like all systems, is moving toward a goal — a goal that continues to emerge and to change. So American agriculture is shifting from post-World War II production goals to include others for the environment and consumers — a response to information showing agriculture's effect on natural systems as well as the removal of these toxic products from the marketplace. Agriculture is changing in response to consumers' concern for how their food is produced. And agriculture is changing because business is always looking for a new niche and the latest niche is organic. There are a number of reasons, therefore, why I think that the future of American agriculture will begin to resemble the practices of organic agriculture more and more, as consumer demand asserts itself in the marketplace and priorities change with new information and conditions.

This dynamic, cybernetic process of change puts a necessary burden on government to promote agencies, which will seek new information, provide thorough analysis and then develop policies reflecting this new understanding. With this charge for policy formulation, government must integrate often-contradictory policies. For instance, American taxpayers pay millions of dollars for the deadly impact of tobacco on health while at the same time we subsidise tobacco growing on the farm. The US government recently passed a budget-breaking USD 180 billion Farm Bill for ten years with USD 130 billion in commodity programmes. A quarter of these benefits will go to 4% of the recipients, these are organisations with USD 500 000 gross sales and up, corporate farms which have been major contributors to the ecological and social damage we also pay to ameliorate.[3]

Seeking rational public policy, an interesting report was recently released in Great Britain (Lang and Rayner, 2002). The year-long study looked at integrating farming, food, and health policies. The government charged the commission of experts to advise it on how to create a sustainable, competitive and diverse farming/food sector, which would contribute to a thriving and sustainable rural economy, as well as advance environmental, economic, health, and animal welfare concerns. Introducing its recommendations, the Commission concluded: "After half a century of production-driven farming and food policy, the old model has outlived its usefulness. There should be a new set of national principles and strategies for farming and food policy. Health, human and environmental, should be the central tenet of this policy." The Commission recommended that government take the lead in setting policy, including "Defining core goals for the next 30-50 years to include for example, the encouragement of local food suppliers, providers and retailers to reduce 'food miles', ensuring that all citizens are within or walking or bicycling distance of food shops"). Not surprisingly, organic agriculture is ahead of the curve on this issue, too.

Organic agriculture's changing goals: local food

As agriculture evolves, that sub-system, organic agriculture, continues to enlarge its perspectives, bringing new issues into its purview — issues not yet uniformly agreed upon. One such issue is the emerging belief that locally grown food is better for all concerned: farm-fresh food is better for the consumer because it hasn't been stored or transported miles, losing important nutrients and taste. Consumers know who grows their food and under what conditions. They can provide the grower with feedback on the products sold, establishing trust and gathering nutritional and culinary information while contributing to a healthy local economy. Farmers gain in this relationship because a local market means fewer overhead costs in transportation, storage, marketing and customer surveys. Local food means that food dollars can be circulated locally while protecting the local resource base. This local food movement is finding support from fine chefs and restaurants that serve as models for cooking seasonally available, tasty food.

3. Ferd Hoefner, Midwest Sustainable Agriculture Working Group (MSAWG), personal communications.

From a security perspective, a widely dispersed, diverse food supply is more resilient to interruption from any source. Furthermore, research has shown that a population of small- and medium-sized farms can support a healthy infrastructure and provide employment opportunities for healthy rural communities. Therefore, it comes with some dismay that organic growers see signs that large-scale corporate agriculture is making forays into their markets. In California, for instance, five giant farms account for half of the USD 400 million organic produce market. Cascadian Farms acquired Muir Glen and became Small Planet, now owned by General Mills. Horizon Milk, Colorado, a USD 127 million public corporation controls 70% of the retail market, selling "ultra pasteurised milk that destroys much of the nutrients but allows them to ship all over the country" (Pollan, 2001).

Although we recognise that organic production at any scale protects the health of our natural resources and even human health, there is more to this concern about the growth of the organic-industrial complex than fear of competition. The effects of corporate agriculture are well known and have been documented for decades. Linda Lobao, Ohio State University professor, reviewed 38 studies over 50 years (Lobao, 1999). She believes that the empirical evidence is sufficiently established so that almost all studies begin with the hypothesis that large-scale industrial farms have negative impacts on rural communities. Then there is the question of the inputs used by such large-scale operations. Even though safe for the ecology, the need to use non-renewable fossil fuel to import these off-farm inputs makes such operations non-sustainable.

In 1985, Bob Rodale wrote in *The New Farm*:

> *Regenerative agriculture is an example of one of the new alternative agriculture ideas now being developed. Organic farming fits within the regenerative model. However, to be truly regenerative, a farm would rely mainly on abundant, renewable resources like air, sunlight, water and minerals from the soil to produce food. For example, a farm that uses an abundant off-farm source of manure for fertility would be organic but not regenerative.* (Rodale, 1985).

To protect family-sized farms and the communities that depend upon them, as well as their natural resource base, some states have enacted or are considering rules against corporate farms. Nebraska, for instance, found that livestock production was harming the Sandhills, an ecologically fragile part of their state. Studies of two Sandhills counties in the 1970s found that over one-quarter of the irrigated land was owned by non-family farm corporations, despite its classification as non-arable land (*Farm Policy Network News*, 2002). In her study, Linda Lobao concludes: "From a social science standpoint, the farming system in place today has been created from both market forces and government policy and programmes. It is thus logical that government can also be an instrument transforming this system toward greater public accountability" (Lobao).

The adverse effects of chemical agriculture are widely known today; the adverse effects of corporate agriculture are also known as damaging rural economies' human and ecological resource base. However, while taxpayers have become fed up with the subsidies going to these same large corporate farms, farm state lawmakers who benefit from their campaign contributions are reluctant to reduce their commodity payments.

Conclusion

Take a lesson from organic agriculture: policymakers should look as systematically at the goals and outcomes of agricultural policy as we have tried to do with our farming systems. Is the agriculture we promote:

- producing safe and sufficient food for a healthy diet for all our citizens?
- supporting a diverse, thriving natural ecology and a pleasing landscape?
- building a sustainable resource base?
- providing sufficient income for family-scale farms?
- protecting rural community infrastructure?
- offering opportunity for those who want to engage in agriculture to become involved with the land at an appropriate level?
- encouraging understanding and appreciation for food, farmers and the land?
- If not, how can we learn to do this?

Now let me offer another definition of organic agriculture that I learned when I joined the Rodale organisation over 20 years ago: organic agriculture is healthy for the consumer; economically sustaining for the farm family and community; environmentally enhancing and socially just. Maybe agriculture is even spiritually sustaining as Thomas Jefferson, E.O. Wilson and Bob Rodale believed. I cannot imagine a better hope for all of agriculture.

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Part I.

Organic Agriculture and Sustainability

Chapter 1.

Organic Agriculture and the Environment
Overview

ORGANIC AGRICULTURE AND SUSTAINABILTY: ENVIRONMENTAL ASPECTS

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Abstract

While positive effects on the environment lie at the heart of the idea of organic farming they are still surrounded by controversy. The question whether positive effects on the environment justify political support of organic farming is especially critical. The paper outlines some of the methodological difficulties in assessing the environmental costs and benefits of organic farming. It is argued that a set of physical indicators should be used to measure the environmental benefits of organic farming compared to non-organic, rather than using monetary estimates. Results from a literature review on the environmental effects of organic farming based on the OECD agri-environmental indicators are presented, which generally show a superior performance of organic farming on a per-hectare scale. The paper critically reviews the hypothesis that a combination of conventional farming plus agri-environmental measures is always more cost-effective in providing the desired public goods than organic farming. Organic farming has advantages with respect to lower transaction costs and a partial internalisation of externalities. Lower per area productivity is not a relevant problem as long as set-aside schemes are used to cut surplus production, but it might be in other situations. The paper concludes that there is sufficient justification to support organic farming for environmental reasons. However, this should be combined with agri-environmental measures targeted at all of agriculture. [2]

Introduction

Positive effects on the environment lie at the heart of the idea of organic farming. For consumers, they are in many cases a key argument for buying the products; for organic farmers, the experience and belief to apply an environmentally benign system is often part of their motivation and, last but not least, for policy makers interested in organic farming, its environmental effects are a key issue. The EU is an important, but by no means the only, example for this approach. There is at present no EU country which does not directly promote organic farming through agri-environmental political measures (see Lampkin *et al*., 1999). Such active policy involvement towards organic

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farming has a relatively short history and still sparks controversy. A recent example of such a controversy and the arguments put forward against organic farming being a useful sustainability indicator are given in Box 1. Pointedly expressed, the positions voiced in that controversy range from “organic agriculture is the only sustainable system” to “organic agriculture is not at all a sustainable system”.

The aim of this chapter is to examine the environmental costs and benefits of organic production compared with non-organic production. This is quite an ambitious objective, as will become clear in the discussion. The objective of this paper is to highlight some of the important issues and questions, and present evidence that can be helpful in finding politically relevant judgements.

Box 1. The proportion of organic farming as an indicator for the sustainability of agriculture? A recent controversy in Germany

When in early 2002 the German federal government suggested including the proportion of organic farming as the only sustainability indicator for agriculture into the national strategy for sustainable development, it was harshly vetoed by the government’s own Council for Sustainable Development (Rat für Nachhaltige Entwicklung, 2002, p. 10, own translation):

The objective of the Federal Government to raise the proportion of organic farmed area to 20% is not an appropriate indicator for sustainable agriculture. This indicator attaches an exclusivity to organic farming which is inappropriate. The indicator orients sustainability exclusively towards organic farming. On the contrary, suitable management is a prerequisite for the sound path into the future with respect to ecological, economic and social aspects – and this statement holds both for organic and conventional agriculture. The indicator does not give any evaluation of the sustainability of the currently 97 % agricultural area that is conventionally used, (...). An indicator for sustainable development in agriculture has to be oriented in the first place towards conventional agriculture, because this will be in the future the dominating form of agriculture.

The Council suggested using the nitrogen balance as an indicator instead of the proportion of organic farming. Finally, both indicators were included (Bundesregierung, 2002), a compromise that did not satisfy the representative of agriculture within the Council who resigned under protest, stating “an agricultural system that uses 30-50% more area to produce the same amount of food cannot be sustainable.”

This paper is divided into three parts. As a starting point, different approaches to the measurement of environmental benefits are presented and their consequences are outlined in a conceptual discussion, which concludes that physical indicators of benefits from organic farming compared to conventional must play an important role in the policy discussion. Consequently, the second major section of the paper presents results of a comprehensive literature review on this topic and interprets them in a context of agri-environmental policy. Finally, some conclusions are drawn.

Different approaches to the measurement of benefits and costs, and their consequences

Important characteristics of the problem

Consider a completely idealised world where only two farming systems exist: conventional farming, which takes up the vast majority of the land, and organic farming, taking up a small percentage. Conventional farming produces food more cheaply than organic farming but provides less environmental benefits. Let us assume that both the costs and benefits associated with a change in organic farming area are known in monetary terms. In our static world of complete information, the costs could reasonably expected to be increasing with an increasing organic area, at least beyond a certain point. This would come about because with an increasing area farm types with higher opportunity costs would convert, like farms in the most fertile areas or intensive livestock farms. These would have to decrease their output considerably and would suffer from high labour cost per unit of output produced (compare Braun and Dabbert, 1997). The monetary value of the environmental benefits of organic farming would decrease if the systems spreads, because a higher supply would lead to a decreasing marginal appreciation of the environmental goods produced. In this world it would be easy to calculate the optimum area of organic farming. Even the existence of public goods and externalities would not be a serious problem in such a case. If the supply of some public goods would be less than efficient, government could easily correct this through some form of intervention.

This idealised world is, in a number of aspects, far from the real world. It is therefore useful to consider some of the real world characteristics that make the task of integrating organic farming into agri-environmental policies more difficult to cope with. The following problems will be discussed:

- the valuation of externalities;
- the correct estimation of cost under the presence of sectoral economies of scale;
- the dynamics of conventional technology;
- the existence of a variety of options, even within conventional farming; and
- the influence of transaction cost on policy design

The fact that no market values exist for public goods and externalities is a serious problem. There have been intensive efforts to develop methods to value such externalities in monetary terms; however, "considerable scepticism still remains regarding the validity and reliability of these methodologies" (Hueth, 2001). In the case of the comparison between organic and conventional farming, measurement and monetary evaluation of externalities is complicated by the fact that externalities often have effects at different spatial scales (from local to global). The consequence is to deviate from traditional cost-benefit analysis of policies and to look at cost-effectiveness. With this approach the environmental benefits are quantified in physical terms. In addition, the result of the analysis contains that part of the cost that is easy to calculate, like the cost of forgone production or of increased labour requirements. The policy maker is then confronted with a mixture of monetary and physical units, more difficult to interpret than the result of a cost-benefit analysis.

If the costs associated with organic farming are calculated, they usually directly reflect the current situation of organic agriculture. However, one should take into account that in many countries organic farming is still a very small part of agriculture. A dynamic growth will most likely lead to some economies of scale due to a higher efficiency in the technology and information delivery system, and improvements in the logistics of transportation, processing and marketing.

In a more dynamic view, the development of conventional farming should also be taken into account when assessing the cost associated with the provision of environmental benefits from organic farming. It is likely that technological progress in conventional farming will continue at a rapid pace. As only some of that is directly transferable to organic farming, this is likely to worsen the position of organic farming by comparison.

Actually, the comparison of just two options (organic *versus* conventional) is very incomplete. Typically both farming systems comprise a high variation in management practices, which makes average comparisons quite difficult.

There are also different ways to produce the desired public goods. Conventional farming with the inclusion of some agri-environmental options might also be able to deliver a set of such goods. Some economists argue that the flexibility of such an approach is a key advantage. In their view, under this approach only those public goods actually desired by society are produced, while organic farming might only by accident produce the level and extent of public goods desired by society. In several areas organic farming will remain behind the targeted level, in others it will surpass it. This view is summarised by von Alvensleben (1998), who stated: “There are farming systems that can achieve the desired environmental goals more cost-effectively than organic farming.”

As a consequence, this would mean that, with a combination of several measures aiming at improving parts of the conventional system, the targeted level could be attained more precisely and as a whole more cost-effectively. For those who subscribe to this view, it is obvious that support of organic farming is ruled out as an instrument of agri-environmental policy. This point of view follows the Tinbergen-Rule of economic theory, which states that the number of political instruments should at least be equal to the number of the goal dimensions (Ahrens and Lippert, 1994). This is theoretically correct, if a number of prerequisites are met: that the environmental indicators are measurable and their measurements do not incur costs; that the interactions between the different environmental indicators can be described quantitatively; and that the transaction costs of a multitude of political instruments are zero or negligible.

Reality, however, departs from these assumptions. Agri-environmental programmes can be associated with considerable transaction costs. The measurement of environmental indicators can incur considerable costs; understanding of the interactions between the different environmental indicators is limited; and the administration of very detailed agri-environmental political measures can also be expensive (Falconer and Whitby, 1999). These costs will be higher: the more detailed the set of targeted indicators is; the better this set of environmental indicators is adapted to regional circumstances; and the more precisely the policy is tuned in order to meet exactly the targets. So any agri-environmental programme has to be designed as a compromise. There are certainly some costs associated with using imprecise indicators, such as the costs of deviating from a target. Such costs will increase with more imprecise indicators. Transaction costs counteract this as they will decrease if more imprecise indicators and policies are used.

The case for policy support for organic farming for environmental reasons

There is, thus, a case to argue that for policy formulation it is useful to rely on indicators that are reasonably simple to measure and on political instruments that are relatively straightforward to administer. Organic farming, as such, can be viewed as an environmental indicator (OECD, 2001). From a theoretical point of view, the costs of missing the targeted level which could be connected with organic farming must be set against the transaction cost savings which can be achieved through organic farming when compared with a detailed policy development improving conventional farming on a step-by-step basis. Only if the costs of missing the targeted levels of environmental performance are greater than the saved transaction costs is the implementation of detailed agri-environmental political instruments worthwhile. In practice, organic farming in its operation as an agri-environmental political instrument has minimal transaction costs because the actual control of the farming system is carried out within the scope of certification in order to make it possible for the separate marketing of the products at higher prices.

Finally, this is an empirical question where few studies yet exist and where many methodological problems are waiting for researchers. Jacobsen (2002) found on average comparatively high cost per kg nitrate reduction in a Danish investigation that compared organic farming as an agri-environmental measure to other measures. However, all costs of converting to organic farming were charged to the nitrate reduction in this case and no transaction costs were considered. Still, these results are in line with plausibility. If very specific environmental goals are desired, then more specific agri-environmental measures than those targetting organic farming are probably more appropriate. Organic farming is well suited for an improvement in the condition of a greater number of environmental indicators. In this case, one can assume that the saved transaction costs, which are connected with the promotion of organic farming (compared to a very detailed solution), are greater than the cost of missing the environmental target level. This conclusion rests on the assumption that organic farming does indeed lead to an improvement in physical indicators. The results of such a comparison of physical indicators is shown in the next major section of the paper.

The preceding discussion centred very much on one specific type of policy support, namely supply-side payments within agri-environmental programmes, normally on a per-hectare basis. If it is argued that support of organic farming is justified, because it produces environmental goods which are under-supplied, there are of course a number of other means of support, which might be quite effective and less costly than per-hectare payments. The Danish actions plans for organic farming (Holmbeck, 2001) and more recently the German Federal Programme for Organic Farming (Isermeyer *et al*., 2001), or suggestions for a European Action plan for organic farming (Dabbert *et al*., 2001) give numerous examples. Such policies aiming, for instance, at technological development within organic farming, and at making information available within the organic sector, can be seen as having important influence in certain situations. But again, such policies need justification — and the environmental effects of organic farming can provide such a justification.

There are numerous consumers of organic products who want to support an environmentally friendly system by buying the products. This implies that they are actively supporting the private provision of a public good. And it is evident that while in some cases the demand for organic products is only motivated by product characteristics and thus the provision of the public good is an accidental by-product, in other cases there are politically relevant, altruistic motives present. The argument is that there is no 100% free riding. If there should be any hidden demand among consumers, it might also from an environmental viewpoint be a sensible strategy to help to realise it.

The existence of a segmented organic market with premium prices for consumers and farmers is important in designing agri-environmental policies that include provisions for organic farming. The case of Sweden is an interesting example (Lampkin *et al*., 1999). In Sweden, the agri-environmental measure supporting organic farming does not require the farmer to obtain certification in order to get the agri-environment payment. A considerable proportion of the farmers using this programme chose not to be certified. Sweden stands out from other countries in supporting organic farming as a purely agri-environmental programme. The products that are not certified do not influence the organic market.

One of the advantages of organic farming is that partial internalisation of an externality happens. For policy, this has the implication that environmental goods and services are partly paid for by the consumer. On the other hand, any form of intervention can change the market balance. The existence of a segmented market for organic products is very important. Any support policies for organic farming have to be carefully implemented and monitored in order to make sure that they do not interfere with sustained premium prices.

Implications for methodology

An ideal study would have to take into account all the characteristics of the problem outlined above. Such a study does not yet exist, and it might be quite difficult to include all the aspects into one empirically relevant quantitative model. In a more pragmatic line of thought, the following requirements seem to be especially important:

1. Taking into account the difficulties of the monetary valuation of benefits, it seems necessary to use a broad set of physical environmental indicators either supplementing monetary values or in addition to them.
2. A gradual approach is to be preferred if the (relative) costs of organic farming are to be assessed. Rather than asking "organic *or* conventional?" it seems to be useful to ask "to what extent organic, for what purpose, and where?" This has, of course, the implication that marginal thinking becomes important.

In light of these requirements it makes sense to take a short look at the studies found in the literature that might have practical relevance for our problem. Many studies have tried to estimate the consequences of a drastic decrease of the use of pesticides (some reviews are Oskam, 1997, Kuhl *et al*., 2001, Waibel and Fleischer, 2001). The results of such studies tend to show rather large costs if no pesticides are used. As Waibel and Fleischer (2001) point out: "All existing studies on drastic pesticide scenarios, no matter if a partial or a general equilibrium is used, come to the same conclusion: They state that on average benefits of pesticides outweigh their costs. Such a result is not surprising, simply because two extreme scenarios are compared: the current situation versus a complete pesticide ban or an extremely high reduction. ... This definitely limits the usefulness of all these studies with regard to policy conclusions." By their very nature, these studies concentrate on pesticide (and sometimes nitrogen fertiliser) use, so they also fall short of the first requirement.

Studies that explicitly look at the cost of widespread conversion have been reviewed by Offermann (2000). He summarises: "In spite of large differences in methods used and regions covered, all studies show a significant, and remarkably similar reduction in the production of most agricultural products, with the decline in output being highest for cereals, pig and poultry. The development of farm income is to a large extent dependent on the assumed prices, and can both be higher and lower than in the respective reference scenario". Offermann notes serious methodological limitations in most studies because they were not able to model a limited area conversion endogenously, let alone the resulting changes in organic prices. Also, impacts on conventional markets are often neglected. In addition, if the environmental indicators have been included in these studies, their extent has been quite limited.

In summary, much of the literature that is potentially useful for assessing the environmental costs and benefits of organic farming does not meet either of the two key requirements outlined above. This was one of the motivations for an extensive literature review on the physical effects to provide a starting point for further analysis.

An indicator approach to the environmental effects: measuring the benefits in physical terms

The methodological challenge

In order to create a comprehensive, European-wide information base, a written survey of experts was carried out in 18 European countries (the 15 EU-countries plus Norway, Switzerland and the Czech Republic). By means of a structured questionnaire, the experts were instructed to provide an English synthesis of the respective national literature about the environmental relevance of organic farming. The reviewed literature displays a multitude of methodological approaches. In many cases only a few countries presented studies of important indicators and mostly these did not differentiate according to farm type, making a differentiation of the environmental effects of organic farming according to country, region or type of system impossible. Although there are numerous studies available, the total quality, extent and comparability of the information is of a very diverse nature. Thus a quantitative assessment was not appropriate. Therefore, the decision was made to carry out a qualitative multicriteria analysis and present each step with the utmost transparency to allow the readers to form their own, perhaps differing, opinions. A detailed description of the methodological approaches is beyond the scope of this contribution and can be found in Stolze *et al*. (2000). The actual methodological challenge of this study is characterised by five questions.

Which systems will be compared?

The obvious system with which to compare the environmental effects of organic farming is conventional farming. However, the term conventional farming encompasses a very broad spectrum: a) the system as typically found in practice, b) integrated farming, and c) with regard to the quality of environmental management, expanded integrated farming. Similarly, one can differentiate systems within organic farming: a) organic farming, as it is commonly encountered in practice, b) organic farming of top-quality enterprises with the best possible management practices, and c) the best realisable organic farming, including specific agri-environmental measures. It is evident that the result of a comparison between organic and conventional farming depends on which of the given sub-systems are compared. The selected scientific studies are not easily brought into the outlined structural scheme. However, it can be assumed that in most cases systems typically found in practice were compared.

Which assessment scale will be applied?

In principle, it would be conceivable to compare the different land use systems on an absolute scale according to their fulfilment of criteria. This would allow quantification by achievement of these criteria. However, such a procedure would make it necessary to determine target levels on an absolute scale for all indicators used. In view of the fact that there are good economic and scientific reasons why such target levels of each indicator should differentiate strongly by region, and in view of the problematic data situation, it was deemed necessary to directly compare organic with conventional farming. The following will ascertain whether organic farming ranks much better (++), better (+), equal (0), worse (-), or much worse (--) than conventional farming with regard to the specific environmental indicators. In doing so, a relative system comparison will be undertaken, rather than a comparison of systems according to an absolute target level. The hypothesis states that there is no difference between the environmental effects of organic and conventional farming. This hypothesis will be accepted, if there is clear evidence that no difference between farming systems exists or reliable information for this is not available. Only if the reviewed literature unequivocally verifies a difference between organic and conventional systems, such is stated.

Area-related or product-related comparison?

When relating environmental effects of different farming systems according to land area, it can lead to other conclusions than if one relates these environmental effects to the unit of manufactured product. This has agri-political implications. The majority of investigated comparative studies relates the environmental effects of organic farming to land area, while relatively few studies have attempted to compare the environmental effects per unit of manufactured product. Therefore, for pragmatic reasons, a comparison of environmental effects will be carried out per hectare of land area.

Which indicators will be applied?

The assessment is based on the OECD indicator system (1997). Several places simplifications have been made and — where it appeared appropriate —modifications. As Table 1 shows, the following indicator categories are distinguished: Ecosystem, Soil, Ground and Surface Water, Climate and Air, as well as Farm Input and Output. In addition, Animal Health and Welfare was included. These categories are specified through additional indicators.

How will the indicators be aggregated?

In view of the imprecise data basis, a quantitative approach did not appear appropriate to aggregate the assessment of each indicator. In the results table, the aggregated results are displayed, based on the authors' subjective expert opinion.

Results of the system comparison

The results of the comparison of organic and conventional farming systems are shown in Table 1 in the form of indicators. This portrayal not only takes into account the authors' summarising assessment of the indicators, but also specifies the subjective confidence interval. This again reminds the reader that the subject area is hampered by the shortage of precise information. The subjective confidence interval should mark in which area, based on the literature reviewed, it appears conceivable for a deviation from the end results.

For each indicator organic farming is ranked at least equal to conventional farming, in many cases it performs better or much better. In two cases, the subjective confidence interval reaches into the area which possibly allows conventional farming to appear as the preferred system. Examining the aggregation level of the indicator categories, the picture becomes more uniform. In the categories Climate and Air and Animal Health and Welfare, no clear conclusion could be drawn and the need for further research was identified. Some background on each of the categories is given in Box 2.

In spite of these clear and broadly positive results based on a thorough analysis of the literature available in 1999, further discussion is required:

- Organic farming seems to perform better with respect to all the indicators considered, but substantial differences exist between the various indicators. Other farming systems might, therefore, have even less detrimental effects on certain indicators than organic farming. In this respect, it is plausible that the advantage of organic farming is its broad positive impact on a wide array of environmental indicators.

- The relative environmental performance of organic farming differs substantially according to farming system, farm type and region. This makes it difficult to draw general conclusions on this issue and emphasises the need for more information.

- The results presented might change over time and with developing legislation and policy. For example, organic animal husbandry standards were only defined by EU legislation in 2000 and the above-mentioned results do not yet reflect their effects on environmental performance. Thus, organic animal husbandry is expected to out-perform conventional farming to a greater extent in the future. Equally, tightening of standards for conventional animal husbandry can change this picture.

- Linking the environmental effects of agricultural production to farmed area may give a misleading picture. Impact per unit output might be the more appropriate scale to evaluate the environmental effects of agricultural production. In that case, organic farming — due to lower yields — may under-perform conventional farming. However, given the sustained surplus production in the EU, this argument seems of minor relevance, especially when the issue of keeping marginal land in production is gaining importance in the EU.

Table 1. Assessment of organic farming's impact on the environment compared to conventional farming

Indicators	+ +	+	*O*	–	– –
Ecosystem		X			
Floral diversity		X			
Faunal diversity		X			
Habitat diversity			X		
Landscape			X		
Soil		X			
Soil organic matter		X			
Biological activity	X				
Structure			X		
Erosion		X			
Ground and surface water		X			
Nitrate leaching		X			
Pesticides	X				
Climate and air			X		
CO_2		X			
N_2O			X		
CH_4			X		
NH_3		X			
Pesticides	X				
Farm input and output		X			
Nutrient use		X			
Water use			X		
Energy use		X			
Animal health and welfare			X		
Husbandry			X		
Health			X		

Legend: Organic farming performs: ++ much better, + better, o the same, – worse, – – much worse than conventional farming; if no data was available, the rating was "o the same".

X: Subjective confidence interval of the final assessment which is marked with X

Source: Stolze *et al.*, 2000.

Box 2. Background on the environmental impact of organic farming on the indicator categories given in Table 1

Ecosystem indicators: Floral and faunal biodiversity, habitat diversity and landscape conservation

Organic farming performs better than conventional farming in respect to floral and faunal diversity due to the ban on synthetic pesticides and N-fertilisers, with secondary beneficial effects on wildlife conservation and landscape. Diverse crop rotations in organic farming provide more habitats for wildlife due to the resulting diversity of housing, breeding and nutritional supply. However, direct measures for wildlife and biotope conservation depend on the individual activities of the farmers. With respect to habitat and landscape diversity, research deficits were identified. As with any other form of agriculture, organic farming cannot contribute directly to wildlife conservation goals. Nevertheless, in productive areas, organic farming is currently the least detrimental farming system with respect to wildlife conservation and landscape.

Soil indicators: Soil organic matter, biological activity, structure and erosion

Organic farming tends to conserve soil fertility better than conventional farming systems. This is mainly due to higher organic matter content and higher biological activity. Therefore, organic farming seems to control erosion more effectively. A more continuous soil cover due to close crop rotations also supports this. In contrast, no differences between the farming systems were identified for soil structure.

Ground and surface water indicators: Nitrate leaching and pesticides

Organic farming results in lower or similar nitrate leaching rates than other farming systems. Leaching rates per hectare are up to 57% lower. However, the leaching rates per tonne of produced output were similar or slightly higher. Ploughing legumes at the wrong time, unfavourable crop rotations, and composting farmyard manure on unpaved surfaces increase the possibility of nitrate leaching in organic farming. However, awareness of the problem and alternative measures have been developed and introduced in practice. The risk of ground and surface water contamination with synthetic pesticides is zero.

Climate and air: *CO_2 , N_2O, CH_4, NH_3, pesticides:*

Research on CO_2 emissions shows varying results. On a per-hectare scale, the CO_2 emissions are 40-60% lower in organic farming systems than in conventional ones, whereas on a per-unit output scale, CO_2 emissions tend to be higher in organic farming systems. Similar results are expected by experts for N_2O and CH_4 emissions, although to date, no research results exist. Calculations of NH_3 emissions in organic and conventional farming systems conclude that organic farming bears a lower NH_3 emission potential than conventional farming systems. Nevertheless, housing systems and manure treatment in organic farming should be improved to reduce NH_3 emissions further. Air contamination with synthetic pesticides is significantly lower due to their ban under organic standards.

Farm input and output: Nutrient, water, and energy use

Nutrient balances of organic farms are generally close to zero because organic farms rely heavily on internal nutrient cycling; N surpluses of organic farms were significantly lower than on conventional farms, for P and K deficits prevail. Energy efficiency of annual and permanent crops seems to be higher in organic farming than in conventional farming, mainly due to lower inputs which require a high energy input, *i.e.* N. Research results on water use in organic and conventional farming systems are not available.

Animal health and welfare

Husbandry, healthy housing conditions and health status depend highly on farm-specific conditions. Thus, housing conditions do not differ significantly between organic and conventional farms. Preventive use of synthetic, allophatic medicines is restricted by some national standards and recently also by EU rules. Although the application of homeopathic medicines should be preferred, conventional veterinary measures are permitted and used in acute cases of disease. Health status seems to be closely related to economic relevance of animal husbandry on the farm: significantly fewer incidences of metabolic disorders, udder diseases and injuries were found when dairy production was properly managed. Organic dairy cows tend to have a longer average productive life than conventional dairy cows.

Source: Stolze *et al.*, 2000.

Relevance of the system comparison results for agri-environmental politics

In the absence of further interpretation, the comparison of organic and conventional farming by means of different scientific indicators does not present an immediate contribution to the agri-environmental political assessment of organic farming. In this section, it should become clear which questions can be answered with the preceding comparison and where the limits of interpretability of the system comparison lie.

Environmentalists might ask the question: how would an expansion of the proportion of land under organic farming (*e.g.* doubling) influence the environmental situation? With this question, it is assumed that the total agricultural area does not change, instead the proportion of organically farmed land increases. This question can clearly be answered with the system comparison as a basis: organic farming performs equally in some indicator categories and better than conventional farming in others. Thus, the question is answered as follows: an increase in the proportion of organically cultivated land would lead to an improvement of the environmental situation.

The question of "Food Security Provision" could run as follows: how would a proportional increase in organic farming affect the environment, if the same amount of food were produced as in the starting situation? This question assumes a political decision in which the proportion of organic farming is increased without decreasing the amount of food production. Under the current conditions of EU agricultural policy, this scenario is not relevant although conceivable in the future. In this case, the lower yields of organic farming play an important role. The positive environmental effect from additional land converted to organic farming is not the total effect on the environment, because in this scenario the total cultivated area is expanded. If this expansion is connected to negative environmental effects, then these must be compared with the positive effects of the additional area converted to organic farming. In the situation of a food shortage, it would be relevant to know the environmental effects of both land use systems per production unit. As this information is not available for most indicators, this question cannot be answered at present. From a scientific point of view, this may be unfortunate, but for practical agricultural policy the question is not politically relevant under the current conditions of the EU.

The question many economists would tend to ask could be phrased: which is the most cost-effective way to reach environmental objectives, and to what extent is organic farming part of such a solution? A physical benefit measurement that does not include the cost aspect can of course not give an answer to that question. However, the findings can be interpreted in a way that organic farming is at least among the candidates to be examined further for a cost-effective solution.

Conclusions

From the discussion and the results presented it can be concluded that there is sufficient justification for support of organic farming for environmental reasons. However, this should be combined with agri-environmental measures targeted at all of agriculture. In this respect direct support of organic farming is just one option. It is also conceivable to have agri-environmental policies geared at all of agriculture which only indirectly influence organic farming. Pesticide and fertiliser taxes would be an example of such policies. They would change the relative profitability of conventional versus organic farming without providing direct support to organic farming.

In a policy environment such as the EU, which seems to be evolving from market support to a combination of world market prices, more decoupled support and special environmental provisions under agri-environmental programmes, further elaboration of such more general environmental provisions without any financial remuneration is not fitting too well into the picture (Commission of the European Communities, 2002). Environmental taxes would be a competitive disadvantage if farmers have to face world market prices.

The scientific evidence on many of the questions discussed is not fully satisfying. Even the most simple question of assessing the physical benefits of organic farming can be answered only with a certain degree of precision. Based on the existing literature, the necessary differentiation according to region and farm type is, to a large extent, not possible. The economic aspects are even less researched and studies suffer from methodological limitations. As political decisions cannot be postponed until more research is done, this paper has been written as an attempt to come to some politically relevant conclusions based on the evidence available, even if this evidence is incomplete and sometimes ambiguous.

With a view to future developments, it seems to be important to keep in mind that both the relative economic and environmental performance of organic farming compared to conventional might change (Häring *et al*., 2002). There might be changes in relative yields through technological progress. Technology development will also influence relative environmental performance, *e.g.* by using precision-farming methods more widely in conventional, but possibly also in organic, systems. If legal restrictions for conventional agriculture would lead to a "greener" conventional system it will be interesting to see whether the organic sector reacts with tightening its own standards in order to keep a clear distinction. The magnitude and the resulting net effect of these developments is an interesting area of speculation. For practical policy, two lessons emerge from such discussion: first, technology development within the organic sector is a key question for its future development; second, policies geared at conventional agriculture might heavily influence the future development of organic farming.

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ORGANIC FARMING AND NATURE CONSERVATION

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Abstract

This paper summarises the potential contribution of organic farming to biodiversity conservation through an assessment of its impact on the World Wildlife Fund's (WWF's) conservation priorities: 238 global priority ecoregions and six global themes (living water, forests for life, toxics, species, endangered seas and climate change). Organic production (the production methods as well as the movement) has contributed to biodiversity conservation by: 1) identifying production systems with ambitious and comprehensive principles for sustainable agriculture; 2) demonstrating that alternative methods of production are commercially and economically viable; and 3) galvanizing an important and rapidly growing demand in the marketplace for more sustainably produced products. The lack of science-based indicators to measure environmental impacts of organic production, however, limits our ability to assess its impacts on biodiversity conservation. The safety of natural compounds should be investigated scientifically and not assumed. To identify truly sustainable production methods and move beyond statements of principles to measurable conservation results, robust, scientifically-based measures or indicators are needed to assess impacts and evaluate tradeoffs between different kinds of production systems, including organic, on environmental criteria.

Introduction: organic farming and WWF's mission

WWF's mission

Globally, WWF's mission is to stop the degradation of the planet's environment and to build a future in which humans live in harmony with nature by:

- conserving the world's biological diversity;
- ensuring that the use of renewable natural resources is sustainable; and
- promoting the reduction of pollution and wasteful consumption.

To put its mission into practice, WWF, a global environment network of some 80 organisations and 4 million members, has identified 238 global priority ecoregions and six thematic priorities.

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WWF's geographical priorities

WWF has undertaken an analysis of the globe divided up by ecoregions to assist it in developing geographical priorities for its mission. Two hundred and thirty-eight priority ecoregions have been identified. WWF is pressing ahead with work in 52 of these. In a large number of them agricultural commodity production is a significant threat to biodiversity. So, better management practices in agriculture are a key solution to the conservation of biodiversity in these ecoregions.

WWF's thematic priorities

Living waters: protection of important freshwater wetlands; reduction of water over-abstraction and pollution of watercourses, especially where induced by key crops; appropriate use and management of river basins essential for people and wildlife; and influence private sector practices and government policies to ensure freshwater resources for all.

Forests for life: protection of a network of areas representative of the world's threatened and most biologically significant forests; correct management of forest areas by the Forest Stewardship Council's (FSC) certification initiative; and restoration of the most threatened, deforested and degraded forest landscapes.

Toxics: ceasing completely the use (including production, release, transfer and application) of key persistent organic pollutants (POPs) through complete and effective international treaty; phasing out a selected list of endocrine disrupting chemicals (EDCs); and establishing an international co-operative research project on EDCs.

Species: conservation of emblematic and strategic species like the giant panda, Asian and African elephant, tigers, whales, great apes and turtles; conservation of plants as a resource for human health and economic activities; and strong control and improvement of wildlife trade legislation.

Endangered seas: conservation of marine biological diversity by establishing marine protected areas and ending over-fishing by creating market incentives for sustainable fishing through the Marine Stewardship Council's certification initiative.

Climate change: reduction of CO_2 emissions; increase energy efficiency; and promotion of labelled green energy sources.

The significance of organic farming

World-wide, more than 20 million hectares of cultivated land are certified organic. This is a significant amount, but three orders of magnitude less than the world's 5.9 billion hectares occupied with arable land, pastures and wooded areas used for agricultural purposes. Australia, Argentina, Italy, the US and Brazil are respectively the five countries with the largest cultivated area that is certified organic. Only in Africa is organic agriculture still at a budding stage. In Europe, the area under organic agriculture has risen rapidly over the last decade, even though it represents only 3% of all agricultural land. Organic agriculture is the most dynamic sector within the whole of European agriculture, with production increasing by 30% per year since 1998, while in the US the organic market has increased by 20% per year for more than a decade.

This brief overview shows that the sector is in expansion and could have an increased significance in the future throughout the world. Any changes in land use patterns merit careful examination by WWF for their potential impacts on natural resources. This is no different with organic farming. According to the Food and Agriculture Organization of the United Nations (FAO), more than 50% of the world's habitable land surface is currently under agricultural production. What land is being used for agriculture could change in the near future due to soil degradation and compaction, wind and water erosion, exhaustion of water resources and demographic growth as just some of the reasons. This would increase the pressure on remaining natural habitats and protected areas towards conversion to arable fields or intensively managed grasslands, and it could lead to the intensification of production on the remaining utilisable area.

Protecting biodiversity will require preventing, and, if necessary, reversing land use processes that degrade natural habitat. Organic farming is generally perceived as benefiting the environment and biodiversity conservation. This paper is a short evaluation of whether and how organic agriculture contributes to the achievement of WWF's mission and what modifications are required to enable organic farming to contribute more strongly to biodiversity conservation. The paper also suggests additional research to collect clearer evidence about the contribution of organic agriculture to WWF's mission.

WWF aims to achieve its conservation targets by campaigning and advocating with key partners and stakeholders, having scientific evidence that the solutions promoted are contributing to our overall objectives. This requirement for scientific evidence has considerable consequences for how WWF sees organic farming. Organic farming is a potential means to achieve more sustainable production of food and fibre and has to be examined in this context just like any other production system.

The next section identifies and discusses the specific contribution of organic farming to achieving WWF's global priorities and how this could be improved. This is followed by an examination of the additional general benefits of organic farming for the environment. Some suggestions for further improvements in organic agriculture that are necessary, as well as some still-unanswered questions, are then offered. The final section outlines our conclusions and recommendations about the way forward.

The contribution of organic farming to WWF's priorities

This section assesses very briefly if, and how, organic farming contributes to the achievement of WWF's conservation priorities in specific, targeted ecoregions as well as to the six thematic priorities.

Ecoregions

This section reflects the actual state of WWF analysis in some global priority ecoregions where agriculture has been identified as a major issue.

Meso-American Reef

Agriculture's link with the seas is through the release of pollutants from land-based production and their adverse impact on fragile marine ecosystems. This is particularly relevant in this ecoregion where recent research has indicated that the two main threats to the reef system are both from agriculture — suspended solids and agro-chemicals. WWF will evaluate agricultural systems and improvements in management practices within systems against the measure of how much they reduce suspended solids, and other pollutants, reaching the marine environment. Improvements that reduce marine pollution will be encouraged by working directly with producers, but also with governments, buyers and investors.

Shrimp aquaculture and ecoregions

Aquaculture can pose significant threats to the environment. These include habitat conversion, the use of wild species for feed or stock, effluents (both volume and content), and introduced species. Aquaculture is expanding and the first organic products are appearing on the market. A good co-ordination between organic aquaculture and other means of moving towards more sustainable aquaculture are needed in ecoregions where aquaculture is a major threat for nature conservation.

According to the website of the International Federation of Organic Agriculture Movements (IFOAM), organic aquaculture guidelines are in a draft stage. However, organic aquaculture products are currently being sold in the European market. At present, there are some 8-10 labels that exist for aquaculture shrimp alone, including organic. At this time, little if any co-ordination exists between labels and, while organic standards are better in many areas, there are still issues related to feed, feed conversion, broodstock, energy and natural chemicals that remain to be addressed adequately.

Organic aquaculture could be an interesting and more sustainable alternative if there were strict and global guidelines valid for the whole organic sector. A clear commitment and regulation for organic aquaculture in protected areas is missing. Co-ordination should be sought out with other ecolabelling initiatives including WWF-US's development of a shrimp certification programme based on better management practices that address the main impacts of the shrimp aquaculture industry. And, co-ordination with the Marine Stewardship Council (MSC), an ecolabel for good fishing practices promoted by WWF, could help to identify complimentary approaches with the most significant ecolabel for wild caught seafood.

Alps and Dehesas (Mediterranean ecoregion)

Organic agriculture should develop standards for high-value agroforestry production systems such as wooded pastures in the Alps or Dehesas forests in Spain, as these would significantly aid the conservation of biodiversity in these priority ecoregions.

Eutrophication in the Baltic and the North-East Atlantic

Phosphates, nitrates, sediments and pesticides are all-important agricultural pollutants of the Baltic and North-East Atlantic ecoregions, areas of priority concern and action for WWF. These problems and the evidence for organic agriculture's contribution to their solution are provided in the sections of this paper dealing with water and with sediment pollution of the Meso-American Reef.

Living waters

The agricultural freshwater issue currently of highest concern to WWF is the quantity of freshwater for irrigation and the impact of this on the areas of the world's greatest freshwater biological diversity. WWF is already actively exploring the links between freshwater use for cotton production and the impact of this on priority river basins. Two more global crops will be selected by the end of 2002. WWF encourages the organic movement to have efficiency of water use for crops as a priority.

IFOAM principles advocate the promotion of healthy use and proper care of water, water resources and all life therein, but this remains largely unspecified in terms of measurable standards. While the IFOAM principles of organic agriculture cited above would direct organic farmers not to over-abstract water, there is little obvious evidence of clear definitions of these terms. For example, organic production does not limit the amount of water that a producer can use. Since water is one of the most limiting factors in agricultural production, production standards should be developed that provide guidelines for efficient use and identify indicators to allow for continued improvement over time. In this regard, tilled fields (organic or conventional) have far higher run-off than untilled fields. WWF is currently contemplating sponsoring the development of organic standards for responsible water use on farms with a major organic certification body.

In its defence, organic agriculture promotes high levels of organic matter in the soil that should lead to improved capacity for water retention. We are not aware of any studies that have specifically demonstrated the greater efficacy of organic farming over other systems for water and rainfall retention, and zero tillage systems can actually produce much higher levels of organic matter.

WWF has a global objective to increase integrated river basin management in priority catchment areas. Organic agriculture shows interesting potential for the integrated management of priority river basins and the prevention and control of pollution. Indeed, no highly soluble mineral or artificial nitrogenous fertilisers are allowed in organic farming. In most cases in the consulted literature the nutrient balance of organic fields seems to show no excess in nutrients. Therefore, the potential leaching risks to surface and groundwater should also be smaller from organic than from conventional agriculture.

Stockdale *et al*. (2001) reviewed the literature about the impacts of organic agriculture. They found that nitrate leaching is generally lower in organic fields. Comparisons between organic and conventional fields with some crop rotations showed smaller differences. However, the mineralisation of organic matter following the cultivation of clover or other N-fixing plants can lead to nitrate leaching in groundwater and could counterbalance this positive benefit. Such evidence suggests the need both for ongoing measurement and monitoring.

Concerning phosphates, surface water pollution could be less frequent in organic agriculture due to the absence of any highly soluble phosphate fertilization. We are not aware of any positive evidence from comparative studies that this is the case. Possible water eutrophication by organic farming could still be linked with inappropriate livestock densities inducing inappropriate manure management in pig and cattle rearing. This is unlikely to occur in organic farming because of the requirement to have a balanced ratio between livestock and crops and the need to use local resources. However, increased demand for organic meat could place this principle under considerable pressure. WWF would like to see evidence showing that the above organic principles on the balance and intensity of livestock farming are applied in practice.

Forests for life

No evidence has been found that organic guidelines ban the clearing of natural forests and, even more important, ban the clearing of forests with a high conservation value. While there is no proof that organic guidelines support it, either, there are some organic products that are undoubtedly produced on recently cleared natural habitat. These include, among others, soy in parts of South America and oil palm in parts of Asia and Central and South America. WWF's strategy is to promote the FSC label and to identify, with partners, high conservation value forest in areas of the world where forest clearance is a major threat to biodiversity.

We expect from the organic agriculture movement clearer commitments to ban the clearance of high conservation value forests when pursuing new areas of implementation. In fact, we propose to work with IFOAM to develop appropriate language about the clearing of high conservation value natural forests as well as other natural habitat for organic production.

Toxics

WWF's priorities in this theme include the eradication of the production and use of POPs and the elimination of targeted pesticides suspected of being EDCs.[2] Many POPs pesticides have been banned for use in agriculture, though stockpiles remain and some uses continue, particularly in the developing world. Of growing concern is the extensive use in most agriculture production systems of pesticides that are suspected to have endocrine disrupting abilities. Organic production standards do not permit the use of man-made pesticides, thereby reducing human and environmental exposure to both POPs and synthetic EDCs.

Organic agriculture, while not allowing the use of man-made pesticides, does allow the use of "natural" pesticides. Many of these natural compounds (*e.g.* copper, sulphur, nicotine or pyrethrinoide) can be highly toxic to the environment. To determine whether a pesticide — natural or man-made — is safe for the environment requires a method for comparing toxicity on critical environmental criteria such as acute and chronic human toxicity, aquatic species, soil microbial activity, water solubility, etc. There is, in fact, considerable evidence that many of the natural chemicals, while benign for humans, are deadly for invertebrates and others in the web of life.

Species

Initial information is showing that agriculture can affect the conservation of some WWF's key species. It is not clear how organic agriculture is likely to help solve these problems. On the negative side, organic production would need to be zoned away from areas of habitat conversion. A potential positive point is the prohibition of the use of man-made pesticides that could damage or even destroy species that are of global concern to WWF. Organic agriculture should bring the evidence that their natural pesticides and chemical inputs are safe: again, there is too little evidence regarding the safety of permitted organic chemicals.

Endangered seas

The marine issue has been treated under ***Ecoregions***.

Climate change

WWF is interested in the potential of agricultural systems as carbon sinks. WWF's assessment of the benefits of organic agriculture will be affected by its overall success in sequestering carbon relative to other agricultural systems (such as zero tillage). WWF is also interested in the use of biomass crops for energy generation. It would be interesting to investigate the potential for certification of systems of biomass crop production for environmental benefits. However, it will most likely be impossible to increase organic matter/carbon sequestration and increase the off-take of biomass for energy generation. Research and practical advances in these areas would make a contribution to WWF's objectives.

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2. EDCs are suspected to have the ability to mimic hormones. Hormones are the chemical messengers commanding the development and the functions of organisms. The wrong messages delivered at inappropriate moments by endocrine disruptors can cause huge and irreversible damage to the development of organisms, including human beings.

Other general benefits of organic farming to the environment

Organic agriculture has principles and standards

The principles of organic farming show a clear commitment to sustainability. IFOAM's basic standards set a range of principles referring directly to environmental and conservation issues.[3] Organic farming is not perfect in many respects as discussed previously, but it is arguably the production system that sets the highest level of environmental standards.

Energy efficiency and greenhouse effect

The CO_2 Output-Input ratio shows a 43:1 relation for organic and a 22:1 for conventional farming demonstrating the higher energy efficiency of organic agriculture. Organic farming is also likely to be a larger sink for CO_2 in the soil compared to some conventional farming systems because of its higher biomass levels fixed in the form of root material or humus and a lower rate of soil respiration. However, it produces less organic matter than no-till as it is practiced in some areas. Organic farming has interesting potential for reducing CO_2 emissions or equivalents, even though CO_2 emissions from agriculture are not WWF's focus. Additional research in energetic efficiency balance is necessary to determine the overall impact of organic agriculture and to compare it with other production methods.

Research from Germany is showing increased energy efficiency from organic farming relative to conventional farming. Comparing the energy required to produce winter wheat in conventional and organic fields suggests a positive balance in favor of organic. The differences are explained by the huge amount of indirect energy mobilised by conventional agriculture in form of pesticides and fertilisers (*e.g.* nitrogen). In this comparison, organic farming utilises only one-ninth as much P. P is a limited non-renewable resource world-wide. Its limited availability presents a potential problem for future agricultural activities. Organic farming uses 50% of the energy needed for wheat production in drilling and drying the harvest. In contrast, conventional agriculture invests 80% of the total energy used in the form of pesticides and fertilisers.

It is also worth recalling that artificial nitrogen fixation consumes large amounts of non-renewable energy supplies responsible for CO_2 emissions and contributes to the greenhouse effect. The same is true for N_2O emissions, a gas approximately 300 times more powerful than CO_2 in its contribution to the greenhouse effect.

3. IFOAM's production principles: interact in a constructive and life-enhancing way with natural systems and cycles; encourage and enhance biological cycles within the farming system, involving micro-organisms, soil flora and fauna, plants and animals; develop a valuable and sustainable aquatic ecosystem; maintain and increase long-term fertility of soils; maintain the genetic diversity of the production system and its surroundings, including the protection of plant and wildlife habitats; promote the healthy use and proper care of water, water resources and all life therein; use, as far as possible, renewable resources in locally organised production systems; minimise all forms of pollution; process organic products using renewable resources; produce fully biodegradable organic products; produce textiles which are long lasting and of good quality; consider the wider social and ecological impact of the organic production and processing system; use, as far as possible, renewable resources in locally organised production systems; create a harmonious balance between crop production and animal husbandry; give all livestock conditions of life with due consideration for the basic aspects of their innate behaviour; allow everyone involved in organic production and processing a quality of life which meets their basic needs and allows an adequate return and satisfaction from their work, including a safe working environment; progress towards an entire production, processing and distribution chain, which is both socially just and ecologically responsible; produce food of high quality in sufficient quantity.

In Western Europe around 17% of methane (CH_4) emissions come from animal excrement. Organic animal husbandry methods commonly use straw. This is less the case in conventional systems and mostly missing in intensive ones. Liquid manure management shows a great emission potential for methane and ammonia. Incorporating straw in manure diminishes emission risks significantly.

Genetically modified organisms

The rejection of GMO use is considered by many in WWF as a great contribution of organic farming to the implementation of the precautionary principle. One of the main risks of GMO releases is the possible hybridization with wild relatives. Another key, little explored issue is the impact of GMOs on soil micro-organisms that can mutate very rapidly. Possible interactions between GMOs and key species should be examined where relevant.

Further development needed and open questions

The challenge of natural chemicals

To better understand the impact on the environment of the natural chemicals that are allowed under certified organic production, WWF recommends that organic producers and certifiers begin to work with toxicity unit measures. Through such measures, the chemicals that are allowed in organics (and their frequency of use) can be compared with the pesticides used in conventional as well as lower input forms of agriculture. Through such a measure, it will be possible to see which systems are responsible for introducing more toxins into the environment. While it is clear that the majority of organic producers do not use as great a quantity of toxic inputs as some conventional producers, it is not clear that organic producers are better then low-input producers. From an environmental point of view, toxic inputs are important whether man-made or of natural origin.

A major impact of the use of natural substances is that many are highly toxic to invertebrates, the very organisms that are the basis of living soils. Increasingly, it is clear that micro-organisms break down organic and inorganic materials so that other organisms that are part of the food web can use them. Natural toxins can destroy or otherwise hamper this activity. As a result they can increase the negative environmental impact of organic agriculture.

Organic agriculture is perceived as being “natural.” Yet, nowhere in nature are soils tilled. One of the aspects of organic agriculture that does most environmental harm is the constant tillage of the soil during land preparation and to reduce or eliminate weeds. The tillage of soil disrupts and destroys the growth of micro-organism colonies and of root canals that channel water, aerate the soil and reduce compaction. In fact, tillage in organic agriculture reduces the production of organic matter and eliminates many of the benefits of allowing soil to develop without disturbance as compared to some no-till systems. In order to understand the impacts of organic agriculture compared to no-till and other conservation tillage programmes, it is important for organic producers and certifiers to compare their impacts with those of other innovative producers. Disturbed, exposed soil has impacts on micro-organisms. The evaluation of current practices from a number of different production systems would indicate how each can be improved and can reduce their overall environmental impact.

WWF wants to see more evidence of the benefits of organic production

Organic principles suggest, from a normative point of view at least, that organic farming has comprehensive and positive commitments to sustainability. The critical point is that evidence is required to demonstrate that the principles are implemented and measured in terms of their results on the ground. This should occur through the certification system. In this context, organic should require verification systems to measure production impacts as well as product characteristics such as residue levels, etc.

A large body of technical rules demonstrates that organic agriculture is busy putting its principles into practice. The evidence to show that these rules are producing beneficial results for biodiversity is still more a matter of argument from theory and from general extrapolation and inference from principles than from concrete, undisputed scientific evidence.

Independent peer-reviewed research into the benefits of organic farming for biodiversity is rare. It has been prevented by a number of factors:

- Conventional farmers and their lobby have been opposed to organic.
- Advocates of organic agriculture have not considered scientific evidence of conservation benefits as critical to their overall mission.
- The organic movement has pulled itself up by its own bootstraps and has had few resources to spare.
- The private sector has not seen how to make money from undertaking such work.
- Government-sponsored research services have tended to see organic as unscientific and have not been willing to invest in it, at least in the past.

Conclusions

The contribution of organic farming to WWF's mission is generally rather positive. The contribution to WWF's priorities is fairly positive as well, especially in the areas of toxics and climate change. Unfortunately, the impacts are not always well documented. For marine, forest and species issues, the contribution is less clear. In the freshwater sector a commitment to improved practices on the part of organic producers is required to reduce the impact of organic agriculture. Finally, there is a tremendous need to gather the evidence of the benefits of organic and other innovative farming systems and to address questions about how to reduce further the impacts of organic farming on the environment.

Performance against three organic principles needs to be evaluated

Performance against the three following IFOAM principles has not been monitored sufficiently to demonstrate overall levels of impact much less continuous improvement. These principles appear to have remained at the level of general statements. They need to evolve into technical criteria with measurable standards.

- develop a valuable and sustainable aquatic ecosystem
- promote the healthy use and proper care of water, water resources and all life therein
- maintain the genetic diversity of the production system and its surroundings, including the protection of plant and wildlife habitats.

Reduce crop water use

The question of quantitative restrictions on water consumption for crop irrigation should be addressed more fully by organic farming. Water is one of the key resource issues for the 21st century and as such requires an appropriate response from the organic movement. In some specific situations, water availability may be absolutely limiting on the total amount of farming of any kind that can happen in a particular catchment. This suggests that for water (and perhaps other resources) cumulative impacts and carrying capacity issues will have to be addressed. In addition, the inclusion of water use guidelines in the technical rules of organic farming is needed.

Apply biodiversity standards more widely

Some country associations (like the Soil Association in the UK during the 1980s, or Bio Suisse in Switzerland in the 1990s) have addressed the question of biodiversity management on organic farms. They intend to introduce guidance and technical rules in their national standards. These initial steps need additional improvement and should be incorporated into IFOAM’s general guidelines. They also have to be adapted to local conditions.

Certification should measure success

Wherever possible, objective measures of results should be developed to evaluate whether specific minimum performance requirements have been met or to show progress over time in the achievement of organic criteria in the field of biodiversity conservation. This is a new area to explore for the organics industry.

Look again at the permitted chemicals

To be credible in its arguments about being better for biodiversity, organic farming should look again at the levels of application of permitted chemicals. These have only been very weakly examined in terms of their impacts on biodiversity. Of particular concern for organic farming is its continuing dependence on copper for pest management and control. Even if copper is a trace element necessary for life and is used in a natural form, it is not acceptable in the long run that organic farming make widespread use of a heavy metal. Research must be undertaken to find acceptable biological alternatives and disease management strategies.

Organic could co-exist with protected nature

In the past, the planet was covered by approximately 40% of natural grasslands compared to 16% today. In this context, organic farming could play a greater role integrating protection and management of natural and modified habitats. Organic farming uses fewer inputs, feeds ruminants with raw fodder, and has lower stocking rates. These should make organic farming more compatible with biodiversity. This approach can combine productive land and non-farmland in optimal ways both on a single farm as well as over larger areas. This could reduce the tendency to have a more segregated approach to land use with productive land on one side and non-productive, conservation areas on the other.

More evidence and resources to gather it

Finally, it is important that greater financial and human resources are devoted to more research on the actual (as opposed to theoretical) benefits of organic agriculture for resource protection and biodiversity conservation.

This brief overview shows that there are strong arguments from theory and general principle, accompanied by some evidence, that organic farming has great potential for the conservation of biodiversity. If these arguments are borne out by the evidence, then its continued expansion is not only highly desirable but should also be encouraged.

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THE BIODIVERSITY BENEFITS OF ORGANIC FARMING

Hannah Bartram and Allan Perkins[1]

Abstract

Organic farming has been held up as a model of sustainable farming delivering economic, social and environmental benefits. Taxpayer support is justified through the environmental "public" goods delivered, which extend to society as a whole and not just to the minority of consumers who choose to purchase organic food. One of the reasons consumers cite for buying organic food are benefits to the environment and for wildlife. However, various commentators have questioned the environmental claims made by the organic sector. Given these questions, plus the renewed emphasis on increasing UK organic primary production for both market and policy reasons, the Royal Society for the Protection of Birds (RSPB)[2] *undertook a review of 33 published studies on the biodiversity differences associated with organically and conventionally managed farmland systems. General findings of these studies were that organically managed fields and farms had a greater biodiversity than conventionally managed sites. Management practices associated with organic regimes which were generally beneficial for biodiversity included mixed crop rotations, spring sowing of cereal crops, prohibition of herbicides and insecticides, use of farmyard manure, shallow ploughing and sensitive management of non-cropped field margin habitats. Practices that had negative impacts included weed control using mechanical methods and undersowing of crops.*

Introduction

Organics in the UK

The UK organic market has increased rapidly in recent years, with growth rates of 30-50% *per annum.* Sales in 2000/01 amounted to GBP 802 million, up by 33% on the previous year. Sales for 2001/02 are predicted to be up a further 20%, to over GBP 950 million. By the end of 2001, almost 4 000 organic producers were managing 680 000 hectares of land organically (39% in conversion and

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2. The Royal Society for the Protection of Birds (www.rspb.org.uk) is Europe's largest wildlife charity, with over one million members. We manage one of the largest conservation estates in the UK, covering more than 120 000 hectares. Sixty of our 150 reserves are farmed, of which about 5 500 ha are registered as organic, along with the resident livestock. We protect and enhance habitats such as lowland farmland, heather moorland, lowland heath, wet grassland, estuaries and reedbeds, and our reserves help to protect 63 of the 77 most rare or threatened breeding birds in the UK. The RSPB has a full and varied programme of work on agriculture policy and practice. It is the UK Partner of the global federation of conservation organisations, BirdLife International (www.birdlife.org.uk).

61% fully converted) — equivalent to 3.9% of UK farmland and an increase of 29% year-on-year. The majority (90%) of organically managed land is grassland, most as rough grazing and permanent pasture. Overall, England accounts for 32% of organically managed land (converted and in conversion) in the UK; Scotland 60%, Wales 7% and Northern Ireland 1%.[3] The majority of organic farmers are in the south-west region of England. The market also varies, reflecting demographic difference.

Despite the recent dramatic growth rates, organics still represents a small proportion of the total food sector, and many factors influence supply and demand. Predicting and managing growth in these conditions is difficult. A small increase in the number of producers in one sector can result in a significant increase in available organic product, leading to significant pressure on prices and loss of confidence by existing farmers and those considering conversion. Exchange rates and better growing conditions in some countries make organic products cheap to import — a tempting prospect for UK retailers, under immense pressure to bring down prices to consumers. There is real concern that the current growth in the organic sector is primarily being fuelled by imports, which account for around 75% of the volume of organic food sales. These factors have resulted in a number of organic producers selling a proportion of their milk, potatoes and livestock into conventional markets.

Consumers believe that organic farming delivers benefits to the environment and for wildlife (although consistently the main reason for buying organic food is for personal health benefits). The market for organic food is therefore a vital component for delivering the benefits of organic production, but reliance solely on the market ignores the public good elements. Though organic can be regarded as a "niche" food sector, from a policy point of view organic farming is an agri-environment scheme.[4] Taxpayer support (for conversion only at present) is justified through the "public" goods delivered, in particular the environmental benefits, which extend to society as a whole and not just to the minority of consumers who choose to purchase organic food.

As part of its developing strategy for sustainable agriculture, the Department of Environment, Food and Rural Affairs (DEFRA) co-ordinated the development of an action plan to identify what is required to ensure stable and strategic growth for the organic sector in England (published July 2002). A key objective is to promote the organic farming sector by encouraging producers to supply a greater proportion of the organic primary produce consumed domestically. Currently they supply only around 30% of the market. The action plan is intended to help British producers to supply the organic market at least at similar levels to the conventional market, reflecting the varying trends in consumption and UK output. The UK conventional market share of indigenous produce in 2001 was 74.7% and the objective is for the UK organic market share to increase to at least 70%. This will be achieved via a mix of market measures (*e.g.* the UK food retailers have committed themselves "*to increasing the proportion of organic food which they source within the UK in product sectors where it is feasible for British producers to supply at acceptable levels of quality and price*") and policy drivers (*e.g.* public procurement, on-going financial support post-conversion for organic farmers).

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3. England's Organic Sector: prospects for growth (July 2002): http://defraweb/farm/organic/actionplan.htm.

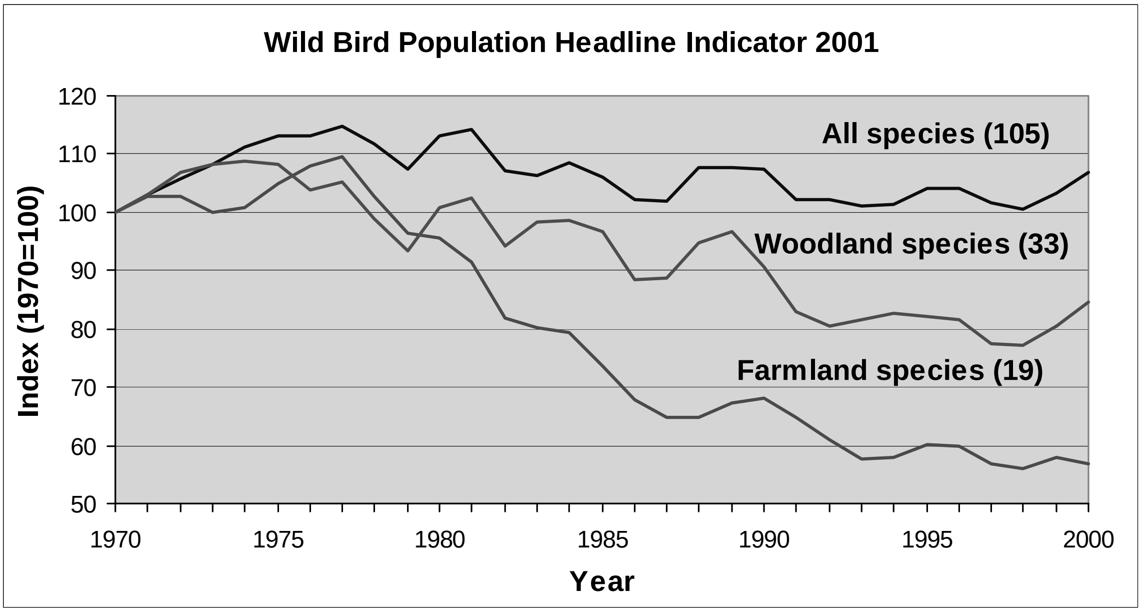
4. Agri-environment schemes are governmental programmes set up to help farmers manage their land in a more environmentally friendly way. The schemes recognise the important role farmers play in managing the countryside, and reward farmers who have not intensified their farming methods but have continued to farm in wildlife-friendly ways.

The state of the UK's birds

Over 75% of the UK is farmed, and has been for thousands of years. For most of this period, relatively small-scale, low-input and mixed farming systems created the conditions that led to a diversity of wildlife and landscapes. Wildlife adapted to the ways in which farmers managed the land, and as a consequence, farmland became the countryside — this is where most wildlife lives. Unlike many other countries, for example the USA, places such as National Parks are actively farmed — they are not places where no economic activity takes place. Following the Second World War, the government asked for increased food production to ensure food security and to feed a growing population. Farmers responded, following scientific advice and technological advancement, dramatically changing their practices in order to meet this challenge. The changes in farming practice have led to a source of cheap and plentiful food, but have also had the effect of damaging wild bird populations on both arable and livestock farmland. The Common Agricultural Policy of the European Union (EU) has further encouraged changes in farming practice, helping to accelerate declines. The situation is not confined to the UK; farmland bird populations across Europe are also suffering. The declines are correlated with agricultural intensity across Europe, and declines have been greater in the EU than in non-member States (Donald *et al.*, 2002).

Evidence of these changes comes from national monitoring of birds over the last 30 years, which indicates an alarming downturn in the populations of species that depend on farmland. Common birds such as skylark (*Alauda arvensis*), song thrush (*Turdus philomelos*), grey partridge (*Perdix perdix*) and tree sparrow (*Passer montanus*) have declined by over half of their population in a very short space of time (Gregory *et al.*, 2002). As a result of such rapid declines, such species appear on the UK Government's Biodiversity Action Plan. In addition, the UK Government has adopted wild bird populations as one of 15 headline indicators of sustainable development (Figure 1). Bird populations are considered as a good indicator of the broad state of wildlife and countryside because they occupy a wide range of habitats, they tend to be near or at the top of the food chain, and considerable long-term data on bird populations have been collected. A significant number of species of insects and other invertebrates, mammals and plants are also declining on farmland.

Figure 1. Population of wild birds in the United Kingdom, 1970-2000



Source: RSPB, BTO, DEFRA (published by the UK Government on 19 December 2001).

Organic farming has been held up as a model of sustainable farming, one that delivers economic, social and environmental benefits. However, various commentators have questioned the environmental claims made by the organic sector. Given these questions, plus the renewed emphasis on increasing UK organic primary production for both market and policy reasons, suggested the need for a review of the benefits of organic farming. Although various research studies have been completed, there was little comparative analysis between them. As a result, the RSPB has undertaken a literature review of the relative benefits of organic and conventional farming for biodiversity.

Rationale for review

The review is intended as a critical, objective review of the major published studies comparing organic and conventional farming, and drawing together results and conclusions from those studies, particularly where findings from different studies are consistent with each other. It also attempts to identify which individual management practices associated with either organic or conventional farming are responsible for differences in biodiversity between the two farming regimes.

Organic farming, although characterised by the general prohibition of use of agro-chemicals, differs in many other ways from conventional farming. Crop rotations are more diverse, and factors such as hedgerow management, tillage and cultivation often differ. It is this "whole farm" approach which is often cited by the organic lobby as being critical to providing benefits for biodiversity and that the whole is greater than the sum of the parts. However, there is a need to know which are the most beneficial and cost effective components to implement on a broader scale if we want to make the most of opportunities to benefit wildlife within the agricultural landscape. Organic farming currently occupies approximately 4% of the agricultural land area within the UK, and is likely to continue growing. However, a huge shift in attitudes and policy would be required for it to become a dominant force in the agricultural sector. Therefore, it is advantageous to identify the best management components of organic farming regimes which it may be possible to integrate into conventional systems and to provide benefits for biodiversity to a much larger proportion of the agricultural land area within the UK and across Europe.

This review has attempted to pull together existing literature to determine how organic farming as a complete system, and which components of organic farming were beneficial and detrimental, compared to conventional farming, for different taxonomic groups and species.

Terms of reference

The review included only those studies which explicitly compared organic and conventional farming practices and their effect on biodiversity. It did not include studies that looked solely at components of one or other of the two farming regimes, for example insecticide use. Neither did it cover aspects other than biodiversity such as landscape quality, soil quality, food, animal welfare, economics, etc.

Review

The review considered 33 papers that compare biodiversity on organic and conventionally managed farming systems. Most of the literature focuses on arable and mixed farming systems in lowland regions. Six of the studies are predominantly on birds, one on mammals, sixteen on invertebrates, eight on flora and vegetation, and two on soil microbes. Some of these studies also incorporate other taxonomic groups, for example certain invertebrate groups as well as flora and vegetation.

Birds

Six major studies of the comparison between bird abundance and/or productivity on organic and conventional farms were reviewed. Four of these compared bird communities as a whole between pairs of organic and conventional farm sites, and two were species-specific.

Within the UK, Wilson *et al.* (1997) studied the territory distribution and breeding success of skylarks *Alauda arvensis* on organic and intensively managed farmland and, as part of a wider study, Bradbury *et al.* (2000) made similar comparisons for yellowhammer *Emberiza citrinella*. Chamberlain *et al.* (1999) compared bird populations of a whole suite of species on organic and conventional farms. Overseas studies included a Danish study by Christensen *et al.* (1996) and a Canadian study by Freeman and Kirk (2001), both of which compared general bird populations on conventionally and organically managed farmland. A study by Lokemoen and Beiser (1997) compared nest density and nesting success in organic, conventional and minimum-tillage crops.

The findings of all six studies suggested that organic farms were generally better for birds than conventional farms. For the single species studies, there was strong evidence that skylark territory density was greater in organic than conventional fields and some evidence that nesting success was also greater in the organic fields. For the yellowhammer, breeding started slightly earlier on organic than conventional farms, but there was no difference in breeding success between the two, and farming regime was not an important factor determining yellowhammer settlement patterns. However, work from an additional study by Morris *et al.* (2001) found that yellowhammers used organically managed wheat fields significantly more than conventionally managed wheat as a foraging habitat for nestling food.

Consistencies between the two multi-species European studies included higher densities of skylark (*A. arvensis)*, blackbird (*Turdus merula)* and greenfinch (*Carduelis chloris)* on organic than conventional farms. In general, many more species were found at significantly higher densities on organic than conventional farms in both studies, although some species did show the opposite relationship. Similar findings were made in the Canadian study, with a higher species richness, abundance and frequency of occurrence of bird species on organic than conventional sites, but with some species more abundant on the conventional farms. Lokemoen and Beiser (1997) found that nest densities and the number of nesting species were higher in minimum-tillage and organic fields than in conventional fields, and nesting success was highest in minimum-tillage fields.

Mammals

Only one study compared mammal abundance and activity densities on organic and conventional farms. Brown (1999) found that activity levels of small mammals [wood mouse *(Apodemus sylvaticus)*, bank vole *(Clethrionomys glareolus)* and common shrew (*Sorex araneus)*] were greater in organic than conventional fields. He also found that grass margins were the preferred habitat compared with the cropped field area in both farming systems.

Invertebrates

There are many more published studies which compare invertebrate populations between organic and conventional systems than for larger taxonomic groups such as birds and mammals. The 16 reviewed here include 2 on earthworms, 1 on butterflies, 1 on spiders, 8 on beetles and 4 on other arthropod groups. These comprise a mixture of comparisons made between fields on working farms and of experimental studies comparing specific treatments.

Earthworms

Two major studies of the comparison between earthworm abundance and activity densities on organic and conventionally managed plots were reviewed. Both studies were carried out at sites under long-term experimental manipulation, designed to determine the relative responses of biodiversity under contrasting management regimes. Two further studies, investigating a wider range of taxonomic groups in grassland systems, were also reviewed.

Within the UK, Brown (1999) studied earthworm populations within grass margins and cropped fields under organic, conventional and Integrated Crop Management regimes. Younie and Armstrong (1995) and Yeates *et al.* (1997) compared earthworm populations in organic and conventional grassland systems. In Switzerland, Pfiffner and Mader (1997) made similar comparisons between organic and conventionally managed arable plots. Applications of farmyard manure characterised the organic plots, and mineral-based fertiliser and pesticides the conventional plots.

The findings of two studies were that organically managed plots supported more earthworms of more species than conventionally managed plots. The two studies in grassland systems showed no difference or greater abundance of earthworms in conventional than organic fields. Some earthworm species were found only in the organic plots, and one species was found only in one of the conventional plots. The Swiss study showed that earthworm populations were healthier in the organic plots, containing more of the large, vertically burrowing anecic earthworms and more juveniles than those in the conventional and control plots. Younie and Armstrong (1995) also found more immature earthworms in organic than conventional grassland plots. The importance of grass margins within both farming systems was recognised as they provide structurally stable reservoir habitats which aid rapid within-field recovery of earthworm populations following major cultivation disturbance.

Butterflies

One study which compared butterfly abundance on organic and conventional farms was reviewed. Feber *et al.* (1997) studied the relative abundance of two pest species, large white *Pieris brassicae* and small white *P. rapae,* and other non-pest species on organic and conventional farms across England. Significantly higher numbers of all butterflies and of non-pest species were found on organic than conventional farms, but higher numbers of the two pest species occurred on the conventional farms. Non-pest species were particularly associated with the grass leys of organic farms and the large and small white were both attracted to oilseed rape on the conventional farms.

Spiders

Only one major study on spiders was reviewed. Feber *et al.* (1998) compared surface-active spider assemblages in organic and conventional wheat fields on farms in southern England. Abundance and species diversity was generally greater in organic than conventional fields, although five species were recorded only in the conventional fields. Similarly, as part of wider studies, Reddersen (1997) and Moreby *et al.* (1994) both found a greater abundance of spiders in organic than conventional fields.

Beetles

Eight major studies comparing beetle populations between organic and conventionally managed plots and fields were reviewed. Seven of the studies were on arable systems and one on grassland. One of the studies investigated changes over time since conversion from conventional to organic management. A further two studies which compared several taxanomic groups in organic and conventional cereal fields were reviewed.

Within the UK, Armstrong (1995) studied carabid beetle populations in organic and conventional potato fields. Younie and Armstrong (1995) made similar comparisons between organically and conventionally managed grassland. As part of a study on a wider range of arthropod taxa, Moreby *et al.* (1994) compared beetle populations in organic and conventional wheat fields. European studies included two in Austria by Kromp (1989; 1990) which compared carabid beetle populations in organic and conventional winter wheat, sugarbeet and potato fields. A Swiss study by Pfiffner and Niggli (1996) investigated differences in carabid, staphylinid and spider populations in organic and conventionally managed experimental plots. In Germany, Hokkanen and Holopainen (1986) compared populations of carabid beetles and their prey in organic and conventional cabbage fields. In Norway, Andersen and Eltun (2000) compared carabid and staphylinid beetle assemblages in organic and conventional crop rotations, and investigated changes since conversion of fields from conventional to organic management. As part of a wider study, Reddersen (1997) compared the beetle fauna of organic and conventional cereal fields. Outside of Europe, Dritschilo and Wanner (1980) compared ground beetle abundance in organic and conventional corn fields in mid-west US.

Six studies showed that organically managed fields supported higher beetle population densities and species diversity than conventionally managed fields. Three studies, including the one on grassland, showed the reverse, with beetle densities greater in conventional than organic fields. Most of the studies, however, showed inconsistencies within the beetle community with some species groups clearly favouring organic fields and others found in greater abundance in conventional fields. For example, *Harpalus spp., Acupalpus spp., Agonum spp., Brachinus explodens* and *Clivina fossor* all showed consistently higher densities in organic than conventional fields, whilst *Trechus quadristriatus* and *Asaphidion spp.* consistently showed the opposite relationship. Species and groups which showed inconsistencies between studies included *Pterostichus melanarius, Loricera pilicornis, Bembidion spp., Carabus spp., Amara spp.* and *Calathus spp.*

The Norwegian study, which investigated changes in beetle abundance over time following conversion from conventional to organic management, found that carabid numbers increased, but species diversity did not. In contrast, the number and species diversity of staphylinids declined following conversion to organic. Findings of other studies included the discovery that beetles within organic fields tended to be dominated by larger species than those found in the conventional fields, and bigger catches of certain species of beetles were made in areas of organic fields which had the densest weed cover.

Other arthropods

Four studies which compared abundances of other arthropod groups between organic and conventional systems were reviewed. Three of these compared cereal fields under different management regimes and the fourth compared organic and conventional tomato farms.

Within the UK, Moreby *et al.* (1994) investigated differences in abundance and species diversity of a number of taxonomic groups of arthropods and also considered variation in weed abundance within the same organic and conventional fields. A second study by Moreby (1996) focused on differences in densities of Heteroptera between farm types. A Danish study by Reddersen (1997) made similar comparisons between farm type for a wide range of arthropod taxa. Outside of Europe, a study by Letourneau and Goldstein (2001) investigated arthropod communities and pest damage levels in organic and conventional tomato farms in California, USA.

The results of all four studies suggested that, overall, organically managed fields contained a greater variety and abundance of arthropods than conventionally managed fields. However, there were differences between certain taxanomic groups of arthropods. Pests such as aphids were more abundant in conventional than organic fields, as were some of their natural predators. Groups including Collembola and Formicidae (ants) were more abundant in organic than conventional fields, and others such as Hymenoptera (wasps and bees), Hemiptera (plant bugs) and Diptera (flies) showed inconsistencies between studies. Most of these taxanomic groups showed inconsistencies between species, with some more abundant within organic and others within conventional fields.

Within fields of both farm types, the Danish study showed that the number of individuals, species and biomass of arthropods was greater in the margin than in the mid-field, but this difference was more pronounced in conventional fields.

Flora

Eight major studies on plants and vegetation associated with organic and conventionally managed fields were reviewed. A further five studies which primarily investigated invertebrate abundance also measured botanical diversity in organic and conventional fields. Eleven of these studies investigated botanical differences in arable and mixed farming systems, two compared grassland systems and one investigated changes in the hedgerow structure and composition since conversion to organic farming.

Within the UK, Kay and Gregory (1998; 1999) surveyed rare arable flora in organic and conventional fields, and Feber *et al*. (1998), Moreby *et al.* (1994), Moreby (1996) and Younie and Armstrong (1995) compared weed vegetation structure and composition between organic and conventional fields as part of wider studies. McCloskey *et al.* (1996) compared weed communities in experimental plots under organic and conventional management, and Stopes *et al.* (1995) investigated changes in hedgerow composition following conversion of a farm from conventional to organic management. European studies included Danish (Hald, 1999), German (Frieben and Kopke, 1995), Swedish (Rydberg and Millberg, 2000) and Austrian (Kromp, 1990) comparisons of weed communities in organic and conventional fields. In Germany, Albrecht and Mattheis (1998) investigated changes in weed abundance following conversion from conventional to integrated and organic farming systems, and in Norway, Sjursen (2001) made similar investigations of the weed seed bank following conversion to organic farming.

Eight of the comparative studies in arable and mixed farming systems found that weed abundance and species diversity was greater in organic than conventional fields. These differences were greater for broad-leaved weed species than grasses, which tended to show similar densities in organic and conventional fields. There were exceptions, however, with evidence from two studies that weed abundance can be greater in conventional than organic fields. Several rare species were found much more frequently in organic than conventional fields, but some nitrophilous species were more abundant in conventional fields. The Danish study showed a greater abundance of weeds in margins than the mid-field in both organic and conventional systems, but these differences were much more pronounced within conventional fields which had much lower weed abundance in the mid-field. There was evidence that weed cover increased with conversion from conventional to organic management of fields, and species diversity within hedgerows also increased.

In grassland systems, more herb species occurred in organic than conventional permanent pastures, but there was no overall difference between silage leys other than more clover present later in season in organic leys. Within organic rotations, densities of weeds in the seed bank were greater following arable crops than silage leys.

Soil microbes

Two studies which compared soil microbial activity in organic and conventionally managed soils were reviewed. Within the UK, Yeates *et al.* (1997) compared faunal and microbial diversity in organic and conventional grass fields. A Swiss study by Mader *et al.* (1995) compared micro-organisms in soils under organic, conventional and intensive management.

Both studies found greater microbial biomass and activity in organic than conventionally and intensively managed soils. Nematode populations, particularly fungal-feeding nematodes, were greater in the organic soils, but some groups and species were more abundant in the conventional soils.

Discussion

This review aimed to pull together studies which assessed the relative benefits to biodiversity of organic farming compared with intensive, conventional systems. Of the 33 studies reviewed, many showed clearly that there were biodiversity benefits associated with organic systems. Some, however, showed little or no difference and others showed that conventional systems were beneficial for some species (Table 1).

Table 1. Number of studies that show the effect of organic farming on biodiversity compared with conventional farming

	Birds	Mammals	Beetles	Butter-flies	Spiders	Soil Microbes	Earth-worms	Other Arthro pods	Flora
Positive	6	1	6	1	3	2	2	4	8
No difference	0	0	1	0	0	0	1	0	3
Negative	0	0	3	0	0	0	1	0	2

Note: The general finding of the studies is shown, but they may include opposite effects for some species.

To consider biodiversity as a whole, it is necessary to focus separately on the major taxonomic groups which link together within agricultural ecosystems. For example, plants such as arable weeds provide food and habitat for invertebrates, and both plants and invertebrates provide food for larger organisms such as birds and mammals. Management methods which are beneficial for plant diversity within farming systems may have a knock-on effect for many groups and species of invertebrates, birds and mammals.

Of the larger organisms, widescale studies showed that many bird species were more abundant on organic than conventional farms. Differences were not always obvious or significant, but there were consistencies between studies. For example, skylark, blackbird and greenfinch were more abundant on organic than conventional farms in both European widescale studies. Skylark is of high conservation concern within the UK and Europe. However, some species showed no difference or were more abundant on conventional than organic farms.

The reasons for higher abundance on one or other farm type were not always easy to determine. Most of the studies hypothesised that more food was available on organic than conventional farms, but did not go on to prove this. Other studies were cited which do show differences in bird food abundance between organic and conventional farms. These are discussed later. Some management methods were associated with better conditions for some species. For example, the mixed cropping systems and spring sown crops of organic farming provided more suitable nest sites for skylarks in less dense swards than the dense swards typical of conventionally managed cereal fields. Consequently, territory density was higher on organic than conventional farms. Minimum tillage was associated with more nesting birds and greater nest success than in conventional systems. Yellowhammers were shown to forage for invertebrate food more in organic than conventional cereals and started to breed earlier on organic farms. Sensitive field margin management providing taller, thicker hedgerows, the presence of more stubbles, the lack of use of insecticides, and a wider variety of crops associated with organic farming regimes were all thought to be beneficial for birds, but many of these hypotheses were not specifically tested.

Food was identified as probably a key factor in there being more birds on organic than conventional farms, so why should there be more invertebrate and plant food for birds and mammals within organic fields, and is this hypothesis true?

Sixteen studies on invertebrates, including butterflies, spiders, beetles, earthworms and other arthropods were reviewed. Many of these groups provide food for many species of birds and mammals. Most of the studies reviewed pointed to a greater abundance of arthropod food resources for birds in organic than conventional fields.

Beetles are an important arthropod group which provide an invertebrate food source for a variety of bird species, including many of those that have experienced major population declines in farmland habitats over the last 25 years. During the breeding season, they provide food for nestlings and adults of species such as skylark, tree sparrow, yellowhammer and corn bunting. Although findings were mixed, most studies showed greater abundance of beetles on organic than conventionally managed fields. Other groups including butterflies, spiders and earthworms, which all feature prominently in the diet of many farmland bird species, were also found in greater numbers and diversity in organically managed fields. There were exceptions, however, within these groups as some families or species tended to show the opposite relationship to farming regime.

For butterflies, differences in crop rotations were recognised as being of importance with grass leys within organic systems providing important habitats for many species, and oilseed rape in conventional systems favoured by two pest species, large white and small white. Lack of pesticide drift and a greater abundance of food plants in organic fields and field margins were also considered to be important factors associated with a greater abundance of butterflies in these fields. For spiders, greater abundance of understory weed vegetation and a wider variety of broad-leaved weed species within organic fields were identified as important factors. Such vegetation provides greater structural complexity, which is beneficial for web spinners, and host plants that provide food for prey species.

The distribution and abundance of beetles was also linked to variation in vegetation structure between organic and conventionally managed fields. Lower fertiliser inputs of organic regimes tended to result in the development of a less homogeneous crop density within fields. This provides a more diverse vegetation structure and greater variety of microclimatic conditions at ground level, providing favourable conditions for a wider range of beetle species than was found in conventional fields. Also, greater abundance and diversity of weeds associated with organic fields provided nutrition for seed-feeding carabids and the arthropod prey of predacious carabids.

There were also potential benefits associated with the prohibition of herbicide and insecticide applications within organic fields, especially for carabid larvae and spider communities. Within the soil, earthworms may also benefit, especially anecic and juvenile earthworms, which occur close to the soil surface and are most vulnerable to exposure to toxic pesticides. It was these groups of earthworms which showed the biggest difference in abundance between organic and conventional soils.

Although, in general, organic farms provided greater benefits for invertebrate populations than conventional farms, exceptions did occur. For example, in years of high abundance of pests such as aphids, they and their natural predators occurred in greater abundance in conventional fields where higher nutritional levels were provided by heavily fertilised, faster growing crops. Spring and summer insecticide applications depressed arthropod abundance in conventionally grown crops. Where insecticides are not used, abundance rises and may, exceptionally, exceed that found in equivalent organic crops where aggressive mechanical weeding can also result in the depletion in numbers of some arthropods, such as carabids.

Earthworm populations may also be adversely affected by excessive soil disturbance. However, earthworm populations in organic soils under arable cropping systems were larger, more species-diverse, contained bigger individuals and more juveniles than those in conventionally managed soils. The use of farmyard manure in organic systems provides an important food source of undegraded plant matter for earthworms. In grassland systems, however, there were fewer differences in earthworm populations, and there was evidence to suggest that abundance was greater in conventional than organic soils. This may have been related to the way in which organic matter was returned to soil and how it decayed, but no mechanism was confirmed as the cause of this unexpected relationship.

Soil microbial activity and biomass was also greater in organic than conventionally and intensively managed soils. Plant and fungal-feeding nematodes appeared to benefit from the lower inputs of nitrogen associated with the use of organic manure rather than agrochemical fertilisers. Consequently, groups such as Acari and Tardigrada which prey upon nematodes were also more abundant within organic soils.

Vegetation structure and weed abundance were recognised as key factors influencing the invertebrate abundance within fields. The majority of the studies reviewed showed a greater weed cover and species diversity in organic than conventional fields, but this was not without exception. Grass species were as abundant, if not more so, in conventional fields, as were some of the more nitrophilous weed species. Most broad-leaved weed species were, however, more abundant within organically managed fields, including some of the rarer arable weeds. Many of these species were thought to be unable to tolerate the intensive weed control measures and denser crop swards of herbicide-treated, heavily fertilised conventional arable fields. Lower nitrogen levels as a consequence of lower fertiliser inputs, and reduced soil cultivation also contributed to the greater weed abundance generally found within organic fields.

Exceptionally, abundance of weeds was lower in organic than conventional fields. In such circumstances, intensive weed control using mechanical methods was most likely responsible for the limited abundance of weeds within organic systems. Undersowing of crops and the presence of silage ley in the crop rotation can also limit the amount of weed cover in organic fields. Whilst this is not particularly beneficial for seed-eating birds, it does provide an over-wintering habitat for invertebrates, shown to be a vital food source for other declining bird species such as grey partridge.

Minimum tillage was sometimes associated with organic farming and was shown to lead to an increase in weed seeds near the soil surface. Consequently, germination rates were increased and this led to a greater weed cover. Differences in cultivation methods may also play a part in differences between beetle populations in organic and conventional fields. Shallow disking in organic systems tends to be less harmful to such populations than deep ploughing typical of conventional systems.

A number of the studies reviewed showed management of non-cropped habitats to be an important factor in the relative abundance of invertebrates on organic and conventional farms. Grass margins around arable fields were important habitats in both farming systems. These habitats supported the highest butterfly abundance and also provided undisturbed, stable reservoir habitats for earthworms and other arthropods which help rapid re-colonisation of fields following disturbance to the soil caused by cultivation. Hedgerow management including frequent cutting every 2-5 years, preservation of the hedge base, laying, coppicing and allowing trees to mature was also associated with greater plant species diversity within hedgerows on organic farms. Although not strictly characteristic, sympathetic field margin management does form part of the requirements associated with organic farming and is part of a "whole farm" approach adopted on such farms to help maintain biodiversity.

Table 2. Elements of farming promoted by organic systems and their effect on biodiversity

Farm practice	Biodiversity effect[1]
Mixed farming	+
Spring sowing	+
No pesticides	+
No herbicides	+
Mechanical weeding	-
No mineral fertilisers	+
Green/Farmyard manure	+
Shallow ploughing/Minimum tillage	+
Undersown crops	+/-
Non-cropped areas	+
Small areas	+/-

Note: 1;; Positive (+), negative (-) or mixed (+/-)

The biodiversity impact of specific practices

The findings discussed above show how management practices associated with organic farming contribute to greater biodiversity on organic farms and how these link together to provide a "whole farm" approach to conserving wildlife in agricultural landscapes. However, it is possible to de-couple these practices and consider the benefits associated with each in isolation (Table 2). The following management practices are characteristic of organic farming and are not normally used in conventional systems (NB — all farmers have to have weed control strategies). From the findings of the studies reviewed, they have been shown to impact on biodiversity in the following ways:

Crop rotation and mixed farming

- provides greater habitat diversity for birds;
- provides grass leys favoured by butterflies.

Spring-sown cereals/over-winter stubbles

- shorter crop height and less dense swards provide nesting habitat for birds such as skylarks;
- associated stubbles provide seed food for birds over winter (especially if weedy, and not undersown) and may promote earlier nesting, *e.g.* yellowhammer.

No insecticides

- increased invertebrate abundance;
- increased invertebrate food for birds and mammals.

No herbicides

- increased weed abundance;
- increased plant food for invertebrates, birds and mammals;
- increased variation in vegetation structure for invertebrates.

Mechanical weeding

- reduced weed abundance;
- reduced plant food abundance for invertebrates, birds and mammals;
- negative impact of disturbance on soil fauna, other invertebrates and nesting birds.

Undersown crops

- reduced weed abundance and diversity;
- increased availability of invertebrates as food source (*e.g.* grey partridge).

No mineral-based fertilisers

- sparser crop swards beneficial for a wide range of invertebrates and nesting birds;
- wider variety of less competitive weed species;
- more natural nutritional crop levels and negative impact on pests (*e.g.* aphids) and their predators.

Green manuring and farmyard manure

- beneficial for earthworm populations and other soil biota;
- increased soil fauna food for other invertebrates, birds and mammals.

Shallow ploughing/minimum tillage

- less disturbance to soil, beneficial for earthworms and other invertebrates;
- greater germination of seeds and greater weed cover.

Sensitive field margin/hedgerow management

- grass margin habitat provision for invertebrates, small mammals and nesting birds;
- greater species diversity within hedgerows;
- taller, thicker hedgerow structure, beneficial for many bird species.

Smaller fields

- more field boundary habitat for invertebrates, birds and mammals;
- negative impact on species requiring large field areas, *e.g.* skylark (an issue where new hedgerows are being planted and skylark is a conservation priority).

Conclusions

On balance, organic farms provide for greater biodiversity than conventional farms, particularly given an equivalent intensity of management. However there are situations where this may not hold true. Intensive management within organic farming regimes can lead to impoverishment of biodiversity, and conversely, extensively managed conventional farms sympathetic to wildlife can provide conditions equally as good for biodiversity as organic farms.

There are many benefits associated with organic farming for a wide range of species and taxanomic groups. Although the “whole farm” approach undoubtedly provides greater benefits for many species, it was possible to identify specific management methods which were more beneficial than others. Although these may not be as effective when implemented in isolation on conventional farms than when part of a “whole farm” organic management regime, they may still make a significant difference to the conservation of biodiversity at these sites. In certain circumstances, this approach may be more cost effective and achievable on a wider scale and could complement wholesale conversion of farms to organic management regimes.

Most of the existing literature comparing biodiversity associated with organic and conventional farming regimes focuses on arable and mixed farming systems in lowland regions. Very little is known about the potential benefits of organic farming in upland areas and within pastoral systems in general. There is a clear need for more research to be carried out within these areas of agriculture, particularly as demand continues to increase for organic animal products such as milk, beef and lamb and the share of organic farming within these sectors increases. More long-term studies which document changes in biodiversity over time since conversion from conventional to organic management would also prove valuable in determining the scale of benefits and length of time it takes for these to develop. More experimental research is also needed on a larger scale so that changes or differences in populations of larger organisms such as birds and mammals can be assessed in response to specific changes or differences in specific management practices associated with either organic or conventional farming.

From a policy point of view, this review justifies continued public support for organic farming, including the provision of financial support post conversion, already available in most EU member States. It is important to note, however, that the wildlife benefits from a wider uptake of organic farming will depend on the attitudes of new converts (who may be more motivated by financial support than environmental concerns) and the standards applied. Organic farming standards need to be consistent and vigorously applied to maintain the intrinsic environmental benefits of organic farming, and are essential to retain consumer confidence.

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PRODUCTIVITY OF ORGANIC AND CONVENTIONAL CROPPING SYSTEMS

Tom Bruulsema[1]

Abstract

While it is difficult to make quantitative estimates, the productivity of organic cropping systems is considerably lower than that of conventional or integrated cropping systems. This reduced productivity could potentially lead to less land available for non-agricultural land uses such as wildlife habitat, greater negative impacts on the environment, and reduced sustainability. To ensure that the practice of organic farming aligns with its perception by the public, its conceptual definition must avoid misleading connotations regarding its ability to produce healthy and safe food in an environmentally sustainable manner.

Comparing productivity

Comparing organic and conventional cropping systems for productivity is difficult.[2] Since crop production depends on many sources of inputs of a diverse nature (land, water, nutrients, genetic resources, labour, energy, technology, etc.) the definition of productivity depends on the particular input efficiency under consideration, and on the interactions among inputs. Fortunately in agriculture — in the short as well as the long term — yield per unit area of land is the most critical component of sustainable productivity. Even so, since the two systems often produce a different mix of crops, the ability to compare productivity is limited.

Yield per unit area of land is important not only economically, but also for environmental, ecological and social reasons. For agriculture to be both sustainable and compatible with biodiversity in non-agricultural areas, most stakeholders agree that yields on existing cropland must increase while nutrient losses from cropland to air and water must be reduced. "For agriculture to be ecologically, socially and economically viable it is more favorable to increase productivity on existing land rather than expanding cultivation into marginal areas or fragile ecosystems. Manufactured plant nutrients, crop protection products and enhanced plant varieties contribute to this extensively and therefore allow farmers to increase productivity per cultivated unit area. The use and application of these

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2. In this paper, the terms "conventional" and "integrated" are used interchangeably to describe cropping systems that do not fit the current definition of organic crop production. The term "integrated" is preferred, as it implies the use of all available and appropriate technologies that have been shown by science to benefit crop production. The use of term "conventional" reflects much of the literature cited, but should not be taken to imply a static system of production; rather, one that is continuing to evolve.

products has to be adapted to local conditions, markets, and consumer demands. Integrated farming systems, which include a standard of best agricultural practices, are increasingly demonstrating the most appropriate way of achieving the goals of sustainability" (IAFN, 2000).

In the literature comparing yields of organic and conventional systems, productivity claims are often made based on yield per unit area of specific crops in a rotation without bringing time into the evaluation. If the organic rotation contains fallow years or years in which a crop with limited marketable value is included, specific crop yields can be very misleading. Comparisons must be based on yield of marketable product per unit area per unit time.

Crops produced organically will not always yield less, but often do. For example, a 21-year study in Switzerland found that yields were 20% less when a rotation including wheat, potato and forage was grown organically (Mäder *et al.*, 2002). However, the economically most important crop, potato, suffered the greatest yield reduction (38%). These yield reductions occurred despite the better structure and quality of the soils of the organic system, achieved because of external organic material inputs not supplied to the conventional system. The rotation comprised 43% forage crops, which could imply greater emphasis on animal agriculture than would be justified by local or global demand. As stated by Per Pinstrup-Anderson (2002), "…yields per unit of total land used for organic farming including the land needed to produce green manure and animal waste are not at a level necessary to avoid encroachment on ecologically fragile soils and still meet future food demands."

External inputs of organic nutrient sources often contain nutrients that were originally supplied in an inorganic form, such as commercial fertilisers. Or they contain nutrients mined from soils external to the farm. Were organic farming to be more broadly adopted, such practice would lead to extensive soil nutrient depletion. Currently, for example, crops across Canada and the United States remove approximately as much phosphorus as, and more potassium than, that contained in the sum of all recoverable manure plus all commercial fertilisers used (PPI, 2002).

Nutrient input restrictions

Because organic production has greater restrictions on inputs, it is more difficult to maintain the same yield levels sustainably. Organic standards minimise or eliminate use of synthetic or manufactured inputs and encourage maximum use of local natural resources. Organic food producers rarely use readily soluble mineral nutrients. They also exclude some organic sources, such as sewage sludge and composts derived from wastes. Thus, they must rely to a greater extent on green manures, crop rotation, and (preferably composted) animal manures.

The inputs allowed as fertilisers in organic production are generally lower and more variable in nutrient content and plant-availability than commercial fertilisers. To meet all the crops needs using these inputs, they have to be applied at high rates. There is greater likelihood of supplying some nutrients at excess rates, which may lead to increased risk of loss and negative environmental impact. A commentary published in *Nature* recently by Trewavas (2001) points out the hazards of relying solely on organic sources for nutrients. He reported, "Manure breakdown cannot be synchronized with crop canopy growth, as is desirable, but continues throughout the growing season. Ploughing in of legume crops (a necessary part of the organic method to build soil fertility) and continued manure breakdown leads to nitrate leaching into aquifers and waterways at identical rates to conventional farms."

Organic systems rely on tillage to incorporate organic materials and control weeds. Tillage increases mineralisation (breakdown) of soil organic matter. Today's integrated cropping systems are reducing or eliminating tillage, allowing crop residues to contribute more to increasing soil organic matter content.

Organic systems also vary more widely in nutrient availability because of reliance on indigenous soil fertility which exhibits strong spatial variability (Brandt and Molgaard, 2001). Nutrient input levels in organic farming systems tend to be lower than in conventional systems because the philosophy is aimed at growing crops under more natural conditions. Deficiencies of nitrogen, phosphorus and potassium are natural conditions. These deficiencies reduce productivity.

Importance of soil quality

Productivity depends on soil quality. Soil quality — its structure and its capacity to retain water and nutrients — depends on inputs of organic material to maintain appropriate levels of humus. Nutrient inputs have large impacts on the total quantity of organic material produced and available to build soil humus. When nutrient deficiency limits crop yields it also limits their contribution of organic material (crop residue) to the soil. Nitrogen has particular importance, since soil humus maintains a carbon to nitrogen ratio of 10, and nitrogen inputs have been shown to stabilise soil carbon in the long term (Paustian *et al*., 1997).

The nutrient inputs critical to photosynthetic productivity (the original source of all organic matter) should be supplied by a combination of organic and mineral sources, as defined by integrated plant nutrition. "Integrated plant nutrition implies a combined use of various nutrient sources with special emphasis on those which can be mobilized locally by the farmers themselves. The benefit of organic inputs extends beyond their nutritional value, for example, by contributing to improved soil physical conditions. But organic materials are not sufficient to replenish nutrients removed by crop harvests. The complementary use of mineral fertilizers is essential to sustain soil fertility and to achieve increased production" (IFA, 1996). "The use of inputs external to the farm and the community should complement the use of available organic materials, crop rotation, and other improvements in production systems" (Pinstrup-Andersen, 2002).

The danger of nutrient deficiency limiting the primary production of organic materials for soil improvement is highlighted in the following statement: "… in most developing countries too little intensification [of agricultural production] is a major cause of natural resource degradation, as desperately poor farmers mine soil fertility and climb the hillsides in an effort to survive. … Low soil fertility and lack of access to reasonably priced fertilizers constrain farmers in many countries. Policies should encourage farmers to make appropriate use of organic and inorganic fertilizers and improved soil management" (IFPRI, 2002).

Distinction of natural versus synthetic

It is often implied that nutrients used in organic cropping systems are "natural" as opposed to the "synthetic" or "chemical" sources used in conventional systems. Actually, any effort to differentiate foods from a nutrient source standpoint is of limited use because, whether the source of nutrients is organic or inorganic, all nutrients are "chemical" … all are "natural" and exist in nature … and all nutrients are absorbed by the plant in the soluble inorganic form. The "natural" *versus* "synthetic" distinctions are not defensible on the basis of science.

Environmental impact and sustainability

Crop production uses the natural resources of soil, water and air, as well as genetic resources. Producing high-yield crops saves space for natural habitat. Managing inputs for profitable high-yield production minimises losses of nutrients that could potentially adversely affect the quality of the surface waters that surround cropland and the groundwater below it. Crop production impacts on the atmosphere are also important. Increased crop growth will help to store more carbon in the soil to mitigate the increase in greenhouse gases.

Integrated farming systems face productivity challenges by managing site specifically, meeting the landscape-specific needs of the soils and crops. Prudent, scientifically sound use of technology in a systematic management programme is essential to long-term sustainability. Improved and adapted genetic materials are a key component. Integrated pest management must be included, using best practices from cultural, biological, and chemical approaches. Conservation tillage and other practices to control erosion, maintain water quality and reduce herbicide use are often critical components.

Several researchers have acknowledged that the environmental impact of organic farming systems is unknown and requires more research (Condron *et al.*, 2000; Hansen, *et al.*, 2001). While risk per unit area of farm may be lower, when practised as a small percentage of agricultural land, the overall environmental risks of organic production may increase dramatically as organic farming expands. Few studies have compared organic and conventional systems for risk per unit of production.

Sustainable crop production requires the efforts of all the world's farmers. Both large-scale enterprises and smallholder agriculture have a role to play in the increasingly intensive business of producing crops. To sustain both the large and the small, the public must continue to provide the infrastructure to deliver agricultural inputs and outputs, the educational resources for knowledge generation and transfer, and the regulatory framework to assure a rational business climate. This includes development of mechanisms to assure consumers of the quality and safety of foods and other crop products.

Conclusions

The challenge facing agriculture today is to increase the quantity and quality of food produced, with less detrimental impact on the environment. For sufficient flexibility to meet that challenge, integrated cropping systems should have access to the necessary resources for efficient, bio-intensive production. If organic farming is defined only as that which is done with a restricted list of inputs, its ability to meet the challenge will be less than that of integrated farming systems. Lower input use equates to lower quantity and quality of food produced, with greater detrimental impact on the environment.

Public perception of the term "organic" connotes concern for product safety, healthfulness, and environmentally sustainable production. Policy development for organic agriculture must recognise that simple avoidance of specific inputs cannot assure that these concerns are addressed. Organic production must also include accountability for these concerns.

The concept of organic farming must be defined in a manner that accurately communicates the practice, in a non-misleading way, to the public. Acceptance of separate standards must avoid implying that organic crop production delivers benefits that have not been established on the basis of sound science. Such acceptance must recognise that integrated farming systems also produce safe, healthy food in an environmentally sustainable manner.

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Chapter 2.

Organic Agriculture and the Environment
Case Studies

CONSIDERATIONS OF THE ENVIRONMENTAL AND ANIMAL WELFARE BENEFITS OF ORGANIC AGRICULTURE IN THE NETHERLANDS

Eric Regouin[1]

Abstract

Policy support for organic agriculture in the Netherlands is based on the assumption that organic agriculture to a large extent fulfils the public's expectations in respect of advantages to the environment and to animal welfare, as compared to non-organic, conventional agriculture. This paper looks at the major issues in which organic agriculture differs from non-organic agriculture and identifies those issues where this difference may be considered significant. Such analysis of the performance of both systems can be done using different measuring rods. Based primarily on field research in the Netherlands, conclusions are drawn and organised in accordance with the OECD environmental indicators for agriculture. Taking those indicators that are relevant for the Netherlands, organic agriculture shows a different overall performance than does non-organic agriculture. However, quantification of their relative position is difficult and conclusions often depend on the measuring rod chosen. Moreover, environmentally and animal welfare benign non-organic production systems are approaching, or even surpass the performance of organic agriculture, by market demand or by legislative force.

Introduction

The existence of a national policy plan[2] on organic farming in the Netherlands can be explained by the following excerpt from the introductory chapter of the plan:

> *The organic sector has an excellent record of socially responsible business practice: in all links of the chain, organic production meets our social requirements in terms of environment, animal welfare and biodiversity, and plays a pioneering role for the entire agrifood complex.* (Ministerie van Landbouw, Natuurbeheer en Visserij, 2000).

1. National Reference Centre of the Ministry of Agriculture, Nature Management and Fisheries, the Netherlands. The National Reference Centre is an internal policy advisory body of the Ministry of Agriculture, Nature Management and Fisheries. The information offered and the opinions expressed in this paper do not necessarily suggest, or lead to, present or future policy choices by the Dutch government.

2. The present policy plan of the Netherlands "An organic market to conquer" is the third policy plan to stimulate organic agriculture. It outlines Dutch policy intentions during the period 2001-2004, stressing market demand as a tool for growth and main incentive to farmers' conversion to organic production methods. For more details see paper by Gabrielle Nuytens-Vaarkamp in Part III, Chapter 9.

During the elaboration of the policy plan, the point was often raised as to how substantial is the evidence that supports organic agriculture's position in the political limelight. There are many claims in the literature of how advantageous organic farming is. Often these claims fail to clearly limit organic farming to a certain well-defined standard of production principles, but instead look at the many examples of production units that support the claims made.

The reference point for the relative position of organic agriculture would of course be "conventional agriculture" with its many faces. Measuring one ill-defined concept against another would give both defenders and proponents of organic agriculture any argument needed to back up their claims.

Over the last few years, discussion on the relative merits of organic agriculture has grown in intensity in the Netherlands and elsewhere. This has prompted the Ministry of Agriculture, Nature Management and Fisheries to commission a desk study on the available information from farms and research institutions in the Netherlands that can shed light on this topic. The two broad topics being reviewed are environmental benefits and animal welfare, in all areas of plant and animal production, as they compare and contrast with "non-organic agriculture", that is, a modern and developing agricultural production system that increasingly is becoming bound to strict environmental and animal welfare rules.

This paper draws heavily on preliminary findings of this study, complemented by a wider look at the literature. Conclusions are grouped according the OECD agri-environmental indicators, aggregating and integrating the detailed findings of the various studies, bringing them to a level that allows input in policy development decisions. Not covered by the OECD agri-environmental indicators are aspects of animal welfare. Objective criteria with which to quantify animal welfare are still very much in development. For the scope of this paper, however, conclusions in this realm are based on broadly accepted criteria of species-specific natural behaviour and animal health.

References for comparison

Reference for "organic agriculture"

Within the European Union (EU), organic production methods, including rules on certification and control, follow what is laid out in Regulation 2092/91 of 1991, as amended (EU, 1993). This regulation sets out rules for organic plant production, animal production, and trade in and processing of organic products. Regulation 2092/91 prescribes "how" organic products should be produced. It does not define the qualities of the product, and only implicitly refers to any environmental criteria for production. Regulation 2092/91 does not mention nature, biodiversity, energy use, transportation costs ("food miles"), or many other aspects of "environment". As regards animal welfare, Regulation 2092/91 sets out many detailed requirements for raising animals, all directed towards "humane" treatment of the animals, allowing a maximum of natural behaviour.

The whole set of rules in Regulation 2092/91, but not more than this, will be used as a reference point in this paper. Outside the comparison, therefore, are all the different ways in which organic farms present themselves. But this limitation is not exclusive to organic farming. Indeed, conventional farms in the Netherlands, through legal requirement or other motives, show an increasing diversity in their care of nature, the environment and animal welfare.

The relative merits of organic agriculture for the environment and for animal welfare are, to an overwhelming extent, limited to the primary production phase. Not only does Regulation 2092/91 not put any particular "environmental" demands on processing and trade of organic products, brief analysis suggests that in practice there is no relevant difference between organic and conventional production systems (Aalders *et al.*, 2000).

Reference for "conventional agriculture"

There is no such practice as conventional agriculture. The differences in crops, soils, livestock, growing and rearing methods, market approaches, legal requirements and localisation, management styles, etc., make it virtually impossible to define one common denominator, except that the approach to production can be classified as "non-organic". This would make it difficult to define a reference conventional production system with which organic agriculture can be contrasted. However, on the level of single issues, such a comparison is possible, if sufficient room is allowed for qualitative in addition to quantitative descriptions.

Non-organic, conventional agriculture, too, is ruled by market forces and consumer expectations, and bound by laws and regulations. It increasingly uses the "people-planet-profit" approach as a marketing tool, as is shown in many initiatives of "integrated" production, often with their own brands and logos to facilitate consumer recognition and acceptance. These environmentally and animal welfare-benign systems come about out of commercial interest but are increasingly the result of restrictive legislation.

Issues under review

The environmental issues

Based upon the description of the organic farming system as defined by the European rules, the effects on the environment will be determined by the most concrete requirements spelled out, explicitly or implicitly, in Regulation 2092/91. Prohibition of the use of certain pesticides and fertiliser are the most conspicuous. Other effects are leaching of nitrates, emissions of carbon dioxide, ammonia and other greenhouse gases, and energy use. Aggregate effects are taken into consideration if directly attributable to these "single" effects. A case in point can be the natural diversity on the farm. This means that organic farming-related practices that are not exclusively limited to organic farming should not be taken under consideration. These include local marketing of produce (with a subsequent low energy use in distribution) and a certain care for indigenous flora and fauna. The OECD environmental indicators for agriculture (OECD, 2000) will be applied when relevant to the comparison between organic and conventional agriculture, and when relevant to the Netherlands' geographic situation.

The animal welfare issues

Farm animals are entitled to the right to express their natural behaviour. This is one of the basic rules for organic production. This principle can come into conflict with the need for an economically profitable production process and even with certain demands on other aspects of animal welfare. Other contradictions can exist with requirements for human food safety and environmental protection. Compromises have to be found in organic agriculture too and, to a certain extent, Regulation 2092/91 on organic agriculture can be seen as a good expression of that need.

Measuring rods to use

A serious look into environmental effects and animal welfare in organic agriculture and conventional agriculture must consist of both an absolute and a relative component. The absolute component would consist of objective data. The relative component puts these objective data into a wider perspective and adds relevant qualitative descriptions.

Effects can be expressed in various ways, *i.e.* per hectare or per kilogram of product. Depending on the issue under review, both expressions are relevant. The yield per hectare of an organic production system is lower than that of a conventional production system. If there is a need for total output to be the same for both systems, an organic production system requires a greater production area. Then the effects should perhaps be expressed per unit product.

A yardstick to measure the animal welfare performance of any animal production system must be based on accepted ethical criteria like the right of animals to engage in natural behaviour, and the right to health, food, drink, rest and shelter.

The situation in the Netherlands

Pesticide use

In organic agriculture, very few plant protection agents are used. Those that are used are of “natural” origin, being derived from plants or mineral deposits. This does not infer non-toxicity. Dutch organic farmers use even less plant protection agents than Regulation 2092/91 permits because some of the substances are not registered for use in the Netherlands, *i.e.* rotenone, quassia, ryania and copper salts. The most widely used pesticides in Dutch organic farming are sulphur-based compounds, pyrethrum-derivatives and natural diseases and predators of pests, such as viruses and bacteria. Of these, pyrethrum-based compounds are of high toxicity to invertebrates but of very limited persistence in the environment.

Using its “environmental yardstick”, the Dutch organisation CLM concluded in 1997 that organic agriculture uses some pesticides that can have a negative impact on the environment. However, overall only the most “environmentally benign” forms of conventional production could come close to the positive position organic agriculture holds in this respect (Centrum voor Landbouw en Milieu, 1997).

Monitoring a number of arable farms in the Netherlands between 1997 and 2000, organic farms on average used 0.6 kg/ha active ingredient pesticide, as opposed to 9.7 kg/ha for non-organic farms (Peppelman *et al.*, 2002).

In organic pip fruit growing however, the use of pesticides is intensive, as expressed per hectare, and even more so when expressed per unit product. This use is significantly higher than in non-organic systems. However, most use in organic systems refers to sulphur for the control of apple scab. Even with the high quantities used, the environmental effects are far lower than those of many of the pesticides used in non-organic systems (Peppelman *et al.,* 2002). Still, the latter have shown significant improvement of their environmental performance over the last few years, mainly due to the withdrawal from registration of many synthetic pesticides.

In conventional glasshouse crops, a covenant between government and farmers' organisations has established annual ceilings for the use of pesticides. This brings their performance in this respect closer to that of organic farms.

Nutrient leaching

Some studies suggest that organic agriculture, using more composted organic matter (manure), *i.e.* more input, and achieving lower yields per hectare, *i.e.* less output, than conventional agriculture, has bigger problems in staying below the permitted ceilings for nitrate leaching (Centrum voor Landbouw en Milieu, 1997). However, nitrogen surpluses do not always result in more leaching, as two years of studies on clay soils on 14 farms have shown (Dekking, 2001). A difference between the large (calculated) nitrate surplus and the measured levels of nitrates was explained by high levels of nitrogen fixation in soil organic matter and soil flora and fauna, and for up to 50% by denitrification.

Another way to look at nutrient use is through Regulation 2092/91's limitation on organic farms to apply no more manure than the equivalent of 170 kg/ha of nitrogen, and to limit livestock densities for the different farm animals accordingly. This measure effectively limits leaching of nitrogen. In conventional agriculture, under Dutch national legislation, the maximum nitrogen equivalent on grass pasture is 190 to 220 kg/ha in 2002, depending on soil type.

When, in the case of pigs, outdoor range is offered to the animals, manure and urine can present a serious pressure on the immediate environment. Considering area available per animal, duration of outdoor access, nitrogen-uptake, and nitrogen-production in urine and faeces, on 13 observed production units, about half had over 170 kg/ha N-deposits and the other half had less. Often there is no grass left that could absorb part of the nitrogen, and much of the nitrogen disappears towards the surface water, either through percolation or run-off (Peppelman *et al.,* 2002).

However, the overall picture on nitrate leaching seems to be that either organic farms compare favourably to non-organic farms, or results of research are not conclusive. On phosphate surpluses, no significant difference between the two production systems has been found (Peppelman *et al.,* 2002).

Ammonia emissions

In conventional poultry production, as of the year 2008 or 2010, the date depending on the production purpose of the poultry, ammonia emissions are limited to values ranging from 6-45 grams per bird per year. Modern non-organic production systems do not reach that standard yet and produce from 80 grams (broilers) to 35-110 grams (laying hens) per bird per year. In contrast, current organic production methods show figures over 315 grams per bird per year, not yet considering free range, which would make this figure even higher. Organic production units are exempt from the legal maximum ammonia emissions mentioned earlier (Peppelman *et al.,* 2002).

In dairy production, comparisons between organic and non-organic production systems indicate little difference in ammonia emissions. The few studies available in the Netherlands name positive (*i.e.* "loose barn" stable system) as well as negative (*i.e.* outdoor composting of manure) aspects of organic dairy production (Peppelman *et al.,* 2002).

The relative position of organic pig production systems is not positive. It is expected that in the absence of additional emission reduction measures, organic pig production could emit two to three times the amount of ammonia per animal as compared to non-organic systems (Peppelman *et al.,* 2002). It should be noted that an earlier publication suggested the contrary and attributed a very favourable performance to organic pig production (de Kuijer and Wielenga, 1999).

Energy use

Energy use in agriculture is not regulated or limited. It is not covered by the legislation on organic agriculture. Only in greenhouse vegetable production, targets for the reduction of energy use have been agreed between the Dutch government and producers. Energy use in agricultural production directly relates to agriculture's contribution to the emission into the atmosphere of greenhouse gases that contribute to global warming. Thus, it becomes interesting to look at possible differences in this respect between non-organic and organic agriculture.

Still, the relative performance of one production system compared to the other has to be interpreted with care. Energy use per kilogram of agricultural product, in any production system, not only takes place in the primary production phase. Life cycle analysis incorporating energy use for handling, storage, processing, transport, distribution and, ultimately, handling in the household (refrigerator use, cooking, waste production), as well as losses along all of these steps, could well indicate a low significance of the differences between the two production systems.

In arable production systems, organic farms in one study (Peppelman *et al.,* 2002) consume about 50% more energy per hectare than do non-organic farms. Other studies show smaller differences and the opposite has been seen as well. Although organic farms use less and different fertiliser and other inputs this does not always offset the high consumption per hectare of fossil fuels. If calculated per unit of product, this difference would be remarkably higher.

Energy use in glasshouse horticulture depends largely on the heating regime. Some organic farms do not use heating. In situations where heating is used there is little difference in energy consumption per hectare between organic and non-organic farms. However, the difference in energy use per kilogram of product can be high. In one study on cucumber production, a kilogram of organic cucumber needed 80 to 250% more energy than its non-organic counterpart (Peppelman *et al.,* 2002) because of a lower production volume per hectare.

In fruit growing, a large percentage of total energy needs goes to post-harvest storage. It is likely that organically produced apples, having higher storage losses than non-organic apples, in the end need more energy per unit product.

In poultry production, differences exist in food conversion rates between the organic and conventional systems. Organic chickens consume more "energy" to gain a kilogram. In practise, there are also differences in the origin of the feed; the organic feed is more likely to come from nearby sources in Europe. This is probably true for other farm animals as well. Some preliminary data suggest that organic broilers use 10% less and organic laying hens about 13% less energy than conventionally held chickens (Peppelman *et al.,* 2002).

In pig production, direct energy costs per organic animal are less than they are per conventional animal. However, piglet mortality is higher and the imbalance between the two systems evens out.

In bovine production systems, organic producers do have some higher direct energy use per head of cattle. However, including indirect energy use (in fertiliser and concentrate production) organic production probably shows lower total use (Peppelman *et al.*, 2002).

Animal welfare

Although the welfare of cattle is difficult to quantify, three aspects that constitute major differences between organic and non-organic production systems have been looked into. Regulation 2092/91 prescribes a minimum area per head of cattle in the barn ($6m^2$). On conventional farms, this is lower. The "loose barn" stable offers more choice to individual cows on where and how to lie down. This system is more widespread on organic farms. The practice of dehorning is less prevalent on organic farms. Outdoor range is always offered to organic cows. On conventional farms only about half of the cattle can roam and graze outside without much restriction (Peppelman *et al.*, 2002).

On health aspects, there are indications of better health of animals on organic farms, partly due to lower production levels with subsequent lower physical stress (Peppelman *et al.*, 2002). Another study suggests higher disease incidence due to lower preventative medicine use (Hovi and Kossaibati, 2002).

The differences between organic egg production and conventional, highly intensive cage egg production are great. However, the differences with more benign conventional production systems, like free-range systems, are very much smaller, to the point of becoming marginal. As an example, organic chickens would have 18cm of perch, whereas alternative, non-organic systems prescribe 15cm. In respect to collective nesting area per bird, the two systems prescribe $120cm^3$ and $83.3cm^3$, respectively. In many cases, the animal welfare of organic chickens for egg production is offset by problems of cannibalism. In broiler production, however, this relation seems to be reversed (Peppelman *et al.*, 2002). Free-range chickens, whether organic or not, are thought to show a higher incidence of Salmonella and Coccidiosis infections. These generally do not affect the bird directly, but are of concern to human health.

Conventionally held pigs generally have no outdoor range, whereas organic pigs often do, besides having more area at their disposal per individual. Regulation 2092/91 does not require free outdoor range, but in practice many producers do provide outdoor range. Comparisons made by Dutch veterinarians, applying "expert judgement" suggest that organic pigs have a higher degree of welfare than their conventional counterparts do. Mortality before weaning, however, is higher for organic pigs. (Peppelman *et al.*, 2002). Observations are relatively few in number, however, and it is difficult to conclusively demonstrate differences between the two production systems.

Conclusions

Based on the experiences in the Netherlands the following can be said about the relative position of organic farming in respect of environmental performance and animal welfare position. Once again, these conclusions are based on the application of the strict and minimal rules of the EC Regulation for organic production. The OECD agri-environmental indicators (OECD, 2000) provide a useful basic structure for some conclusions on the performance of organic agriculture in the Dutch situation. In these conclusions, the OECD indicators within the categories of "Agriculture in the broader economic, social and environmental context" and "Farm management and the environment" are not specifically addressed, but they are discussed under the similar indicators within other categories.

Nutrient use

The indicators of nutrient efficiency and nutrient balance provide information on the nitrogen input/output ratio and on the potential loss of nitrogen to soil, air and water. Organic arable farming basically compares favourably with conventional agriculture in the Netherlands on the point of nitrate leaching into the soil. However, since the implementation of strict legislation on the use of fertilisers and manure [EU Nitrate Directive and relevant Dutch legislation (MINAS)], some of the large differences between the two production systems are now diminishing. In organic animal production, ammonia emissions are high to very high as compared to non-organic systems. As organic production units are exempt of a part of this legislation there are few incentives for organic farmers to limit nutrient losses, especially atmospheric emissions of ammonia. This holds true especially in production units of pigs and chickens.

Pesticide use and risks

The indicator of pesticide use (kilograms of active ingredient per hectare) is in fact secondary to the more integrated indicator of pesticide risk in which factors like exposure and risk mitigating techniques are incorporated. Organic agriculture uses little pesticides as compared to conventional agriculture. In the Netherlands this is true especially for herbicides (no use in organic agriculture) and insecticides. In some production sectors, *i.e.* organic pip fruit, sulphur fungicides are used in considerable quantities. For pesticides, it can be said that overall risk in organic agriculture is far smaller than in conventional agriculture. Pesticides used in organic agriculture are plant-derived and, even if highly toxic, are often of very short persistence. Copper salts, allowed under Regulation 2092/91, are not registered in the Netherlands. Organic animal production deriving its fodder and concentrate from organic feed crops claims a significant proportion of total organic production area, and in this way can be seen as having a low pesticide use as well.

Soil quality

The soil quality indicators refer mainly to risks of wind and water erosion. Both risks are not very relevant in the Netherlands. In general, soils on conventional farms may have a slightly lower organic matter content than those on organic farms, but there is no indication that this has an impact on either type of erosion.

Water quality

Water quality is of paramount importance in the Netherlands. This applies to both ground water and surface water. The OECD indicators emphasise nitrate and phosphorus. Nitrate load is sometimes lower and sometimes higher in organically managed soils. Phosphate pollution in, and eutrophication of surface water will occur less in organic production systems. Additionally, the pesticide load in ground and surface water evidently is lower in organic production systems than in conventional systems.

Land conservation

Land conservation in general deals with water retention capacity and with off-farm sediment flow. Both indicators have little relevance in the Netherlands, with its lack of steep slopes and slow-moving rivers. Management of both surface water and sub-soil water levels is extensive in the Netherlands and affects organic and conventional agriculture alike.

Greenhouse gases

The emission of green house gases (GHGs), carbon dioxide CO_2, methane CH_4, and nitrous oxide N_2O, from agricultural sources was 12.2% of total emissions in the Netherlands in 1995-1997 (OECD, 2000). As livestock farming and the use of inorganic fertilisers are an important source of methane and nitrous oxides, it is probable that conventional agriculture produces more of these GHGs per animal than does organic agriculture. Organic agriculture is significantly less intensive, and an increase in organic animal production would signify a lower total number of animals in the country and subsequently lower total production of GHGs.

Use per hectare of on-farm of fossil fuels and carbon dioxide production seems to be higher on organic farms than on non-organic farms. When using kilograms of produce as a measuring rod, energy use will certainly be higher. Especially prominent is organic glasshouse cultivation, with high energy use per unit of product.

Biodiversity and wildlife habitats

Biodiversity indicators are genetic, species and ecosystem diversity indicators. Wildlife habitat indicators are six in total, expressing state and trends in wildlife habitats on land farmed with different intensities.

Genetic diversity refers to the richness in genetic make-up of plant cultivars and animal breeds used in agriculture. In the Netherlands, organic agriculture exploits the same cultivars and breeds as does conventional agriculture. There is a need for cultivars and breeds that are better suited for organic production, but there seem to be no technical impediments to develop them. Rather, there are constraints of an economic order. A more varied crop rotation is usually practised on organic farms than on conventional farms. In addition, on some organic farms "old" crop species and cultivars are sometimes produced to supply specific niche markets. As much of the genetic variety of crops and breeds is available in germplasm collections and *in vivo*, it is difficult to say that organic agriculture significantly contributes to maintenance of this richness.

Where species diversity is concerned, many studies have shown a more diverse and rich arthropod and bird life on organic farms than on other farms, resulting from the explicit prohibition of the use of certain agro-chemicals and a more diverse crop rotation schedule (van Bruggen, 2002). Also present on many organic farms is a bigger range of "landscape elements" like ponds, hedgerows, trees to provide shade for livestock, etc. Although not required by the Regulation, organic farmers' convictions of the benefits of this diversity make their holdings markedly different from non-organic farms.

This is one side of the coin. On the other, someone could say that in an intensive production system less surface area would be needed to produce the same quantity of agricultural output. Theoretically, the remaining area could then be dedicated to nature preservation, in which case there is not necessarily any less biodiversity and wildlife habitat. This would be difficult, if not impossible, to quantify as all depends on the yield differences between the organic system and the conventional system, their environmental performance, the crops used, and the land use of the "surplus" area.

Ecosystem diversity and wildlife habitat indicators all indicate a favourable position for organic agriculture. The need for non-chemical plant protection, more extensive grazing regimes for farm animals, longer crop rotation cycles, management practices to shelter and stimulate wildlife diversity to contribute to natural weed and insect control, and others, all stimulate the presence of wildlife.

Landscape

Landscape indicators address landscape functions, structures and values. In legislation on organic farming nothing is said about the need to preserve or enrich the landscape. In practice, however, the management needs of organic agriculture often signify more attention to landscape units like hedgerows, shade trees for cattle, etc. Creation and maintenance of a diverse landscape is the result of certain management needs like crop protection and animal welfare. Though this would not be limited to organic farms, conventional farmers often do not have the economic or ideological motivation or management needs to engage in them.

Animal welfare

The main difference between organic and non-organic dairy cattle management systems refers to management practices such as the provision and duration of outdoor range, dehorning and disease treatments. Although organically managed herds have more access to pasture, and suffer less high production-related stress factors, they also seem to have more health problems because less preventative medicine is used.

The main difference between organic and non-organic poultry production systems refers to the average area allotted to each individual, removal or not of part of the beak, and the presence of outdoor runs, often including access to pasture. In organic egg production, a larger percentage of hens die because of cannibalism-related problems than in other production systems. It is therefore difficult to provide definite answers on the relative merits of organic production.

The main difference between organic and non-organic pig production systems refers to the average area allotted to each individual, castration of males, removal or not of part of the tail and fangs, and the presence of outdoor range. In general, organic production systems seem to provide more welfare to the animals than conventional systems.

Overall conclusions

Depending on the yardstick and on the environmental or animal welfare criterion under review, the relative position of organic *versus* non-organic agriculture is not clear. There are many indications that the organic production method is an interesting model for innovations in other production systems, giving useful suggestions for lowering the environmental impact. On the other hand, the low yields of many organic crops translate into a relatively high environmental impact per unit of produce. This is true for most sectors and in particular for glasshouse horticulture and poultry. In policies directed towards sustainability and lowering of the impact of agricultural production, support for organic agriculture could be one of the policy instruments. Additional instruments, such as environmental legislation, are necessary to counter the undesired effects of all production systems.

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SOIL QUALITY OF ORGANICALLY MANAGED CITRUS ORCHARDS IN THE MEDITERRANEAN AREA

Stefano Canali[1]

Abstract

Soil quality can be defined as the capacity of a soil to function, whilst maintaining the environmental quality and promoting plant and animal health. It also refers to the capability of soil to function at present and in the future for an indefinite period of time. Soil quality is a basic concept in the sustainable management of any agricultural system aimed at producing, avoiding or reducing negative effects on the environment, preserving resources and saving energy on a medium- or long-term basis and its assessment might be considered a means for the evaluation of the environmental sustainability of agricultural systems. A study was conducted with the aim of evaluating the contribution of the introduction of organic farming system to the environmental sustainability of organic farming in Southern Italy, with the assessment of soil quality of conventionally and organically managed citrus orchards. The study was carried out by a field survey, based on a comparative approach at a regional basis and by a farm-level experimental trial. The results obtained indicate an increase of the soil quality on organically managed citrus orchards, thus indicating that the introduction of an organic farming management system may contribute to the increase of the environmental sustainability of citrus production in Southern Italy.

Introduction

Soil quality is the final product of preservation and degradation processes and, according to Doran and Parkin (1994), it can be defined as “the capacity of a soil to function within ecosystem boundaries to sustain biological productivity, maintain environmental quality, and promote plant and animal health”. In a more simplistic way, the definition cited above refers to the capability of the soil to function at present and in the future for an indefinite period of time.

According to the above-cited definition, soil quality is a basic concept in a sustainable management of any agricultural system aimed at production, avoiding or reducing negative impacts on the environment, preserving resources and saving energy on a medium- or long-term basis (Colombo, 2000). Consequently, the soil quality assessment could be considered an efficient instrument that contributes to the evaluation of the environmental sustainability of agricultural systems (Tittarelli and Canali, 2002). However, it is important to note that the evaluation of environmental sustainability is

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just one side of this issue, since agricultural sustainability is a wider concept, including also economic sustainability and social viability (OECD, 1992).

During the past 10 years, many papers dealing with soil quality, assessing biological, physical and chemical properties in organically managed systems, have been published and an updated review was produced by Stockdale *et al*. (2001). Most of the studies have been conducted at field and/or farm scale; only a few of them refer to regional scales and there are no references whatsoever for the soil quality assessment in organically managed soils in the Mediterranean area.

The case study

In 2000, the Italian organic area and land area in conversion was 1 million hectares, corresponding to about 5% of the total national agricultural surface and 25% of the European organic managed cultivated area (Italian Ministry of Agricultural Policies' website, 2001). The distribution of the Italian organic surface was not homogeneous, since 70% of organic farms are localised in Southern Italy, where there is a Mediterranean climate type.

Organic citrus, cultivated on 20 000 ha, are widespread in Calabria, Arco Ionico Metapontino and Sicily, and can be considered one of the most important organically managed crops in Southern Italy, (Lunati, 2001).

The study was carried out with the aim of evaluating the contribution of introducing organic farming systems to the environmental sustainability of agriculture in Southern Italy, assessing soil quality of the most widespread organically managed crop of the area. In particular, the study focused on the Navelina and Tarocco orange orchards localised in Eastern Sicily, carrying out a field survey based on a comparative approach (Larson and Pierce, 1994) of soil quality indicators (Canali *et al.*, 2001). Soil characteristics were analysed in 54 farms under both organic and conventional management. Farms were selected to obtain similar pairs (27) under the same environmental conditions and homogeneous data regarding cultivations and rootstock to reduce effects not linked to the soil management. At the beginning of the study, the requested three-year conversion period foreseen by the law in force (EEC Regulation 91/2092) was completed for all the organic citrus orchards included in the survey.

The soil survey was carried out evaluating both inherent and dynamic soil characteristics (Karlen *et al*., 2001). Inherent characteristics of a soil mainly depend on parental material and on the pedogenetic conditions in which it originates and they are slightly influenced by human activities. Consequently, these properties have been considered in order to exclude differences between organic and conventional soils which do not depend on the management system.

According to the aim of the study, a data set of soil descriptors of dynamic properties (Karlen *et al.,* 2001) related to soil quality has been chosen, in conformity with the criteria proposed by Doran and Zeiss (2000). Since the main differences between the two soil management systems are supposed to be the input/output budget of nutritive elements (Intrigliolo *et al.,* 2000) and the improvement of soil organic fertility and of environmentally linked attributes, the soil quality indicators chosen were related to soil carbon and nitrogen cycles (pools and processes) and to the availability of nutrients for the crop.

Inherent soil properties

Soil samples were collected in January and February both in organic and conventional orange orchards, according to official guidelines (Intrigliolo *et al.,* 1999). The sampling time was defined in order to maximise the interval since the last fertilisation. At least four soil specimens were collected in all the selected orchards and then mixed together to form the single sample to be used for the analyses.

Soil inherent characteristics were determined according to the Italian official guidelines for soil analyses (MiPAF, 1999) and are reported in Table 1. No significant differences between organically and conventionally managed soils were observed for these parameters.

Table 1. Inherent soil parameters (mean values)

Parameter	Organic	Conventional
Clay (%)	33.9	31.7
Silt (%)	21.6	20.7
Sand (%)	44.5	47.6
pH	8.0	7.9
$EC_{1:2}$ (mS cm^{-1})	0.34	0.39
Active lime (g kg^{-1})	57	46

Source: Intrigliolo *et al*., 2000.

Soil organic carbon and humified organic matter

Increases in organic carbon in soils under organic management have been widely reported (Fließbach and Mader, 1997; Stockdale *et al.,* 2001) and this change has lead to a great number of the modifications to the biological and physical properties of the soil. Among the different organic carbon pools of soil, the humified stable portion of the non-living fraction is considered to be more strictly linked to soil quality, which is responsible for positive impacts for the benefit of various soil functions on a medium or long-term basis (Herrick and Wander, 1997).

The soil samples collected were analysed to determine the total organic carbon (TOC) contents and, in order to evaluate the stability level reached by the soil organic matter, humic fraction extracted was analysed through the isoelectric focusing technique (IEF). Humic acids were extracted by a 1:20 soil-NaOH/$Na_4P_2O_7$ (0.1M) solution at 65°C for 48 hours, and 25mL of this solution was precipitated by acidification with HCl 1 M until reaching pH<2.0. After the centrifugation, the precipitate was re-solubilised with NaOH 0.1 M. Ten millilitres of this solution was dialysed in 6.000-8.000 Dalton membranes and then lyophilised to obtain a purified soil humic matter (Ciavatta *et al.*, 1990). This fraction, obtained from each soil, was analysed through the isoelectric focusing technique (IEF) in a pH range of 3.5-8.0, on a polyacrylamide slab gel (Ciavatta and Govi, 1993), using a defined mixture of carrier ampholytes (Pharmacia Biotech): 25 units of Ampholine pH 3.5-5.0; 10 units of Ampholine pH 5.0-7.0; 5 units of Ampholine pH 6.0-8.0. A pre-run (2h; 1200V; 1°C) was performed and the pH gradient formed in the slab was checked by a specific surface electrode. The electrophoretic run (2h 30'; 1200V; 1°C) was carried out loading the water-re-solubilised extracts (5 mg C × 100 □L^{-1} × $sample^{-1}$). The electrophoretic bands were stained with an aqueous solution of Basic Blue 3 (30%) and then scanned by an Ultrascan-XL Densitometer, obtaining a typical IEF profile for each investigated soil. Peaks were numbered and the peaks' area was determined for each soil IEF profile, assuming that the area of all IEF profiles be 100%. The sum of the peaks' areas focused at pH>4.5 (corresponding to more humified organic matter) was calculated and named A_s%.

The results showed higher TOC values in organic managed soils (13 322 mg×kg^{-1}) as compared to conventional ones (10 776 mg×kg^{-1}), even if the differences showed no statistical significance (p = 0.15) (Table 2).

Table 2. Dynamic soil parameters (mean values, *p*-level and significance)

Parameter	Conventional	Organic	*p*-level
TOC (mg×kg$^{-1}_{soil}$)	10 776	13 322	0.15
A_s (%)	54.70	59.30	0.27
C_1 (mg×kg$^{-1}_{soil}$)	102	120	0.30
C_7 (mg×kg$^{-1}_{soil}$)	347	514	0.01
C_{21} (mg×kg$^{-1}_{soil}$)	552	827	0.03
C_0 (mg×kg$^{-1}_{soil}$)	575	894	0.01
C_1/TOC (%)	1.01	0.89	0.28
C_{21}/TOC (%)	6.69	6.14	0.24
N_{tot} (mg×kg$^{-1}_{soil}$)	1 083	1 289	0.20
NPM (mg×kg$^{-1}_{soil}$)	34.10	39.0	0.76

Isoelectric focusing (IEF) is an electrophoretic technique, commonly used to investigate humic matter extracted from soils (Ciavatta and Govi, 1993) and fertilisers (Govi *et al.*, 1991; Canali *et al.*, 1998). It is based on the separation of different humic substances on the basis of their isoelectric point and their molecular weight. It is well known that the more the organic matter is humified, the higher will its isoelectric point be, which means that the organic molecules focus at higher pH values (Govi *et al.*, 1994).

When comparing the IEF patterns of four pairs of organic and conventional soil, differences in the less acidic part of the profiles, corresponding to the pH values higher than 4.5, were noticed. In order to quantitatively evaluate these differences, we calculated the sum of the area of the peaks focused at pH>4.5 (A_s%).

The A_s parameter was higher in organic soils as compared to conventional ones (Table 2) and, even if this difference was not statistically significant, it was observed in 75% of all cases. Since more humified organic compounds focus at higher pH values, this finding indicates that organic matter extracted from organic soils is characterised by a higher level of humification.

Carbon mineralisation

Biological properties have been often utilised to evaluate soil quality in studies having different purposes and that are performed in different environmental conditions. Activity, dimension and diversity of bacteria, fungi, micro- and meso- fauna population have been widely used to assess soil quality in organically managed soils as well (Stockdale *et al.*, 2001).

Carbon mineralisation has been considered a reliable characteristic for the evaluation of the microbial soil activity (Anderson and Domsch, 1985), since it can supply information on the soil metabolic status and the turnover of organic matter (Trinchera *et al.*, 2001). It represents a key soil process and even if it is considered to be characterised by a low sensitivity to changes in soil management (Brookes, 1994), when evaluated in combination with TOC, it may supply useful information on carbon utilisation and energy requirements in the system.

Collected soil samples were analysed for C mineralisation by measuring C-CO_2 production [mg(C-CO_2)$\times kg^{-1}_{soil} \times d^{-1}$] in the soil in potential conditions (Isermeyer, 1952), after the 1st, 2nd, 4th, 7th, 10th, 14th, 17th and 21st days. Cumulative C-CO_2 mineralised after 1 (C_1), after 7 (C_7) and 21 (C_{21}) days were calculated for each soil sample. The kinetic study of organic carbon dynamism was performed by fitting the cumulated data into experimental curves by first order exponential equations $C_t = C_0(1\text{-}e^{-kt})$. This elaboration allowed to calculate the potentially mineralisable carbon C_0 [mg(C)$\times kg^{-1}_{soil}$] and the kinetic constant k ($days^{-1}$) for each investigated soil. Mineralisation coefficients (C_1/TOC% and C_{21}/TOC%) were determined to obtain information on the mineralisation activity related to the various types of farming management.

Some examples of the resulting cumulative curves for the C mineralisation, related to organically and conventionally managed citrus orchard soils, are reported in Figure 2. For all investigated soils, the first order exponential equation was able to fit experimental data and basal respiration was reached after 21 days of incubation. Mean values of mineralised C after 1, 7, 21 days of incubation, C_0, k, and the mineralisation coefficients (C_1/TOC, C_{21}/TOC) are presented in Table 2. C_1, C_7, C_{21} and C_0 were higher in organic than in conventional soils, being highly significant from a statistical point of view in the case of C_7, C_{21} and C_0 ($p = 0.01$, 0.03 and 0.01, respectively). As far as the mineralisation coefficients are concerned, they were lower in organic soils, suggesting a decreased energy requirement and a reduction of organic matter consumption in these soil systems as compared to the conventional ones (Flieβbach and Mäder, 1997).

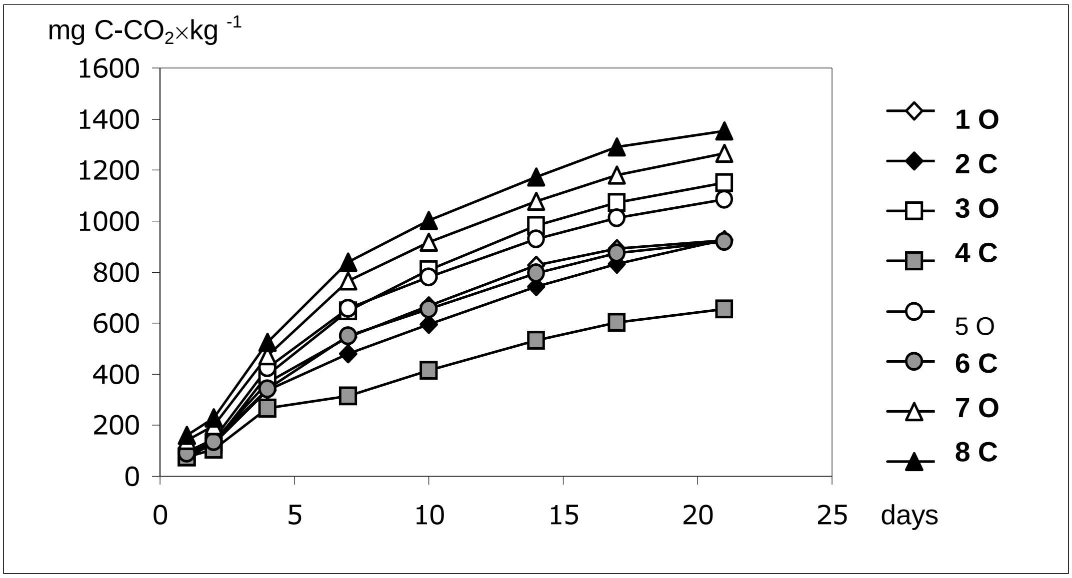
Nitrogen contents and mineralisation

Nitrogen is a key element for crop production and a total N content in the soil has always been considered as a long-term quality and fertility parameter. For this reason, its measurement (Kjeldahl's procedure, N_{tot}., mg$\times kg^{-1}$) was included in the data set performed in the survey.

Nevertheless, the total nitrogen value is a meaningless indicator of the N turnover in the soil, incapable of supplying information about the availability of the element for crops in the short-term period and to evaluate potential pollution risks inherent to losses of mineral N to the waters and to the atmosphere.

On the other hand, soil N mineralisation can be considered an index of soil quality, due to the relation between this process and the capacity of the soil of supplying N for crop growth and also due to the pollution risk of waters and the atmosphere. According to this affirmation, the N mineralisation is often included in minimum data sets set up to evaluate soil quality (Canali and Benedetti, 2002).

Figure 1. Some cumulative curves of C-mineralisation for organic (O) and conventional (C) soils



In this study, N mineralisation was estimated from the NH_4-N (mg×kg^{-1}) accumulated after 7 days of anaerobic incubation at 40°C, according to Sahrawat and Ponnamperuma (1978), slightly modified by Canali *et al.* (2000). This procedure is highly recommended when there is a need for a quick, work-saving, inexpensive procedure (*i.e.* field survey approach on a large-regional scale) (Canali and Benedetti, 2002).

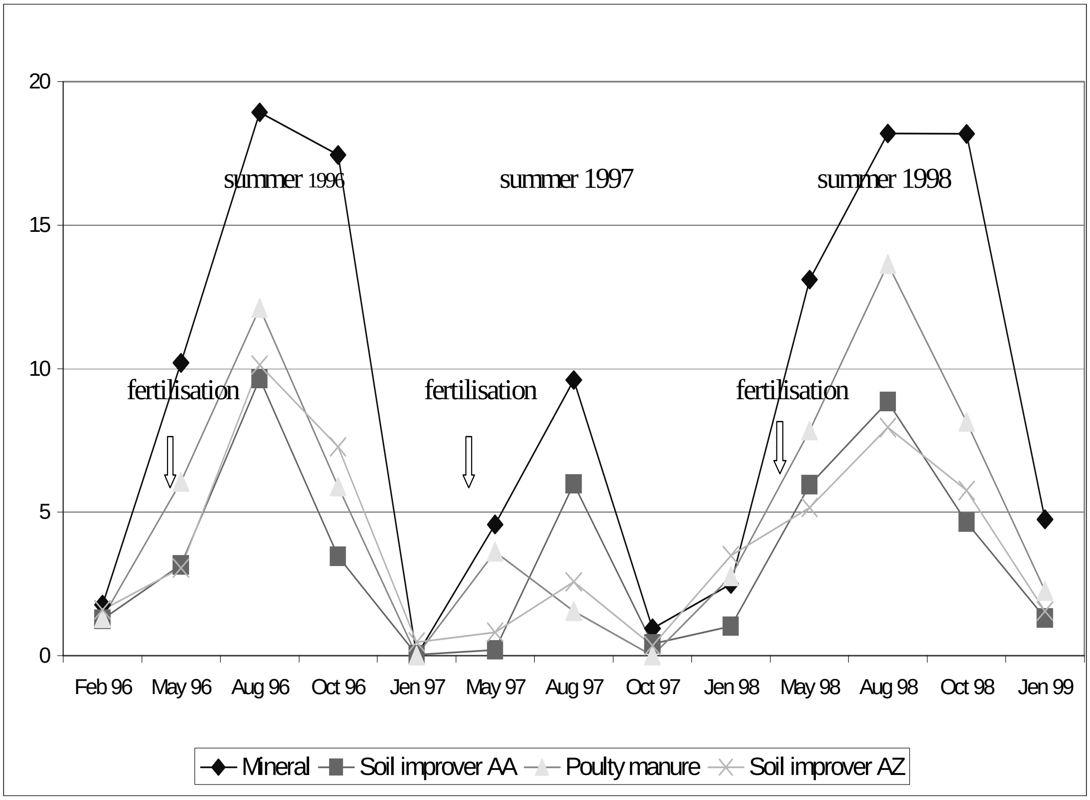
Soil samples (16g) were air dried and ground to pass through a 2mm sieve. The samples were placed in 50ml test tubes containing 40ml distilled water, covered and incubated at 40°C for 8 days. The test tubes were shaken for a few seconds each day, in order to mix the water and soil suspension. After the incubation, the soil was extracted with KCl 2N and 40ml KCl 4N was added to the suspension in order to preserve the soil solution ratio at 1:5. The samples were shaken for 1 hour and then filtered through paper filters. Determinations were performed in triplicate and the difference between the NH_4^+-N amount released by the sample after incubation and the amount released by the non-incubated sample was taken as mineralised nitrogen (NPM). Anaerobiosis was controlled by determining nitric (NO_3^--N) and nitrous (NO_2^--N) nitrogen concentrations at the end of incubation. Only negligible traces of oxidised forms of N were observed.

Results obtained for total N content, mineral N and NPM are reported in Table 2. N_{tot} was higher in organic managed soils (1 289 mg×kg^{-1}) as compared to conventional ones (1 083 mg×kg^{-1}), even if the differences showed no statistical significance. In any case, in this parameter, there is a strong tendency towards an increase of the N content in organic soils, revealed by the low p values (0.20), a fact which may be of interest. This finding seemed to indicate an increase of the long-term storage of this nutritive element in organically managed systems. No significant differences were detected in the N mineralisation process.

NO_3^--N content of soil

A three-year study (1996-98) to assess soil nitrates dynamic was conducted in an organically managed orange orchard (Valencia late grafted on sour orange rootstock) located in Lentini (SR), Sicily (Southern Italy). Four treatments distributing the same dose of nitrogen using four different types of fertilisers and soil improvers were carried out (mineral N fertiliser — conventional; dried poultry manure; compost from distillery by-products; compost from olive oil production by-products and manure) adopting a randomised block experimental design with three replicates.

Figure 2. Soil N-NO_3^- (mg kg^1)



During the three-year period, the nitrogen nutrition status (assessed by leaf analysis) and the yield of the orange orchard were monitored and no significant differences among the treatments were observed. Concentrations of nitrates (NO_3^--N) in the soil layer between 0-30cm depth were determined every three months throughout the study period. NO_3^--N in 1:10 soil-KCl (2M) extracts were determined by continuous flow colorimetry (Autoanalyzer Technicon II), as suggested by Kampshake *et al.* (1967).

Figure 2 shows the concentration of soil nitrate values observed in the trial period. For all the treatments, the tendency is characterised by high values in the summer due to the combined effect of fertilisation and native soil N mineralisation, since, in this season, soil conditions are not limiting for biochemical activities (optimal soil water contents maintained by micro irrigation and high soil temperature). On the other hand, low values measured in the winter could be ascribed to the rainfall that may leach nitrates from the superficial soil layer.

Nitrate concentration in the soil strongly depends on the treatments and it is linked to the typology of the fertiliser applied. The treatments managed and fertilised according to organic farming methods always show lower soil nitrate contents as compared to conventional ones. The results above-reported have allowed us to affirm that the potential risk of nitrate losses is lower in the organic plots, where organic fertilisers and soil improvers were applied, than in the conventional ones (Canali *et al.*, 2000).

Conclusions

The chemical and biochemical parameters considered in this study, have supplied valuable information on differences in the soil quality and fertility between organic and conventional managed citrus orchards located in Eastern Sicily, where there is a Mediterranean climate.

Organic soils were characterised by a higher C-mineralisation (higher C_7, C_{21}, C_0), a higher humification level (higher values of A_s), an increase in the soil nutrient (N) and energy (C) pools (higher TOC and N), plus a better efficiency in the organic matter turnover (lower C-mineralisation coefficients). These findings suggest that organic managed soils could be considered as more sustainable systems. Generally speaking, as has been theorised in Odum's hypothesis (Odum, 1969), natural ecosystems show a balance in the energy and nutrients economy, characterised by an equilibrium between the organic matter input and the residual organic matter amount (Pinzari *et al.*, 1999).

Furthermore, the amount of potentially leaching nitrates was shown to be lower in organically managed soils than in conventional ones. Consequently, the introduction and the spread of the organic farming system in the citrus cropping area should reduce the risk of polluting the waters.

All results obtained, deriving from the comparatively large-scale soil survey and from the farm-level experimental design, have given proof of an improvement in the soil quality in organically managed citrus orchards. Consequently, the introduction of organic farming management systems can contribute to increasing the environmental sustainability of citrus production in Southern Italy.

The entire information obtained suggest that the assessment of alternative (organic *versus* conventional) management systems ought to continue, according to a long-term dynamic approach and using a wider range of parameters and soil system descriptors that may be useful for a better understanding of the soil functions.

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ENERGY BALANCE COMPARISON OF ORGANIC AND CONVENTIONAL FARMING

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Abstract

This paper presents five examples with energy balance comparisons of organic and conventional farming systems in Denmark and Germany. In general, the examples show that conversion to organic farming leads to a lower total fossil energy use and, consequently, to lower greenhouse gas emissions. However, the exemplified organic farming practices also resulted in a lower amount of production per area of agricultural land, a different product quality, and eventually another product price than per unit of similar conventional products. Therefore, direct comparisons of the two systems are difficult. It is recommended that policy makers include fossil energy issues in the evaluation of impacts from organic compared to integrated or conventional farming systems. The examples from intensive farming systems in Denmark and Germany show promising results, where conversion to organic farming might serve as a measure to conserve fossil energy resources for the use of future generations and for the development of less industrialised areas of the world. The challenge is to find the optimal type and extent of conversion, matched with other environmental and socio-economic consequences.

What is special about the energetics of organic farming?

Organic farming differs from integrated or conventional systems by means of a defined set of production standards (IFOAM, 2002). These standards, which in most countries are implemented in the form of nationally adapted, organic farming regulations (*e.g.* The Danish Plant Directorate, 2002), affect the potential energy flows in and out of agricultural systems.

This paper presents five examples where energy inputs and outputs are compared for organic and conventional farming systems. In these examples, it is quantified how conversion to organic farming might affect both the direct and indirect fossil energy embedded in the inputs to agriculture, and how the organic farming regulation on input factors affects the output produced, and thereby the energy balance given as the fossil energy use per unit of product produced in organic and conventional farming, respectively. The examples focus on factors particularly affecting the energy balance when

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converting to different organic farming systems, compared to more or less “integrated” conventional farming systems.

The examples are divided into farm product and national level energy balances. At the farm product level, the energy effect of using synthetic nitrogen fertilisers in conventional spring barley production is compared to the exclusive use of animal and green manures under an organic system. The second example compares organic and conventional fodder production systems under different management scenarios. Subsequently, an example of the energy use in organic and conventional production of milk is presented, with a focus on the energy effect of imported compared to locally produced fodder. At the national level, the energy use per hectare in the organic and conventional dairy farm sectors of Denmark is compared, and the possibilities of Life Cycle Assessment (LCA) are discussed. Finally, a national level energy balance for Danish agriculture is presented and is used as a base to compare three scenarios for conversion to 100% organic farming. In this context, the eventual energy savings from conversion to organic farming are compared to the decline in production capacity, and the different potentials in production of bioenergy from conventional and organic farming are discussed. Moreover, the effects on national greenhouse gas emissions from conversion to organic farming are calculated.

Agricultural energy use

Agricultural energy use is, in accordance with the United Nations’ Food and Agriculture Organization’s (FAO) definition of basic energy concepts (Hulscher, 1991), defined as the net fossil energy measured in joules (J) used for production of agricultural products until they leave the farm. This energy use is divided into direct and indirect energy. Direct energy is energy input used in the production, when such input can be directly converted into energy units (*e.g.* diesel fuel, lubricants, and electricity for lubrication and drying). Indirect energy is energy used in the production when such input cannot be converted directly into energy inputs (*e.g.* machinery, fertilisers and pesticides would come into the latter category). Energy use is simulated with the model described in Dalgaard *et al.* (2001) with some modifications in the German example. All energy use is posited to come from fossil energy carriers in the form of coal, diesel oil, or natural gas, each leading to a fixed amount of carbon dioxide released per J energy used, or eventually from carbon dioxide neutral biofuels (Dalgaard *et al.*, 2002b).

Energy use at the farm level

Example 1: Barley grain production

The first example calculates the energy balance for conventionally and organically grown spring barley on an irrigated (30 mm), sandy soil in Denmark. The type and number of field operations are similar in the two fields, except for the fact that the organic system uses mechanical weed control, no pesticides, and spreads slurry instead of using synthetic fertilisers, according to Danish regulations for organic farming (The Danish Plant Directorate, 2002). The resulting yields are predicted by Halberg and Kristensen’s (1997) model. The unit for the outputs are Scandinavian Feed Units (SFUs).[2]

Table 1 shows a lower energy use per kg of spring barley production for the organic system compared to the conventional system. However, the direct fuel energy use is higher for the organic

2. 1 SFU corresponds to 12 MJ metabolisable energy.

system because of higher fuel consumption for mechanical weed control and spreading animal manures compared to a lower fuel consumption for application of pesticides and synthetic fertilisers in the conventional example. In total, the direct energy use per ha is 28% higher in the organic compared to the conventional example, even though the energy use for drying the organic grains is lower per ha because of a lower grain yield. The indirect energy use is substantially higher in the conventional than in the organic example. This is mainly because of the assumed use of energy expensive synthetic nitrogen (N) fertilisers in the conventional example.[3] In contrast, the use of pesticides requires a comparatively low amount of energy (250 MJ/ha) and is a good idea from an energy viewpoint. For example, fungicide treatment of spring barley can, alone, yield around 5 kg/ha extra grain (Pedersen *et al.*, 2001), with an energy content of 6 000 MJ metabolisable energy gained if used for fodder, or 7 500 MJ heat energy gained if combusted in a stoker. In conclusion, the total direct plus indirect energy use is 35% lower per ha organic compared to conventional spring barley. However, the yield is also 28% lower, and therefore the energy use per produced SFU of barley is only marginally lower for the organic compared to the conventional example.

Table 1. Energy accounts (MJ/ha) for spring barley grown on irrigated sandy soil in Denmark

	Conventional	Organic
Direct energy		
Fuel	3 400	5 000
Lubricants	300	440
Field irrigation	1 500	1 500
Drying	500	360
Sub-total	5 700	7 300
Indirect energy		
Machinery	1 100	1 600
Fertilisers and lime	6 700	50
Pesticides	250	0
Sub-total	8 050	1 650
Total energy use	13 750	8 950
Yield (SFU/ha)	5 000	3 600
Energy Efficiency (MJ/SFU)	2.8	2.5

Source: Dalgaard *et al.* (2002c).

Example 2: Forage production

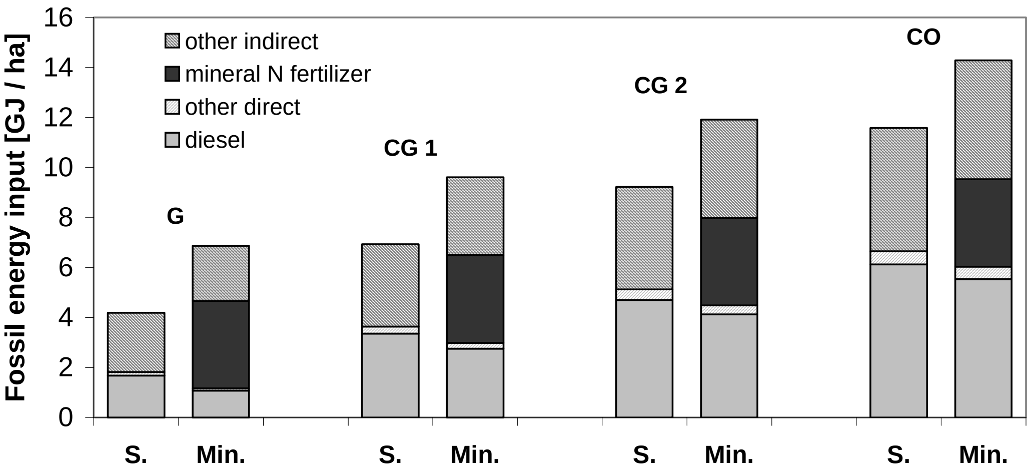
The second example calculates energy balances for forage production. The calculations are based on five years' (1997-2002) field trials from Karkendamm Experimental Station in Northern Germany (Taube and Wachendorf, 2000; Trott *et al.*, 2002; Volkers *et al.*, 2002; Wachendorf *et al.*, 2002). Based on these results, parameters of energy utilisation are calculated and compared for permanent grass/clover under different management systems (grazing, one silage cut + aftermath, two silage cuts + aftermath, four silage cuts + no aftermath), and for maize silage. In this example, energy

3. 120 kg N/ha is applied with 6 000 MJ/ha energy embedded. Moreover, an additional 700 MJ/ha is embedded in the phosphorus and potassium fertilisers and lime applied. If the energy cost of N fertilisers were reduced by 20%, from 50 MJ/kg N to 40 MJ/kg N, the energy efficiency would be equal in the conventional and organic system.

yields are expressed in NEL,[4] and energy consumption is compared to the NEL yield resulting from different combinations of N fertilisation with slurry and mineral N fertiliser.

The main difference between the energy balances in organic and conventional forage production is due to application of mineral N fertiliser. Figure 1 shows that the total fossil energy input both for grazed grass/clover and different types of cut grass/clover can be reduced by about 2 GJ per ha by replacing mineral N with cattle slurry. For organic grassland farming, diesel use may be assumed similar to that of conventional grassland farming. This is because fertiliser or pesticide applications make up only a small proportion of total diesel use for field operations compared to the required field operations for silage making. As grazing land usually requires only low amounts of pesticides (*e.g.* one herbicide application every 3-5 years), there might be no significant effect of pesticide utilisation on indirect energy input between conventional and organic grassland farming. Figure 1 also shows that cutting requires significantly more energy input than grazing due to increased diesel use for mowing, chopping, and silage transport.

Figure 1. Energy input of forage production systems



Notes:
1. Four different grass/clover management systems are compared (G = grazing, CG 1= one silage cut + aftermath, CG 2 = two silage cuts + aftermath, CO = cutting only, with four cuts per year).
2. Energy input is shown for each system using either slurry (S = 20 m³ ha^{-1} slurry, no mineral N fertiliser) or mineral N application (Min = 70 kg ha^{-1} mineral N fertiliser, no slurry).

Forage crops differ significantly in their energy efficiency[5] (Figure 2). Except for the low N intensity, rotational grazing system, forage maize has the highest energy efficiency over the entire N fertilisation range. This is due to: (1) lower direct energy input (diesel) in maize production when compared to cutting-only treatments on grassland; and (2) higher energy yields of forage maize. However, the results are from conventional maize production and cannot be directly transferred to organic farming. The highest energy efficiency was obtained when grassland was grazed over the entire season and not given any mineral N fertiliser. But this system cannot be directly compared to grass or maize silage production, as grazing alone does not fulfil the feeding requirements of highly

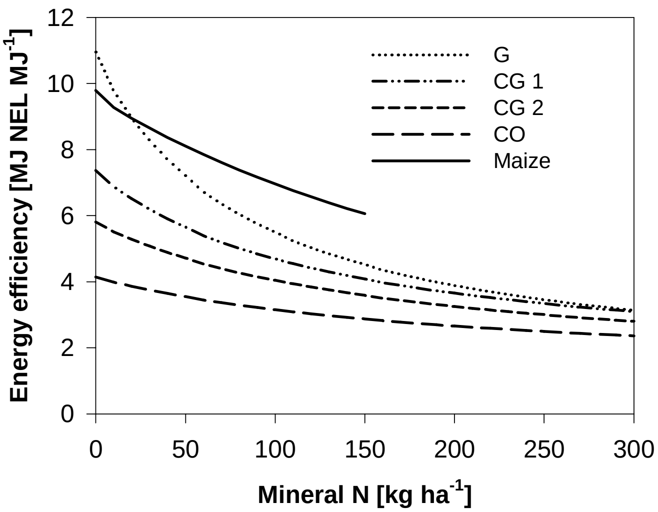
4. Net Energy Lactation (NEL) is the energy value in forage or concentrate feedstuff directly available for milk production in dairy cows.

5. The energy efficiency in forage production is expressed as the energy output per energy input of direct and indirect fossil energy.

productive dairy cows. The results also show that in organic farming with low fertilisation densities and no adding of mineral fertilisers, the energy efficiency of grazed grass is significantly higher than that of mowed grass, while the difference between the two practices is insignificant in conventional systems with high N fertilisation per ha. Therefore, the energy balance of organic farming would especially gain from grazing.

From example 2 it is concluded that the lowest input of fossil energy and highest energy efficiency in both conventional and organic forage production is obtained with grazing systems. Concerning silage making, forage maize requires less energy input and obtains a higher energy efficiency compared to cutting of grassland. The most significant contribution of organic farming to reducing energy use is the non-use of mineral N fertilisers.

Figure 2. Energy efficiency of forage production systems



Note:
Energy efficiencies of forage maize and four different grass/clover management systems (G = grazing, CG 1 = one silage cut + aftermath, CG 2 = two silage cuts + aftermath, CO = cutting only, with four cuts per year) as affected by mineral N application. Slurry application: 20 m³/ha in all treatments.

Example 3: Milk production

The third example calculates energy balances for milk production. The calculations are based on organic and conventional plans for one year's foddering of a Holstein Friesian milking cow held in cubical houses (Dalgaard *et al.*, 1998). The organic system includes more roughage and grain than the conventional fodder ration, and the energy use for these two fodder types are accounted as produced on the farm. In contrast, the conventional plan includes more imported concentrates. The yearly milk yield predicted by Sørensen *et al.'s* (1992) model and added meat converted to milk on energy basis 1:10 are equal for the two plans.

Table 2 compares energy use per milk yield in organic and conventional dairy farming. The total energy use per kg milk produced is lower in organic than in conventional dairy farming because of the energy-inexpensive grassland grazing (example 2) and a lower import of energy-expensive concentrates. The following section discusses whether this result can be generalised to the national level.

Table 2. Energy use (GJ) for milk production in Denmark

1 milking cow in 1 year	Conventional	Organic
Fodder		
Grazing	3.6	2.3
Grass silage	2.4	1.5
Whole crop silage	1.0	0.8
Straw	0.0	0.0
Grain cereals	2.7	3.3
Imported concentrates	7.4	6.7
Straw bedding	0.4	0.4
Housing	8.0	8.0
Farm buildings	2.5	2.5
Total	28.0	25.6
1 000 kg milk*	9.0	9.0
MJ/kg milk	3.1	2.8

* Meat converted to milk on energy basis 1:10.
Source: Dalgaard *et al.* (2002c)

National energy balances

Example 4: Dairy farming in Denmark

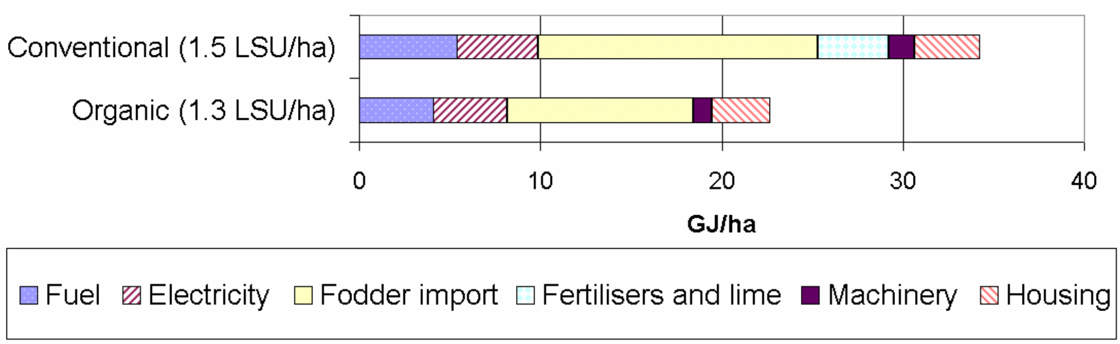
The fourth example demonstrates a method to calculate and compare the national average energy use per hectare in the organic dairy farm sector with that of the conventional dairy farm sector. The calculations are based on farm statistics from the year of 1999. The data set includes more than 1 500 variables concerning land use, crop yields, livestock production, financial account variables etc. (Olsen, 2001), from which the energy use is calculated for a number of farm types. Some of these data are collected for the EUROSTAT farm accountancy data network, FADN (McClintock, 1989). Therefore, similar calculations may in the future be extended to other EU countries. In the present data, organic farming is only represented with one farm type, organic dairy farming, whereas conventional farming is divided into a number of farm typologies. As an example, the energy use in the organic dairy farm type is compared to that of the average conventional dairy farm.

Figure 3 shows the energy use in MJ/ha for the organic and conventional dairy sector in Denmark. For both sectors, the direct energy use (fuel, electricity, machinery and housing) is lower than the indirect energy use (fodder import and fertilisers and lime). Comparison of the conventional and organic sector shows that the direct energy use is almost identical for the two sectors, but the conventional sector uses much more energy for fertiliser production and fodder production than the organic sector does. Therefore, the total energy use per hectare is higher in the conventional than in the organic sector. However, it is very important to notice that the average organic farm produces less milk per hectare than conventional farms do (*i.e.* the number of LSU/ha in Figure 3 differs between the two farm types), and it is still unknown whether the conventional sector uses more or less energy per litre milk produced, on the average, than does the organic sector.

To calculate the total energy use per litre milk can be difficult because Danish dairy farms — besides milk and meat production — also produce, for instance, cash crops, sugarbeet and rapeseed.

This means that the direct and the indirect energy use in the milk sector is not only connected to the production of milk but also to other products. Fortunately, it is possible to address the problem by using Life Cycle Assessment, which is a method used to estimate the resource use and environmental impact of a product (Dansk Standard, 2001). This method has lately been used to estimate the energy use of the Danish conventional pig sector (Dalgaard *et al*., 2002a) but, as already mentioned, has not been applied to the dairy sector yet.

Figure 3. Average energy use per hectare in the organic and conventional dairy farm sector of Denmark, 1999



Example 5: National energy use, bioenergy production and emissions of greenhouse gases

In the final example, the total national energy balance for Danish agriculture in 1996 is calculated and compared to the following three scenarios for conversion to 100% organic farming:

A. Full national self-sufficiency with fodder (*i.e.* no import). This particularly limits pig production because it was assumed that the total Danish EU milk quota would still be produced after conversion.

B. 15% import of fodder for ruminants and 25% import for non-ruminants. Again, pig production is limited, but less than in scenario A.

C. The same level of animal production after conversion as in 1996 (unlimited import of fodder).

In each of the scenarios, crop production on the 2.7 x 10^6 ha agricultural area of Denmark is estimated for the present practice on organic Danish farms (Halberg and Kristensen, 1997) and for an expected improved future practice. Moreover, livestock production in LSUs[6] is determined by the above scenario conditions, and the subsequent need for fodder imports is calculated (Table 3). On the basis of these data, the energy use and the emissions of greenhouse gases are calculated according to Dalgaard *et al*. (2002b) and IPCC (1997).

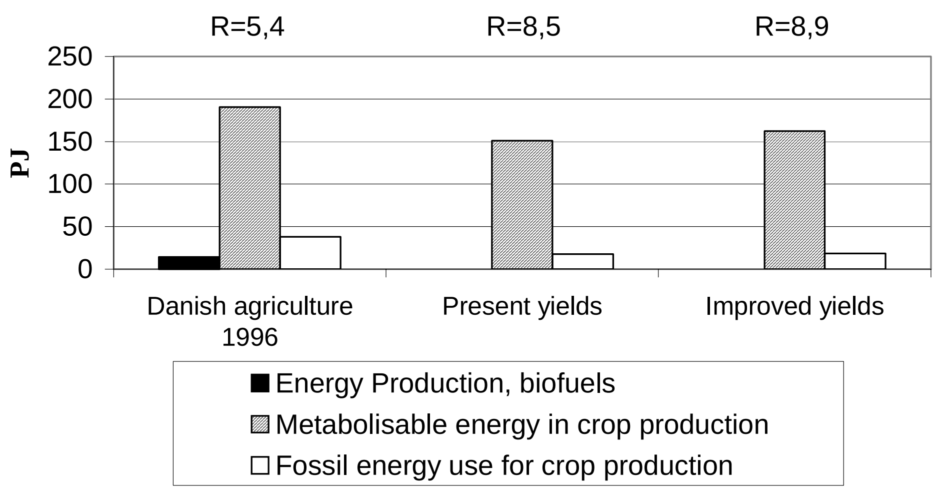
6. 1 Livestock unit (LSU) corresponds to 1 Holstein Friesian dairy cow held in 1 year, or 30 slaughter pigs produced.

Table 3. Total Danish crop production, fodder import and animal production in 1996 and in the three scenarios for conversion to organic farming (calculated from Alrøe *et al.*, 1998)

		Conventional Agriculture	Organic Scenarios *Present (improved) crop yields*		
			A	B	C
Crop production	10^9 SFUs	15	12 (13)	12 (13)	12 (13)
Fodder import	10^9 SFUs	4	0 (0)	2 (3)	4 (3)
Livestock units	10^6 LSUs	2.3	1.7 (1.7)	2.1 (2.3)	2.4 (2.4)

An important difference between present conventional production and the scenarios for conversion to organic farming is the lower crop yields in organic farming. In the organic scenarios, the average yield in MJ metabolisable energy declines by between 15% (if an expected improvement of the yields in organic farming occurs) and 21% (if the present yields in organic farming are sustained). In comparison, the fossil energy use declines by 52% and 53%, respectively, and the ratio (R) between energy production and net energy use is higher for organic than for conventional crop production.

Figure 4. Energy production in the form of biofuels (straw and biogas), metabolisable energy in crops and fossil energy use for crop production[1]



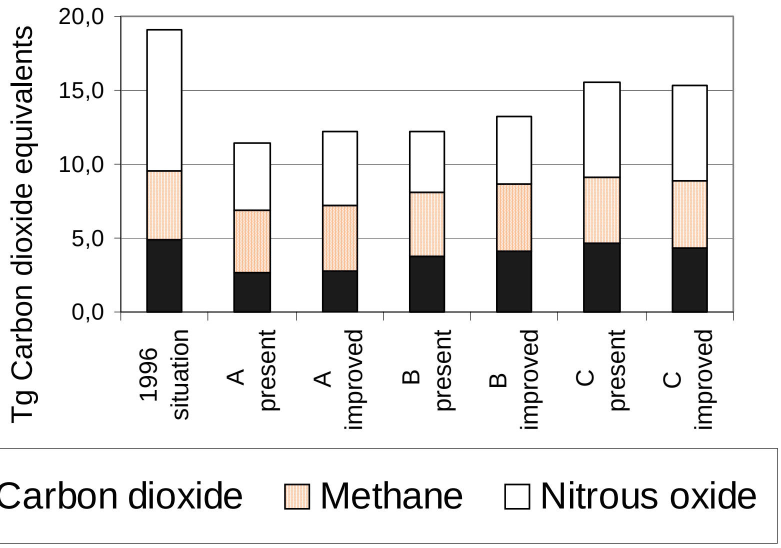
Notes:
1. 1 PJ = 10^{15}J.
2. Results are shown for the present situation in Denmark 1996, and for the organic scenario, calculated for the present yields in organic farming and for expected, improved future crop yields.
3. R is the ratio between energy production and net energy use calculated as the fossil energy use minus the bioenergy production.
Source: Dalgaard *et al.*, 2002b.

In the present situation, significant bioenergy production, primarily from combustion of straw and from biogas extracted from slurry, takes place in Denmark (Figure 4). This should be deducted from the energy used for crop production. However, the potential for further bioenergy production from straw and biogas is twice this present production of around 14 x 10^{15} J bioenergy. Moreover, 2 x 10^9 kg grain was exported from Denmark in 1996, compared to no export in the organic scenario (C), with a national animal production comparable to the present situation (Table 3). If these cereals were burned in power plants for heat and electricity, a gross energy production of about 30 x 10^{15} J might be achieved. In this situation, conventional farming has a more positive energy balance than any of the scenarios for conversion to organic farming (Dalgaard *et al.*, 2002b). However, there are many unanswered questions concerning possibilities for combined food energy systems (Kuemmel *et al.*, 1998), which may be introduced in organic as well as conventional farming and change the conclusion from this example. Further investigations within this area are therefore recommended.

Table 4. Total Danish agricultural energy balance (10^{15} J) for the 1996 situation and for three organic scenarios with present and improved yields

	Danish Agriculture 1996	**Organic Scenarios** *Present (improved) crop yields* A	B	C
Crop production	38	18 (18)	18 (18)	18 (18)
Livestock production	39	13 (14)	28 (31)	40 (34)
Total	77	31 (32)	45 (50)	57 (53)
Energy production	14	0 (0)	0 (0)	0 (0)
Net energy use	63	31 (32)	45 (50)	57 (53)

Figure 5. Total national agricultural emissions of greenhouse gases



Note: 1Tg = 10^9kg.
Source: Dalgaard *et al.*, 2002b.

In the three scenarios for conversion to 100% organic farming, the net fossil energy use of Danish agriculture, calculated to 66 x 10^{15} J, was reduced by between 10% and 51% (Table 4). The highest reduction was found in the scenario with national self-sufficiency in fodders (A), while the lowest reduction was found in the scenario where the present level of animal production was sustained after conversion to organic farming (C).

The net energy use reduction, resulting from conversion to organic farming, leads to lower emissions of the greenhouse gas carbon dioxide. In Figure 5 the reductions in each scenario are accounted and compared to related emissions of the two other important greenhouse gases, methane and nitrous oxide. Not surprisingly, the total greenhouse gas emissions are lowest in the scenario with the highest fodder self-sufficiency and the lowest animal production (A), while the highest emissions found are where the animal production and the fodder import are high (C). In scenarios A and B, the greenhouse gas emissions are increased when the crop yields are improved, while the opposite is the case in scenario C. The cause for this is that animal production in scenarios A and B is limited by the total crop yield. Therefore, higher yields lead to higher animal production and higher greenhouse gas emissions. In scenario C, on the contrary, animal production is not limited by the crop yield because imports of fodder sustain animal production equal to the one in 1996. Consequently, higher yields lead to lower fodder imports, which lowers the total greenhouse gas emissions.

Conclusions and policy recommendations

Based on the presented examples from Denmark and Germany it is concluded that:

- Typically, conversion to organic farming leads to a lower total fossil energy use. However, organic farming practices also result in a lower amount of production per area of agricultural land, a different product quality, and eventually another product price than per unit of similar conventional products.

- In the examples presented, the reductions in the energy inputs were higher than the reductions in outputs from the production. Consequently, the energy efficiencies, defined as output per energy input, were higher in the organic than in the conventional farming examples.

- A higher use of locally produced forage crops in organic dairy production may reduce the energy use via reductions in the energy-costly import of concentrates.

- The fossil energy use reductions lead to similar reductions in emissions of carbon dioxide. This gas contributes with between one-quarter and one-third of the total greenhouse gas contribution from agriculture.

- The potential for bioenergy production is higher in conventional than in organic farming. Fully utilising this potential, conventional farming apparently has a more favourable energy balance and a lower net greenhouse gas emission than organic farming. However, there are still many unanswered questions concerning possibilities for combined food energy systems, which may change this conclusion.

The recommendation for policy makers is to include fossil energy use issues in the evaluation of impacts from organic compared to integrated or conventional farming systems. Within the next generation, the world is predicted to encounter shortage of fossil oil energy and, combined with the concern for energy use-induced climate changes, organic farming should be considered a measure to reduce fossil energy use. However, the type and extent of conversion should be carefully evaluated and matched with other environmental and socio-economic consequences of conversion. The examples presented show promising experiences from Denmark and Germany, countries with highly intensified conventional agriculture. In other regions of the world the conclusion might differ, but nevertheless the industrialised countries have an obligation to save fossil energy resources for the use of future generations and for the development of less industrialised areas of the world.

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Chapter 3.

Economic and Social Aspects of Organic Agriculture

THE PROFITABILITY OF ORGANIC FARMING IN EUROPE

Hiltrud Nieberg and Frank Offermann[1]

Abstract

This paper discusses some methodological aspects important for the analysis of the economic performance of organic farming, and gives an overview of the profitability of organic farming in Europe at the farm level. On the basis of a review of current and previous studies, as well as farm accounting data, the incomes of organic and comparable conventional farms are compared, and the main factors influencing profitability, especially yields, price premia and support payments for organic farming are discussed. The analysis shows that organic farming has been an economically interesting alternative in many European countries even though yields were generally significantly lower. One of the main determinants of profitability is the realisation of higher farm-gate prices. Premium prices could generally be realised for crop products, while for livestock products marketing was often more difficult. European Union and government support payments for organic farming as well as the design of the Common Agricultural Policy contributed to the success of the farms. While on average the profits of organic farms are very similar to those of comparable conventional farms, there was, however, a wide variation in performance within the samples and between countries and farm types. The development of profits in organic and comparable conventional farms is remarkably similar. This indicates that external, non-system inherent factors influence both farming systems in very much the same way. Comparing financially successful and less successful organic farms reveals that in organic farming too, size and cost-effectiveness of production matter.[2]

Introduction

Economic analysis of organic farming needs to cover a wide range of different aspects to account for the complexity of the issues involved, which is reflected in the diversity of the contributions to this Workshop. This article deals with some general methodological aspects, but will focus on farm-level economics. The motives for the conversion to organic farming are manifold (Padel, 2001). In addition to the wish to actively contribute to environmental goals, financial motives have become one of the most important aspects in the decision to convert, which is reflected in the

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2. The paper is partly based on a report which has been carried out with financial support from the Commission of the European Communities, Agriculture and Fisheries (FAIR) specific RTD programme, Fair3-CT96-1794, "Effects of the CAP-reform and possible further development on organic farming in the EU". It does not necessarily reflect its views and in no way anticipates the Commission's future policy in this area.

strong growth in the adoption of organic management practices following the introduction of financial support for organic farming in most countries. This paper will discuss methodological aspects of comparative economic analyses of organic farming. On the basis of these reflections, it will provide an overview of the financial performance of organic farms in selected European countries, and try to identify the conditions and farm characteristics which promise a profitable conversion. Specifically, the importance of yield levels, prices realised, costs incurred and payments received will be analysed.

Data and methodology

The criteria for measuring and evaluating the economic performance of organic farms depend on the objectives of the farmer and the time horizon of the analysis. Quite generally, a minimum requirement would be that organic farming is economically viable, meaning the monetary return under organic management is high enough to cover all expenses incurred, including consumption by the farm household. In the long run though, relative profits and the criteria of profit maximisation are becoming more important for analysing the economic performance of organic farming, and the profits under organic management need to be compared to the (hypothetical) performance under conventional management.[3] Such an approach also facilitates a comparison of results across countries, and permits the evaluation of the financial incentive to convert to organic farming.[4]

Therefore, when analysing the performance of an organic farm, questions that need to be answered include: What would the organic farm look like if it were managed conventionally? What profit would be realised? Essentially, four different approaches to answer these questions can be discerned (Annex 1, compare Schulze Pals, 1994 with Offermann and Nieberg, 2000):

1. ***Calculation of hypothetical farm organisation and indicators under conventional management with the help of models.*** This approach can be quite time consuming, especially if the number of different farm models that have to be developed is high. Often, not all information on the relevant interrelations on the farm is available, and the results very much depend on the assumptions made for the modelling.

2. ***Determination of the farm's situation before conversion.*** The economic data for the period before conversion are often easily accessible, and thus do not need to be estimated or calculated. A serious drawback in this procedure is that a comparison with an earlier situation neglects any development the farm would have undergone even if it had not converted. The longer the time span since conversion, the less viable this approach, since changes in external parameters like prices, policies and technical progress would have substantially influenced economic performance, even without conversion.

3. ***Selection of comparable conventional farms.*** These farms should have a similar "production potential", *i.e.* a similar endowment with production factors, as the analysed organic farm. The comparability increases with the number of selection criteria used.

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3. "Conventional" in this study stands for "non-organic", and should ideally refer to the most obvious alternative to organic farming (*e.g.* the most widespread agricultural production system) in the respective region. This could be mainstream conventional farming, or, for example, an extensive farming system supported within the framework of the agri-environmental programmes.

4. The comparability of economic calculations between countries is a common problem for economic analysis, due not only to the differences in definitions. Different costs of living and purchasing power parities make comparisons of absolute figures less meaningful.

However, as the objective is to isolate the effect of the farming system on profits, only "non-system determined" variables can be used for this matching. Examples of factors that are clearly "non-system determined" are locational factors such as region, soil texture, topography, climate and market distance (Fowler, Lampkin and Midmore, 2000). Additionally, farm size in hectares and farm type are often used as selection variables, even though these may possibly be affected by the farming system (Dabbert, 1990, Offermann and Nieberg, 2000).

4. ***Selection of conventional farms that are comparable to the organic farm before conversion.*** This allows use of a large number of variables to match comparable farms, since the distinction of system-determined and non-system-determined variables is no longer relevant. This approach ensures that conventional and organic farms have similar conventional starting positions. However, this approach requires an excellent availability of data, since data are needed for several years for both organic and comparable conventional farms. To our knowledge, only a single study exists which has applied this approach (Schulze Pals, 1994, continued in Nieberg, 1997). However, even with this approach, a basic problem cannot be solved: is there a correlation between managerial characteristics and inclination to convert? Such a correlation can lead to systematic distortions of farming system comparisons, *e.g.* if innovative abilities correlate with an inclination to convert as well as with farm performance, or if converting farmers place a different emphasis on monetary and non-monetary objectives than non-converters.[5]

Using the comparative methodology discussed above, we will in the following present some results based on data which were collected with the help of national experts in each of the EU member States as well as in Norway, Switzerland and the Czech Republic. The financial performance of the farms is assessed using the indicators "profits per ha" and "profits per family work unit" in combination with important factors which determine profitability, *e.g.* yield levels and prices realised and support payments received. Most of the studies analysed are based on approach 3. In some cases, the selection of an adequate reference group was, in our opinion, not completely successful. Since the selection of the reference system has a large influence on results, the findings of the respective studies have to be interpreted with due care.

Results

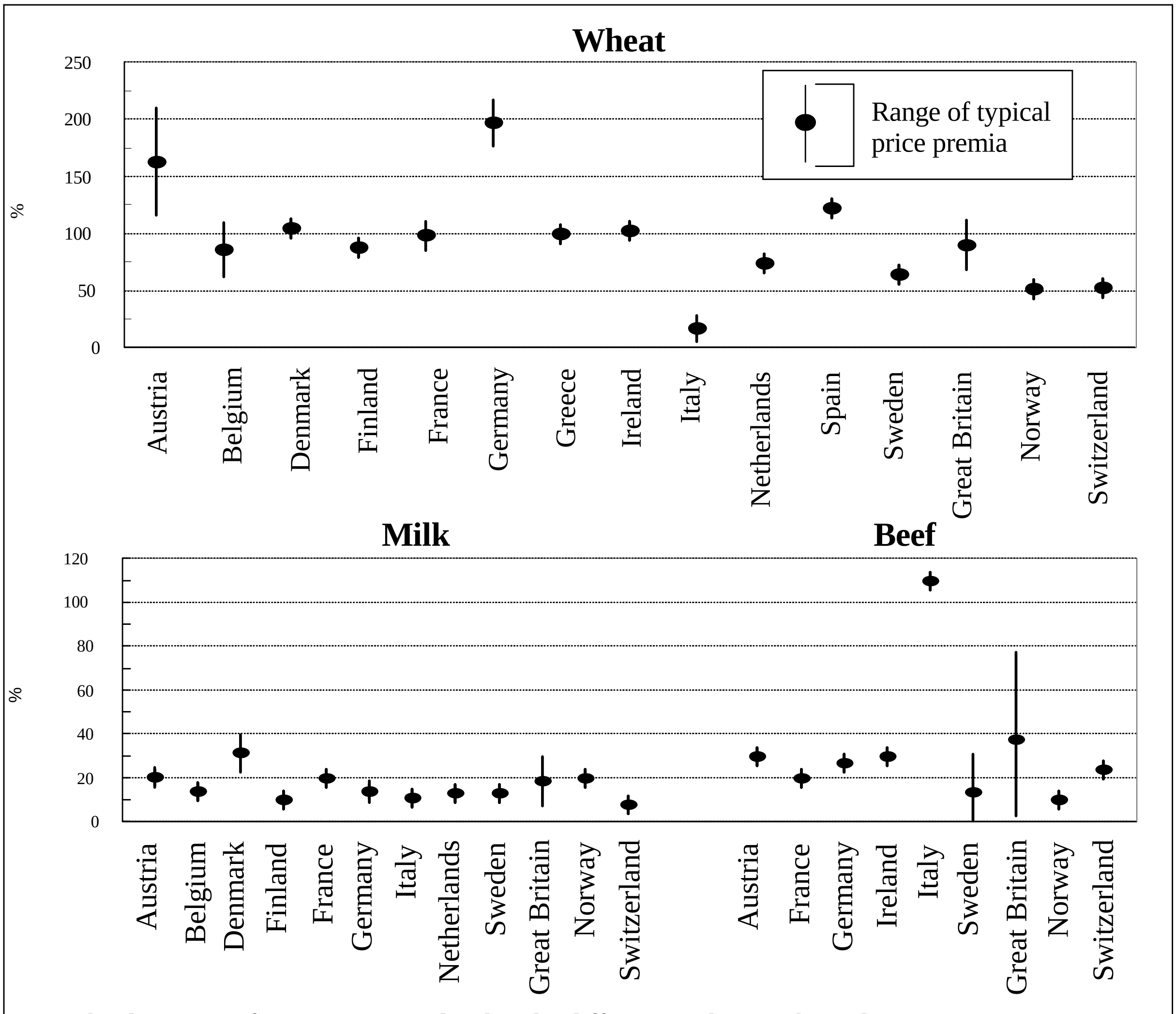
Yields and prices

In Europe, yields in organic crop production are in general significantly lower than under conventional management. Cereal yields are typically reduced by 30-40% compared to conventional management. In livestock production, performances per head are quite similar to those in conventional farming. Dairy yields per cow and year are on average 0-20% lower than under conventional management. However, stocking rates are on average 20-40% lower in organic farming, due to lower yields in forage production, changes in feed rations (less purchased concentrates, more forage) and in some cases the organic guidelines on the rearing of animals.

5. In the long run and with perfect information, profit-maximising behaviour would result in each farmer choosing the farming system which is the most profitable for him or her. In such a situation, the assessment of the profitability of organic farming using a conventional reference group is of course not possible anymore. However, the high degree of uncertainty regarding the economic consequences of conversion during the period analysed justifies using comparable farms for system comparisons.

An important aspect of the profitability of organic farms is the opportunity to receive higher farm-gate prices for organically produced goods than for conventionally produced ones. Prices vary considerably between the different marketing channels. The realised average organic price depends on the level of these prices and on the quantities marketed via the respective sales channels. For many products, the calculation of an "average organic farm-gate price" has to take into account that in many cases part of the production still has to be sold at conventional prices. The studies evaluated for the period 1992-1997 show that the realised average organic price premium varies considerably between products and countries. Price mark-ups were very high for most crop products (Figure 1).

Figure 1. Typical farm-gate price premia for organic products (1994-1997)



Weighted average of price premia realised in the different marketing channels (conv. price = 0%)
Source: OFFERMANN und NIEBERG (2000)

In nearly all countries analysed, average farm-gate prices for organically produced wheat were 50-200% higher than for conventionally produced wheat. In contrast, the marketing of organic livestock products was much more difficult. Often, a significant share of the production had to be sold at conventional prices, and thus the average price premium realisable for organic livestock products was generally comparatively low. Organically produced milk received on average a premium of 8-36% on conventional prices, while prices for organic beef were in most cases on average 20-30% higher than the conventional price. The importance of the realisation of higher prices for organic products is highlighted by studies for Germany and Great Britain: in arable farms, 40-75% of profits is due to the price mark-ups for organic products. In dairy farms, the respective share was between 10-50% (Table 1).

Table 1. The importance of premium prices for organic products for farm income

Country	**Share of price premia in profits (%)**	
	Arable farms	Dairy farms
Germany	75	48
Great Britain	40	10-17 (51*)
Denmark		>45

* In Great Britain, the price difference at the farm gate between organically and conventionally produced milk increased rapidly in 1998 as a consequence of the drastic fall of the price for conventionally produced milk, following the revaluation of the British pound.

Source: Own calculations based on Nieberg (2001a), Fowler *et al.* (2000) and the Danish Institute of Agricultural and Fisheries Economics (DIAFE).

The development of farm-gate prices for organic products in Europe was mixed over the last few years. In several countries, a positive trend was observed for organic livestock products. With intra-European trade of organic products growing each year, it can be expected the prices for organic products will converge at least at the wholesale levels.

Payments for organic farming

Organic farming is supported in all the countries analysed within agri-environmental programmes. Payment levels and eligibility conditions vary significantly between countries, and thus the impact of these grants on the financial performance of organic farms may differ regionally. While most countries support both conversion to and continuation of organic farming, in France and Great Britain only conversion is supported. In 1997, payment levels for arable land in the first two years of conversion ranged from EUR 100/ha/year in Great Britain to EUR 470/ha/year in Finland and more than EUR 800/ha/year in Switzerland (Lampkin *et al.*, 1999). Where data were available, the calculations show that the payments accounted for 15-26% of profits (Table 2). Without these payments, conversion would not have been economically profitable for some of the farms (Offermann and Nieberg, 2000).

Table 2. The importance of support payments for organic farm income

Country	**Share of payments in profits (%)**	**Average payments (EUR/ha)**
Germany (1995-99)	26	130
Denmark (1996-99)	15	123
Austria (1996)	18	218
Switzerland (1996)	24	490

Source: Offermann and Nieberg (2000), supplemented by new data from the Bundesministerium für Ernährung, *Landwirtschaft* und Forsten (BMELF) and DIAFE.

Profits

As far as possible, the definition of profit was based on the definition of "Family Farm Income" according to Farm Accountancy Data Network of the European Commission, *i.e.* profit represents the return to the farm family's own labour, land and capital. The most notable exception is the UK, where net farm income was used as an indicator of profitability.

The analysis of the economic situation of organic farms in Europe shows that on average, profits are similar to those of comparable conventional farms, with nearly all observations lying in the range of +/- 20% of the profits of the respective conventional reference groups (Figure 2), but variance within the samples analysed is high.[6] Profitability varies between the countries surveyed, and between different farm types.

Due to the high price premia realisable in the last few years, and the design of the general Common Agricultural Policy (CAP) measures (*e.g.* set-aside and compensatory arable payments; see the paper by Frank Offermann, Part III, Chapter 8), organic arable farms have in several countries been more successful than the average. For dairy farms, there are large differences in relative profitability between countries. In addition, the evaluation of the results strongly depends on the indicator used: while profits per family work unit were equal to or higher than those of comparable conventional farms in all countries for which data were available, profits per hectare of utilisable agricultural area were often lower. Very little data are available on horticultural, pig and poultry farms. The respective studies highlight both the risks and the opportunities that exist for these farms: while in 1995 the profit of horticultural farms in the Netherlands was four times as high as that of comparable conventional farms, in Great Britain it was less than half the level of the reference group.

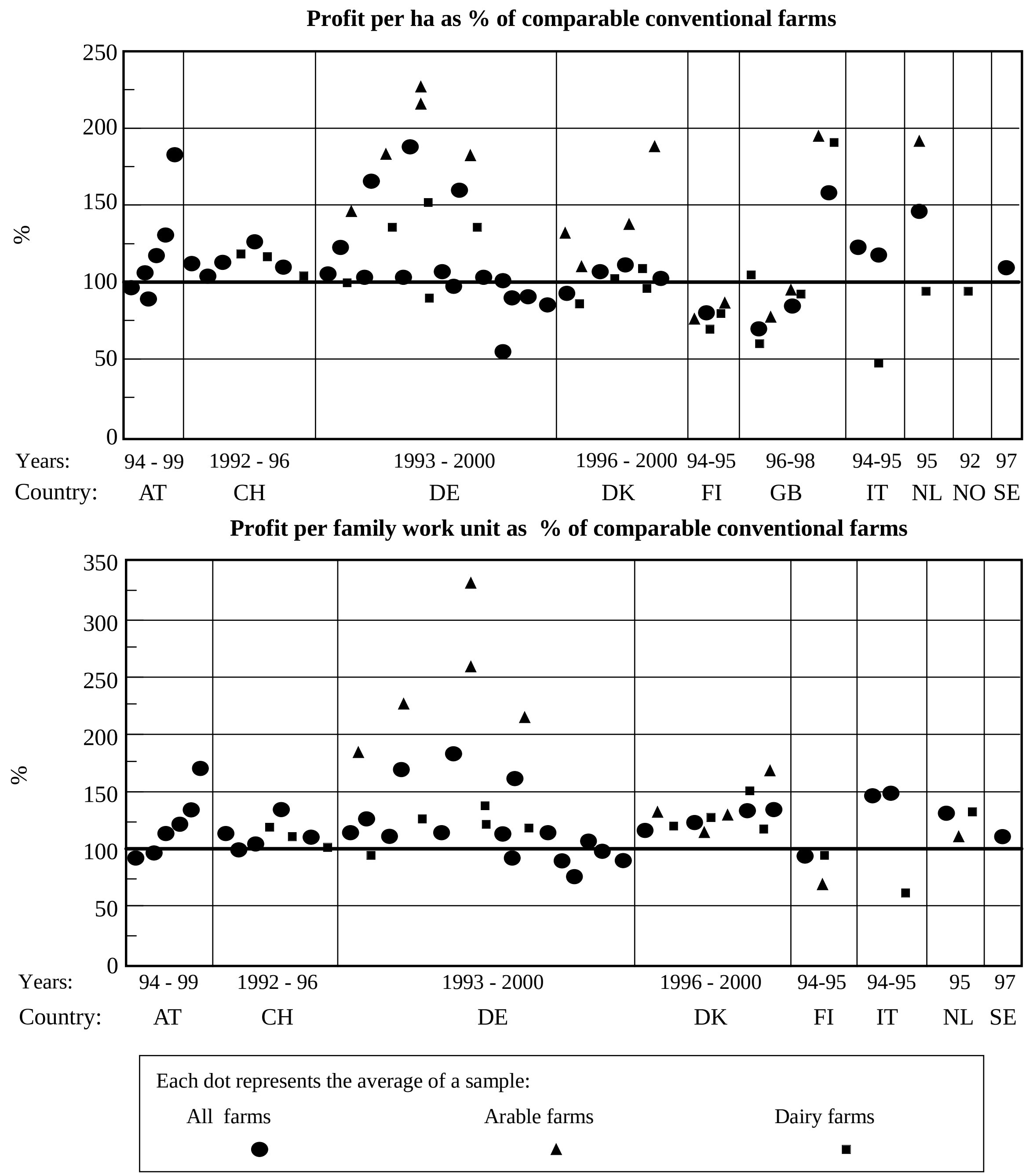
Development of profits

For several countries, time series data on the profits of organic and comparable conventional farms are now available. The data need to be interpreted cautiously, as the composition of the samples may vary over the years. The graphical representation still shows clearly that the profits of the organic farms were slightly higher in most of the years in the five countries analysed (Figure 3). The similarity of the curves for conventional and organic farms over the years is remarkable. This indicates that external, non-system inherent factors like climate, prices and general agricultural policy influence both farming systems in very much the same way. This parallel development may provide an indication that organic farms are subject to the same pressure to adjust to changing external conditions as conventional farms, and may have to face similar consequences from structural change (*e.g.* farm size growth) and rationalisation.

6. For example, in a survey of 107 organic farms in Germany (Nieberg, 1997), the profits of the organic farms were found to be higher than the profit of comparable conventional farms by 23% *on average* — but within the sample, 35% of the organic farms had lower profits than the respective reference farms.

Figure 2. Profits of organic farms relative to comparable conventional farms in different countries

(empirical results of different studies, 1992-2000)

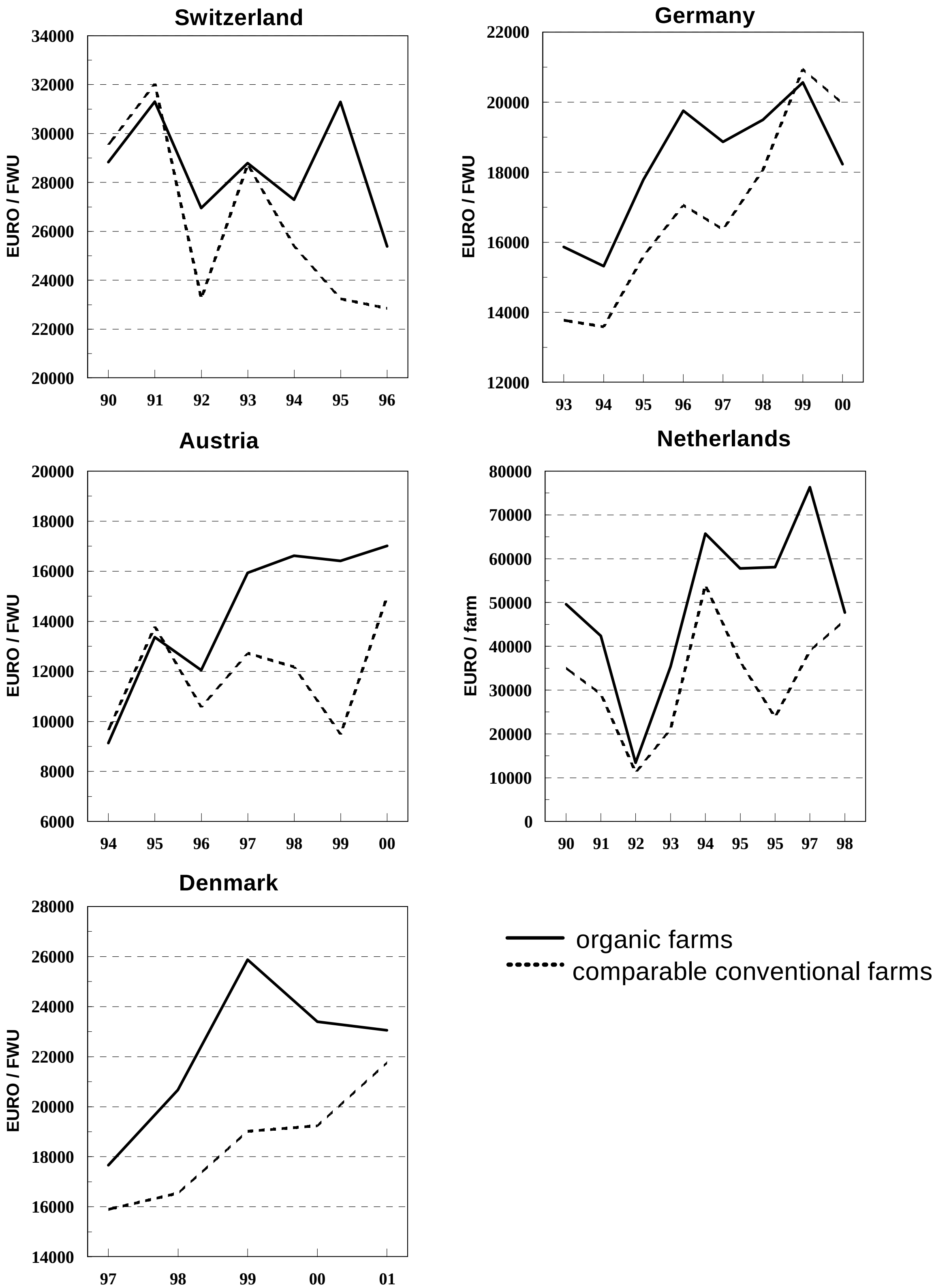


AT = Austria, CH = Switzerland, DE = Germany, DK = Denmark, FI = Finland, GB = Great Britain
IT = Italy, NL = Netherlands, NO = Norway, SE = Sweden

For countries where more than one observation exists, the dots are ordered by year. The further right the dot, the more recent the observation.

Source: OFFERMANN and NIEBERG (2001), supplemented by new data from BMLF, BMELF, DIAFE and FOWLER et al.

Figure 3. Development of profits of organic and comparable conventional farms



Source: Own calculations based on BMELF, BMVEL, FAT, and the Agricultural Economics Research Institute (LEI).

Table 3. Comparing successful and less successful organic farms in Germany 1998/99

Indicator	Unit	Upper quartile	Lower quartile
Yield index[a]	Points/hectare	3 633	3 545
Agricultural area	Hectare	83	40
Dairy cows	Number	33	19
Cereal yield	Tonne/hectare	3.8	3.6
Potato yield	Tonne/hectare	17.8	15.1
Dairy yield	kg/cow	5 107	3 993
Concentrates for cattle[b]	EUR/cattle unit	52	103
Expenses for veterinary services[b]	EUR/livestock unit	27	37

[a] Index describing yield potential for prevailing soils and climate. [b] Numbers refer to dairy farms only.
Source: Based on Nieberg (2001b).

This assessment is confirmed by an analysis of successful and less successful organic farms in Germany. Ordering farms by profit per family work unit and comparing farms of the upper and lower quartile respectively (Table 3) reveals that:

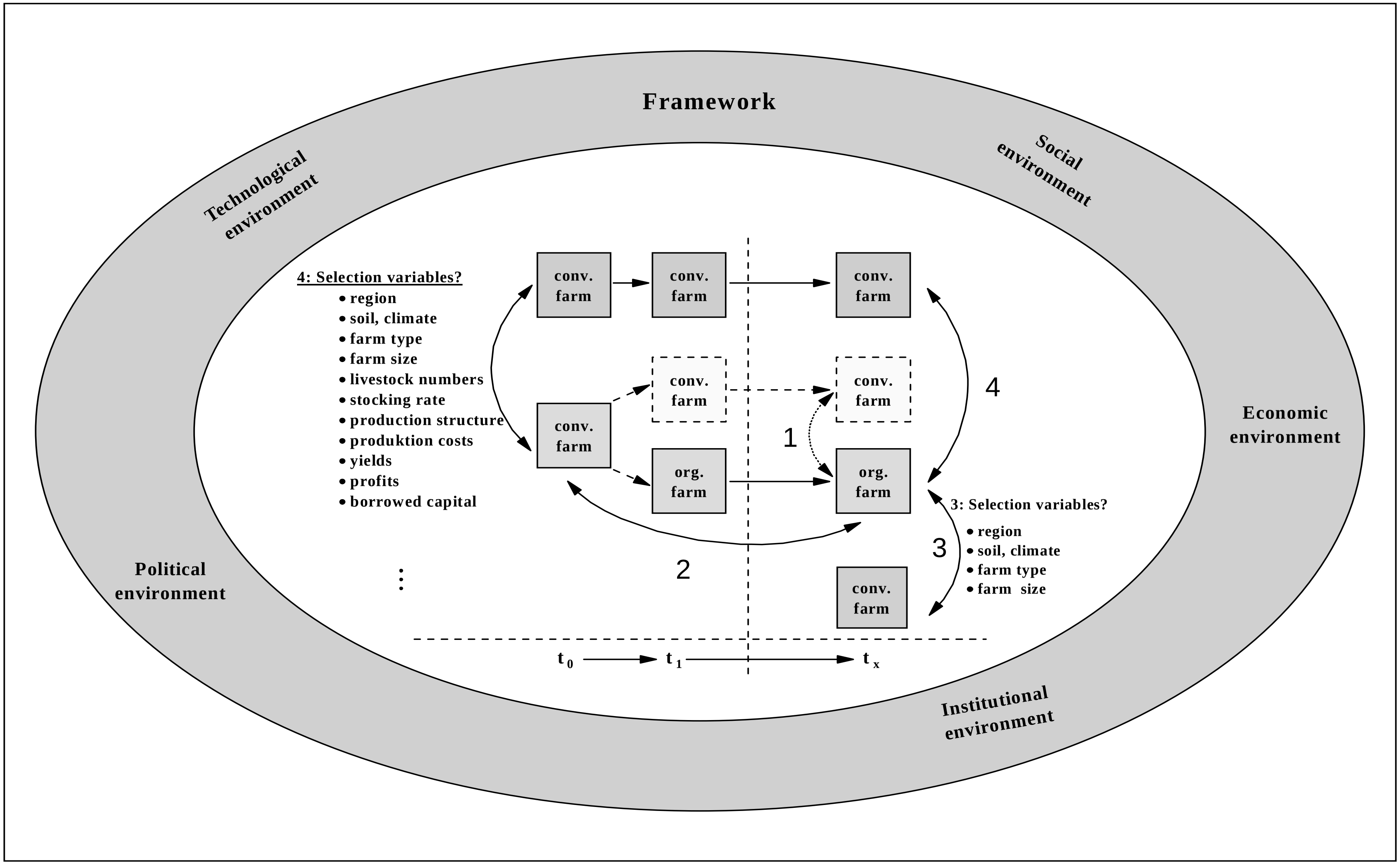
- soil and climate do not seem to have a significant influence on economic results — the yield index (describing the potential of prevailing soils and climate) is only marginally higher on successful farms;
- successful organic farms are larger; area and number of milk cows are significantly higher than on less successful farms;
- successful farmers seem to be better production engineers; they realise higher yields both in arable farming and in dairy farming;
- successful organic dairy farmers realise higher yields with only half the amount of concentrates and fewer expenses for veterinary services and medication.

These results show that in the organic segment, too, successful farms produce at lower costs than less successful colleagues.

Conclusions

Looking back, organic farming has proven to be a financially attractive alternative to conventional farming for many of the farms which converted. However, the large variation of results calls for further detailed analyses of factors determining an individual farm's success or failure of conversion. Whether the relative profitability of organic farming will on average look as positive in the years to come will mainly depend on the development of prices for organic and conventional products, the future design of agricultural support and the regulatory framework, and the technological progress in organic production systems.

Annex 1. Selection of a conventional reference system



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FARM-LEVEL IMPACTS OF ORGANIC PRODUCTION SYSTEMS

James Hanson[1]

Abstract

This paper examines the farm-level impacts of organic agricultural production as measured in profit and risk management, when compared with the conventional alternative. Specifically, farmer perceptions regarding profit, the importance of studying farming systems rather than single crops, and the effect of labour requirements are explored. Off-farm and on-farm sources of risk are identified for the organic producer.

Profit[2]

Farmer perceptions matter

Many farmers speak of the economic advantages of organic production, while many conventional farmers maintain that their system of production is more productive. How all farmers value their family labour and how an organic farmer views the costs associated with the biological transition may partially explain these differences of opinion.

The Rodale Institute Farming System Trial (FST) began in 1981 and was designed to study the conversion from a conventionally managed to an organic farming system. The study has three multi-year rotations: conventional cash grain; low-input cash grain (organic); and low-input cash grain (organic) with livestock; each rotation had three different entry points (nine treatments); each treatment was replicated 8 times. The conventional grain system rotation (five-year rotation) was corn, corn, soybeans, corn, soybeans that followed published Penn State University crop recommendations. The organic rotation changed two times, approximately every five years. The final rotation (three-year rotation) was hairy vetch/corn, rye/soybeans, and wheat. Our economic analyses only compared the conventional versus the organic cash grain systems.

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2. This section is based on an economic evaluation of the Rodale Farming System Trial as presented in Hanson, James C., Erik Lichtenberg and Steven E. Peters, "Organic versus conventional grain production in the mid-Atlantic: an economic and farming system overview", *American Journal of Alternative Agriculture*, Vol. 12, 1 November 1997, pp. 2-9.

In the period 1991-95, the per-acre returns (returns to transition cost, unpaid family labour, and management) were higher for the organic rotation. When the cost of the biological transition were subtracted, the returns to unpaid family labour and management for the two systems were similar. Finally, when the cost of unpaid family labour was subtracted then the returns to management were higher for the conventional system. Because of their variability, this analysis did not include the use of organic premiums. Their inclusion would have significantly increased the rate of returns to the organic production system.

This analysis illustrates how perceptions by both organic and conventional farmers can be true. Between 1991 and 1995, the organic rotation averaged USD 6.30 more per acre than the conventional rotation (without organic premiums). However, when we subtracted the "investment costs" from the organic returns due to the biological transition,[3] the difference in returns per acre was only fifteen cents. When we put a value on family labour, then the conventional rotation's returns exceeded the organic by USD 4.35 per acre. If the organic farmer views family labour as part of his/her chosen lifestyle; if s/he views the transitional costs as acceptable expenses associated with his/her learning curve; then s/he does make more per acre. If the conventional farmer views these costs differently, then s/he does better. Presenting these different expressions of profit is an important component of any analysis.

Evaluate farming systems not crops

In the Rodale Farming System Trial, yields for specific crops between the organic and conventional systems were similar after the biological transition was completed. Consequently, the organic profits per acre for a particular crop were higher because of lower purchased input costs. The principal cost of the organic farming system, however, was that the principal cash crops could not be grown as often because of the need for "low value" soil investing crops.

With farming systems, such as those associated with organic production, it is more useful to study the profitability of combinations of various crop(s) over a multi-year period rather than an individual crop's profitability. For example, during the period 1991-95 in the FST, the organic corn returns per acre averaged 39% higher than the returns to conventional corn (subtracting only explicit cash costs). Yet on our 750-acre study farm, the organic farmer could only raise 250 acres of corn per year while the conventional farmer averaged 450 acres. A key component of the organic rotation was the use of a hairy vetch winter cover crop before corn. To get the vetch properly established so as to produce the maximum amount of nitrogen, it must be planted in very early fall. The only cash crop that could precede it would be a small grain, which in this case was wheat. Single-crop wheat is rarely grown in the Mid-Atlantic because of its relatively low economic returns; double-cropping wheat with soybeans is the nearly universal choice. Consequently, to get the high organic corn returns, the organic farmer is forced to devote one-third of the rotation to an unprofitable single-crop wheat. The cost of producing organic crops is not in the actual production, but in what a farmer must give up in the "off years".

3. The "biological transition period" describes a period when the soil capital is being built up (early years associated with organic production). The relative losses sustained by the organic rotation, in comparison to the conventional rotation during this period, were treated as an investment (similar to an orchard) that were paid back in future years.

Labour estimates are critical

In the Rodale Farming System Trial, family labour requirements were higher and more evenly spread through the growing season for the organic rotation (42% higher than the conventional rotation during 1991-95). This labour difference has significant implications regarding adoption of organic farming systems by different groups (part-time versus full-time and small acreage farms versus large farms).

Farming systems can have considerably different labour requirements, particularly in the Rodale study where organic and conventional grain rotations were compared. As mentioned, the family labour requirements for the organic rotation were 42% higher than for the conventional rotation. However, they were more evenly spread over the growing season, so that the hired labour requirements of the organic rotation were only 3% higher. These higher family labour requirements are not necessarily bad if a family feels that they are paying themselves to supply nutrients and control weeds instead of an agribusiness company. On the other hand, the schoolteacher, who wants to farm intensively only in the summer, may not be able to adopt organic production. A major factor affecting a farmer's decision to adopt an organic rotation is their availability of labour.

Risk management[4]

There are weather and climatic risks but these are the same for organic producers as for non-conventional farmers, and for farmers without irrigation, there is always the risk of drought. However, some organic farmers thought that they could withstand droughts better because of their investment in soil quality which allows their soils to hold water better than their conventional counterparts.

While diseases, insects and, most importantly, weeds cause problems for organic farmers, most felt that they had developed cultural practices to manage these pests. One farmer said that he has learned how to handle the problems on his farm, it was the off-farm problems that concerned him. However, with an unexpected infestation of pests, these organic farmers were decidedly at risk because they did not have any quick-fix solutions to the problems (*i.e*. use of pesticides). On the other hand, since pests are developing resistance to their chemical controls and with the difficulty of agricultural research keeping up with the development of new products, organic farmers were at less risk to this resistance because of their use of cultural (non-chemical) controls.

Of major concern to organic farmers is the drift of pesticides and pollen from genetically modified organisms (GMOs). Drift from chemicals and GMOs is a major risk factor for organic farmers. Drift could cause farmers to lose certification and markets, both domestically and internationally. Buffer zones may help against pesticide drift but there is a real concern that buffer zones may prove ineffective against GMO pollen. GMO contamination is an insidious problem — it can come from anywhere. For example, a tornado in South Carolina led to the contamination of canola with GMO pollen. A loss of certification, due to GMO contamination, might require organic producers to move their operation, which is an expensive proposition. They would have to undergo the three-year transition period again and have to undertake the long process of rebuilding the necessary level of soil quality required for organic production.

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4. This section was based on focus group interviews with organic farmers in South Carolina, New York, Wisconsin, Texas, California and North Dakota, United States of America, with Cathy Greene, Robert Dismukes, William Chambers and Amy Kremen of the United States' Department of Agriculture (USDA) Economic Research Service.

Organic agriculture is increasing at rapid rates, which is causing growing pains in the industry. Increasingly, price premiums are less stable and, in some cases, dropping. Niche markets can disappear quickly after having taken a long time to establish. Also, many larger food companies have moved into organic production, leading to increased supply. These big producers have all the leverage in the market. Local organic farmers are more subject to dumping of excess production by larger producers out of their region into their local markets. Similar to conventional agriculture, the small family producer is more at risk.

The National Organic Standards in the United States have helped to reduce the confusion regarding "what is organic" and also levelled the playing field by setting a national standard. However, many farmers have been discouraged by the amount of paperwork and administration costs associated with achieving organic certification from the USDA. Also, these standards require that organic farmers utilise seeds that have been produced organically. While a grace period has been instituted to permit the use of conventionally produced seed until a suitable supply of organic is available, many organic farmers are concerned about the supply of these seeds including their price, quality, and availability in desired varieties.

Concluding remarks

The organic industry is growing rapidly. With that expansion have come some growing pains. Larger commercial farms have entered into organic production, dramatically increasing the supply of some agricultural products, and significantly reducing the organic price premiums. The National Organic Standards are somewhat frustrating to the smaller growers and some of these farmers wonder if the cost of being certified is worth the "organic label" from the USDA. That said, organic farmers are not going to abandon their practices. They have chosen organic agriculture for other reasons than just profit. In addition, many family-sized farms in conventional agriculture are exploring organic production. They recognise that their farms are not big enough to compete in the conventional markets. Organic agriculture offers them the opportunity to add value to their agricultural products and, in doing that, protect their financial bottom-line and quality of life.

ECONOMIC PERSPECTIVES OF KOREAN ORGANIC AGRICULTURE

Chang-Gil Kim[1]

Abstract

Organic farming has had a tentative start as an alternative production system but now is more widely accepted in Korea. Many farmers express an interest in organic agriculture. However, farmers are reluctant to adopt organic farming practices because of many obstacles. They perceive that there are high risks involved, although they earn similar expected income to their conventional counterparts. The price premium of organic products is an important factor to induce farmers to participate in organic agriculture. The results of the accounts survey reviewed in this paper indicate that factors of production receive a lower remuneration in organic agriculture than in conventional farming. Substantial price premiums on outputs are essential for the economic viability of organic farming. Consumers' lack of willingness to pay significant price premiums on rice and vegetables seems to be the most important obstacle to the expansion of organic farming. Finally, in order to soundly promote organic agriculture, additional public and private research is needed on many aspects of organic production and marketing in Korea. What would the economic impacts and social benefits be under widespread adoption of organic farming? Additional research is also needed on how to improve organic farming systems from agronomic and ecological perspectives, as well as from an economic perspective. The extent of the national research agenda on organic agriculture, along with programme and policy initiatives, will help shape the role that organic farming systems play in Korean agriculture in the decades ahead.

Introduction

Increasing demand for food production in Korea has resulted in the application of more chemical fertilisers and the introduction of mechanisation in agricultural management in the last few decades. It has been reported that, in some areas, intensive agricultural practices have caused environmental problems such as excess residual nitrogen in cultivated farmland. These problems should be taken into account in order to practice better management of agricultural-environmental conditions.

It is well known that the use of organic materials such as crop residues, green manure and livestock waste in soil-crop systems may improve soil structure and support the development of soil micro-organisms. This condition leads to a process of biological transformation of nitrogen in soil and results in the conversion of an organic form of nitrogen into an inorganic form available for crops.

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Practising organic farming, therefore, should be promoted in order to produce safe foods and a clean environment.

Organic agriculture in Korea, generally defined as farming without the use of synthetically produced agro-chemicals, is still in its infancy, but is showing signs of rapid growth in recent years.[2] Organic farming has attracted increasing attention because it is perceived to solve the problems that modern agricultural systems face. The organic farming is considered as the potential agricultural technological system which provides benefits in terms of environmental protection, conservation of non-renewable resources, improved food quality and the reorientation of agriculture towards areas of future social demand.

The Korean government has recognised and responded to these potential benefits by encouraging farmers to adopt organic farming technologies, either directly through financial incentives or indirectly through support for research and marketing initiatives. The Sustainable Agriculture Promotion Act, established in December 1997, has played a major role in the growth of organic farming in Korea by creating an organic labelling system. More recently, an environmentally friendly direct payment and preferential government policy loans have been provided to organic and semi-organic farmers as economic incentives. As a consequence, the number of farms adopting organic farming practices has been increasing since the mid-1990s.

Based on empirical findings, this paper investigates the economic perspectives of organic agriculture in Korea. The following aspects of economic performance have been analysed and compared: physical productivity; price premium; variable costs; and overall financial performance.

An overview of Korean organic agriculture

Historical development of organic agriculture

During the past three decades, agricultural policies in Korea were focused on intensive farming using chemicals, and farmers became apathetic to environmental and natural ecosystem destruction and were generally uninterested in organic farming. The organic agriculture movement in Korea arose from a group of pioneering farmers who raised the problems of excessive use of chemical inputs in the 1970s. A few organic farming clubs began to emerge in that period, including Jeongnong Hoe ("Right Agriculture Association") in 1976 and the embryonic form of the Korea Organic Farming Association (KOFA: www.organic.co.kr) in 1978. During the 1970s, organic agricultural production received little attention from the Korean government, with no incentives being created for growers to convert to organic agriculture.

In the 1980s, however, public concerns about food safety and environmental degradation in rural areas had increased the number of organic farmers to as many as 1 400 farm households. The pioneers of Korean organic farming followed the ideal of agricultural fundamentalism. Therefore, their motives were more philosophical or ethical, rather than economical. Their characteristics and activities can be evaluated as naturalistic agricultural fundamentalism and social movement towards their ideals of organic farming.

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2. In this paper, the term "organic agriculture" (or farming) is a production system which avoids or largely excludes the use of synthetically compounded fertilisers, pesticides, growth regulators, and livestock feed additives, and uses only natural materials such as organic matter, microbes and natural minerals. The term "conventional farming" will be used here to refer to a production system that employs a full range of agricultural chemicals.

Starting in the early part of 1990, the National Agricultural Co-operative Federation introduced organic farming in its training programme implemented for members called the “Farming Technology Support Team”, and organic farming management support training has been carried out every year since then at approximately 200 co-operatives. The Ministry of Agriculture and Forestry expressed deep interest in this field and established a training programme and effective support measures for farmers, such as the operation of an Organic Farming Development Planning Team, established in July 1991.

After a series of examinations lasting for approximately one year, the second committee meeting was held in August 1992 and clarified the definition of organic farming and established the standards of positive organic farming. The first national surveys were administered to organic farmers in 1991, and a quality certification programme for the organic products was introduced in December 1993. In 1994, the state created a section responsible for sustainable agriculture in the Ministry of Agriculture and Forestry, and in 1997 the Korean National Assembly passed the “Environmentally friendly Agriculture Promotion Act” (EAPA). In late 1998, the Enforcement Ordinance and Regulation of the EAPA was enacted to set an institutional basis for fostering organic agriculture in Korea.

Policies for promoting organic agriculture

In the early stage of the development of organic agriculture, government support is essential to guide farmers to participate in organic farming. Accordingly, national plans for developing organic agriculture should be initiated by the government. It is the Korean government’s position that organic agriculture can guarantee food safety and environmental preservation, but cannot guarantee food self-sufficiency, due to the decrease in land productivity. Because of this reason, a moderate type of sustainable agriculture, *i.e.* low-input sustainable agriculture, is considered to be a main policy goal. This means that organic agriculture is considered as subsidiary target, even though it guarantees food safety and protects environmental degradation in the agricultural sector.

A major activity of government is formulating a database for NGOs and organic farmers. The major activities of NGOs are training organic farmer members and marketing their products. Therefore, a unified well-organised co-operative system is urgently needed. In this situation, farmer and consumer groups established a joint organisation, that is, the Federation of Korean Sustainable Agricultural Organisations (FKSAO) in 1996. A major role of this organisation is to network all the activities of member organisations. Despite this network system, a unified standard of organic agricultural technology does not exist because each NGO has its own technological system. As a consequence, the activities of FKSAO are very limited.

Both government and NGOs have actively promoted organic agriculture. Besides central government, which had adopted several policy measures, such as incentive and certification schemes, about 140 rural counties actively participated in organic farming promotion programmes. Some counties have independently developed organic policy programmes, including sales promotion of organic produce, operation of compost-making factories, and the establishment of re-cycling systems for organic materials.

MAF established both supporting and regulatory systems to encourage farmers to participate and to promote organic agriculture. In connection with marketing organic products, there is a need for certification which could give guarantees to consumers. Subsequently, an institutional labelling system was established for organic and other sustainable agricultural products, together with public control for production and marketing. Only certified farms are permitted to label their products. Product control is made in the form of on-farm and product checks by the inspection agencies in public and private organisations.

According to the government quality standard regulation for environmentally friendly agricultural products, there are four types of agricultural products, *i.e.* low-pesticide products with a low level of chemical pesticides used (less than 50% of the quantity used in conventional farming); no-pesticide products, with no pesticides used; transitional organic products under a conversion period of less than three years; and organic products. For efficient and reliable implementation, a government organisation, the National Agricultural Products Quality Management Service (NAQS), is designated as a government certification body for sustainable agricultural products.[3]

Current status of the organic farming sector

Based on the inputs used in crop production, environmentally friendly farming practices are classified as three groups: 1) organic producers, with no synthetic pesticides or fertilisers applied, and appropriate waste and soil management; 2) no-pesticide producers, not using pesticides, and with appropriate water and soil management; and 3) low-pesticide producers, using low quantities of synthetic pesticides, and with appropriate water and soil management.

According to the 2000 Agricultural Census, the number of farm households practising environmentally friendly agriculture was 72 867, accounting for 5.3% of the total number of farm households (1 383 468) (Table 1). The number of organic producers was 3 327, or 4.5% of farm households practising environmentally friendly agriculture, and 0.2% of total farm households.

Table 1. Structure of environmentally friendly farming practices (2000)

(number of farm households)

	Paddy Rice	Fruit	Vegetables	Oil and Cash Crops	Others	Total
Organic	1 057	526	1 275	254	215	3 327
No-pesticide	3 115	408	2 744	671	750	7 688
Low-pesticide	37 322	6 952	14 757	1 068	1 753	61 852
Total	41 494	7 886	18 776	1 993	2 718	72 867

Source: Korean National Statistical Office, *Agricultural Census 2000* (2002).

The number of farms certified under the organic system has been increasing very rapidly since the late-1990s. In 2000, there were 669 certified organic farms, using 667 hectares, or approximately 0.1% of total farmland (Table 2). It is estimated that only about 20% of farm households practising organic production participate in the organic certified system. This implies that many farmers practising organic farming practices chose to remain uncertified.

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3. NAQS is a subsidiary organisation of the MAF, specialising in quality management for agricultural products including safety inspection and quality certification. The role of NAQS is to establish order in quality control and in the fair trade of farm products including standardisation of agricultural products, management for labelling of origin and GMO inspection and storage control of government grains.

Table 2. Change in certified organic agricultural production

	1999	2000	2001
Organic farming households	601	669	899
Acreage of organic crops (hectare)	528	667	962
Quantity of organic production (tonne, A)	16 805	19 257	31 105
Quantity of total agro-production(1 000 tonne, B)	18 944	19 311	19 696
Percentage (A/B)	0.1	0.1	0.2

Source: MAF (2002).

Recently, new types of sustainable farming practices have been widely developed by farmers, including the use of ducks or freshwater snails for pest control in rice production, and cleaner practices for hydroponic vegetable production.

As in other countries, the marketing of organic products is essential to the development organic agriculture in Korea, especially in the early phase of development. During the initial stage, a direct marketing system, in which both producer and consumer organisations were principal market agents, played an important role in creating a connection between organic products and producers and consumers. Currently, there are two different marketing channels: i) the direct marketing channel between producers and consumers organisations; and ii) the indirect marketing channel between producers and consumers through the wholesale and/or retail marketing centres.

With regard to international trade of organic products, there are no institutional barriers in Korea. Nevertheless, very few organic agricultural products and foods are exported because the quantity of product is insufficient. In terms of imports, some Korean food companies import processed food such as orange juice for producing organic baby foods. Sales of organic baby food have grown considerably in recent years since consumers believe that it may reduce health risks from exposure to pesticide residues, and are willing to pay a premium for what they perceive as better taste and nutrition.

The economic perspectives of Korean organic agriculture

Productivity of organic farming systems

Information about the productivity of organic farming systems comes from several sources, such as research plots and case studies using actual surveys of organic farms. The first limited attempt to make a productivity analysis of organic farming in Korea was in 1990-1991 (Suh *et al*., 1991). To date, the most comprehensive comparison of organic and conventional crop production in Korea has been undertaken by Yoon *et al.* (1999). Information from 158 organic and conventional farms was sourced from the dataset created by the Rural Development Administration (2000).

As shown in Table 3, organic crop yields are about 10% to 35% below the conventional average. Yield differences are most noticeable for agro-chemicals (fertiliser and pesticide) intensive crops such as rice, lettuce and Chinese cabbage. The lower yields are primarily due to the reduced use of yield-promoting inputs. Through the conscious avoidance of synthetic fertilisers and plant-protection chemicals, it is often not possible for the genetic potential of the crop to be fully exploited.

Table 3. Yields for organic and conventional crops (1999)

Crop	Conventional (tonne/hectare)	Organic (tonne/hectare)	Relative (conv. = 100)
Rice	5.18	3.39	65.5
Lettuce	33.0	24.4	73.9
Chinese cabbage	79.4	60.2	75.8
Pepper	2.59	2.33	90.0

Source: Yoon, *et al.* (1999).

Financial performance of organic farming

Korean farmers, in general, are not very market-oriented, and the importance of marketing to organic farmers has recently been recognised. Premium prices have an important influence on the financial performance of organic farming. The marketing of organic products is conducted via a number of different channels. Alongside private traders and producer co-operatives, direct marketing to consumers plays an important role. Direct marketing in various forms (farm-gate sales, weekly markets, local distribution rounds, etc.) is practised by many organic farms. Korean organic farms have preferred direct selling and/or specialised organic outlets (such as wholesale food markets) to selling through supermarkets, but the situation is changing.

As in other countries, strong market demand for organic products has led to high premium prices for organic products (Tables 4-7). Certified organic products can achieve prices significantly above the price level for conventional products. The price premiums available for crops such as rice, lettuce, Chinese cabbage and pepper are 42.4%, 75.6%, 36.9% and 13.9%, respectively. Oh *et al.'s* 2001 survey of major urban areas suggested that 30% of consumers would purchase organic vegetables if the price premium were no more than 30%, although this rose to 60% for occasional purchasers. However, there appears to be significant resistance to premiums above 30%-40% at the retail level.

A sharp reduction in input use is characteristic of organic farms. Expenditures on these items are consequently also lower. In crop production, the expenditure on fertilisers and sprays is significantly lower. Depending on the enterprise, savings in variable costs of between 30% and 50% are possible. In interpreting these figures, it needs to be remembered that the parameters only include directly applicable fertiliser and plant-protection costs. In addition, the reduction in herbicide use is often accompanied by increased labour and hence higher labour costs.

The findings reported in Tables 4-7 indicate that the organic sample uses about twice as much labour per hectare as its conventional counterparts. Some of the difference is explained by the considerably larger share of labour-intensive crops — such as lettuce, Chinese cabbage, and pepper — in organic farming.

It was investigated to what extent cost savings due to the non-use of chemical fertiliser and pesticides compensate for lower yields and higher labour requirements in organic farming. On average, cost savings on fertiliser and chemicals cover about 40% of the losses or extra cost incurred by lower yields and higher labour requirements. Thus, considerable price premiums on organically produced farm products are needed to obtain a remuneration of labour and capital at about the same level as in conventional agriculture.

In most cases, farmers select which farming system to use, whether conventional or organic, by considering profitability in the short run. Until recently, conventional farming systems have usually appeared to be more profitable in the short term than organic farming systems. This comes as no surprise, given that agricultural research and policy over the last three decades have promoted conventional agriculture. Even so, the long-term profitability of conventional farming seems questionable if the environmental and health costs are taken into account. Indirect costs, such as off-site damage from soil erosion, pollution of surface water and groundwater, and hazards to human and animal health from conventional farming practices, are at present borne by society. If these external costs were factored into the costs of farm production, the overall profitability and benefits to society of organic farming systems would probably be much higher.

As mentioned earlier, the yields in organic farming are generally lower than in conventional agriculture. These lower yields may, in part, be offset by higher prices and lower variable costs. These three factors influence the level of the gross margin. Depending on the crops, the net revenue results for the two management systems differ correspondingly. As shown in Table 4, the production cost of organic rice farming is KRW 3 898 000/ha higher on the conventional farm and the higher price premium does not offset the difference. Organic rice farming has quite a low-level of net income — KRW 1 254 000/ha — compared to KRW 5 995 000/ha for the conventional.

In reality, comparisons of profitability between organic and conventional systems have limited applicability because of several intrinsic problems. Differences in management costs between organic and conventional production are difficult to assess and are not included in this paper.

Prospects for organic farming

At least for the time being, Korean agriculture, with its limited agricultural resources, cannot completely abandon conventional and intensive farming based on the use of agricultural chemicals. This does not, however, imply that the basic concepts of organic farming cannot be generally accepted, and an attempt made to combine organic farming and conventional farming in practical way. Perhaps the term “organic farming” in its rigid sense can be replaced with a more practical term. Regardless of the terminology, what Korean agriculture must aspire to in the coming years is farming systems which are attractive to farmers economically, while satisfying consumer demands for food safety and environmental quality. Organic farming would be a feasible and a desirable approach to this goal.

Organic farming has had a tentative start as an alternative production system but now is more widely accepted. A change to organic agriculture may have number of benefits. In order to be a member of a global agricultural society, the direction of organic agriculture has to harmonise with the international standards for organic foods. Therefore, the government certification system was changed to the international standards (*i.e.* CODEX) in July 2001. It is a more stringent regulation than previously. Hence, this will influence Korean organic farming in the future. Many expect that organic livestock products will be imported, largely due to limited organic feed production in Korea.

Table 4. Economic performance of organic rice farming

	Organic[1] (A)	Conventional[2] (B)	A/B (%)
	KRW 1 000/hectare		
Gross Receipt (A)	8 434	9 041	93.3
Yield (tonne/hectare)	3.39	5.18	65.5
Unit Price (KRW 1 000/tonne)	2 485	1 745	142.4
Production Cost (B)	7 180	3 282	218.8
– Material Cost (C)	2 393	1 214	197.1
·Seed and Seedlings (KRW 1 000/dectare)	179	80	223.8
·Inorganic Fertiliser	-	119	-
·Organic Fertiliser	894	50	1 788.0
·Agro-chemicals	76	197	38.6
·Fuel and Materials	76[3]	76	-
·Depreciation	1 168	692	168.8
– Management Cost (D)	4 164	2 280	182.6
·Hired Labour	306	148	206.8
·Hired Land Service	661	918	72.0
·Hired Capital Service	804	-	-
– Self-Service Labour	1 275	1 002	127.2
– Self-Service Land	1 258	-	-
– Self-Service Capital Cost	483	-	-
Value Added (A-C)	6 041	8 065	74.9
Revenue (A-D)	4 270	6 997	61.0
Net Revenue (A-B)	1 254	5 995	20.9

Notes:
1. Information on organic rice production was drawn from Yoon, *et al*. (1999).
2. Information on conventional rice production was drawn from RDA (2000).
3. Agro-chemicals in the organic production represent the cost of biological pesticide.

Table 5. Economic performance of organic lettuce farming

	Organic[1] (A)	Conventional[2] (B)	A/B (%)
	KRW 1 000/hectare		
Gross Receipt (A)	36 075	27 737	130.1
Yield (tonne/hectare)	24.4	33.0	73.9
Unit Price (KRW 1 000/tonne)	1 475	840	175.6
Production Cost (B)	43 472	25 834	168.3
– Material Cost (C)	12 085	10 076	119.9
·Seed and Seedlings (KRW 1 000/dectare)	253	213	118.8
·Inorganic Fertiliser	-	316	-
·Organic Fertiliser	3 573	1 018	351.0
·Agro-chemicals	57	147	38.8
·Fuel and Materials	4 527[3]	4 527	-
·Depreciation	3 675	3,928	93.6
– Management Cost (D)	22 248	13 645	163.0
·Hired Labour	2 532	3 390	206.8
·Hired Land Service	522	188	74.7
·Hired Capital Service	7 109	-	-
– Self-Service Labour	13 580	12 189	111.4
– Self-Service Land	4 688	-	-
– Self-Service Capital Cost	2 956	-	-
Value Added (A-C)	23 989	17 670	135.7
Revenue (A-D)	13 827	14 092	148.6
Net Revenue (A-B)	-7 397	1 903	-

Notes:
1. Information on organic rice production was drawn from Yoon, *et al.* (1999).
2. Information on conventional rice production was drawn from RDA (2000).
3. Agro-chemicals in the organic production represent the cost of biological pesticide.

Table 6. Economic performance of organic Chinese cabbage farming

	Organic[1] (A)	Conventional[2] (B)	A/B (%)
	KRW 1 000/hectare		
Gross Receipt (A)	12 907	12 464	103.6
Yield (tonne/hectare)	60.2	79.4	75.8
Unit Price (KRW 1 000/tonne)	215	157	136.9
Production Cost (B)	7 878	7 528	104.6
– Material Cost (C)	1 852	2 287	81.0
·Seed and Seedlings (KRW 1 000/dectare)	152	337	45.1
·Inorganic Fertiliser	-	311	-
·Organic Fertiliser	696	479	145.3
·Agro-chemicals	78	199	39.2
·Fuel and Materials	361[3]	361	-
·Depreciation	565	600	94.2
– Management Cost (D)	4 486	3 431	129.6
·Hired Labour	1 389	915	151.8
·Hired Land Service	495	229	216.2
·Hired Capital Service	750	-	-
– Self-Service Labour	1 689	4 097	41.2
– Self-Service Land	1 259	-	-
– Self-Service Capital Cost	444	-	-
Value Added (A-C)	11 055	10 177	108.6
Revenue (A-D)	8 421	9 033	93.2
Net Revenue (A-B)	5 029	4 936	101.9

Notes:
1. Information on organic rice production was drawn from Yoon, *et al*. (1999).
2. Information on conventional rice production was drawn from RDA (2000).
3. Agro-chemicals in the organic production represent the cost of biological pesticide.

Table 7. Economic performance of organic pepper farming

	Organic[1] (A)	Conventional[2] (B)	A/B (%)
	KRW 1 000 / hectare		
Gross Receipt (A)	13 020	12 725	102.3
Yield (tonne/hectare)	2.33	2.59	90.0
Unit Price (KRW 1 000/t)	5 595	4 913	113.9
Production Cost (B)	21 325	9 703	219.8
– Material Cost (C)	4 305	2 357	182.6
·Seed and Seedlings (KRW 1 000 / dectare)	638	437	146.0
·Inorganic Fertiliser	-	383	-
·Organic Fertiliser	2 374	204	1 163.7
·Agro-chemicals	186	328	56.7
·Fuel and Materials	616[3]	616	-
·Depreciation	491	384	93.6
– Management Cost (D)	8 009	3 565	127.8
·Hired Labour	1 824	739	246.8
·Hired Land Service	591	435	135.8
·Hired Capital Service	1 289	-	-
– Self-Service Labour	5 125	6 138	83.4
– Self-Service Land	6 823	-	-
– Self-Service Capital Cost	1 368	-	-
Value Added (A-C)	8 715	10 503	82.9
Revenue (A-D)	5 011	9 295	53.9
Net Revenue (A-B)	-8 305	3 022	-

Notes:
1. Information on organic rice production was drawn from Yoon, *et al*. (1999).
2. Information on conventional rice production was drawn from RDA (2000).
3. Agro-chemicals in the organic production represent the cost of biological pesticide.

Many farmers express an interest in organic agriculture, but are reluctant to adopt organic farming practices because of various obstacles. They perceive that there are high risks involved, although they earn similar expected income to their conventional counterparts. However, in the long run, it may be considered as the most desirable approach, provided that the necessary technical and economical improvement can be made. The price premium of organic products is an important factor in inducing farmers to participate in organic agriculture. Premium prices can be achieved by means of selling to a specialist market outlet, or selling products directly to the consumer.

Although existing organic farmers have considerable experience, mainly based on practices and research from other countries, new technologies could enhance the environmental sustainability and financial viability of organic methods. Many techniques need further testing and adaptation for the range of Korean conditions.

The perceived risk involved in converting from conventional to organic farming is a major constraint at present. More information, as well as a change in the way of thinking, is needed. Organic farming requires a greater awareness and understanding of biological and ecological processes and interactions, and a longer-term approach to making the system work without depending on chemical remedies. Although a farm may attain organic certification within three years, it may take longer for the soil's biological processes to fully develop. There are risks of lower yields, especially during the 3-year required conversion period, before crops can be certified as organic. However, some established organic farmers have indicated in submissions that they achieve satisfactory production and consider these constraints are more perceived than real. Management ability is likely to have the greatest effect on yields during transition.

Concluding remarks

Farmers have shown rapidly increasing interest in organic farming. Many farmers who adopted organic farming methods were motivated by reasons relating to the health and safety of their families, consumers, and livestock, and by idealistic convictions about soil and land stewardship. The relative economic performance of organic farming and conventional farming is sensitive to the ratio of input costs to the value of outputs. Both organic and conventional farmers are vulnerable to fluctuations in input and output prices, but the effect of a given change will differ between the two farming systems.

Certified organic cropland in Korea more than doubled between 1997 and 2001, but is still modest because of the low starting base. Only 0.2% of total cropland was managed under a certified organic farming system in 2001, although about 5% of some of the major specialty vegetables, such as lettuce, was under organic management.

Strong market signals for organically produced agricultural goods, along with public and private support for organic farming systems, make it likely that organic production will remain a fast-growing segment of Korean agriculture. Currently, government's efforts to facilitate organic agriculture have focused primarily on developing national certification standards, but MAF has recently begun several programmes on organic technology as well as in the production and marketing areas.

Since the technologies relating to organic agriculture involve high risks in productivity, it is not easy for farmers to adopt organic farming practices. Therefore, a comprehensive long-term approach is required. In order to encourage organic agriculture, Korea should change the present agricultural support system to a system favourable to organic farming. This means that the mechanism of technology development and extension, market promotion and the farm income support system should be changed.

The results of the accounts survey reviewed in this paper indicate that factors of production receive lower remuneration in organic agriculture than conventional counterpart. Substantial price premiums on outputs are essential for the economic viability of organic farming. Until now, price premiums have been available only on rice and vegetables. Consumers' lack of willingness to pay significant price premiums on rice and vegetables seems to be the most important obstacle to the expansion of organic farming.

Finally, in order to continuously and soundly promote organic agriculture, additional public and private research is needed on many aspects of organic production and marketing in Korea. What are the primary incentives that motivate farmers to switch from conventional to organic farming systems? What would the economic impacts and social benefits be under widespread adoption of organic farming system? Additional research is also needed on how to improve organic farming systems from agronomic and ecological perspectives, as well as from an economic perspective. The extent of the national research agenda on organic agriculture, along with programme and policy initiatives, will help shape the role that organic farming systems play in Korean agriculture in the decades ahead.

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A SOCIAL AGENDA FOR ORGANIC AGRICULTURE

Thomas Cierpka and Bernward Geier[1]

Abstract

The paper describes how the organic movement with its holistic approach is already engaged in "social agenda" activities. It highlights the co-ordinating and supporting activities in this context by the International Federation of Organic Agriculture Movements (IFOAM) with an emphasis on the co-operation with the Fair Trade movement. An outlook is given about concrete plans and activities of the organic movement to ensure that organic agriculture is not only ecologically and economically — but also socially — sound and sustainable.

Where are we?

The issue of where a social agenda fits in organic agriculture is not new. Aspects were integrated into the concept of organic agriculture at the very beginning of the movement. Organic agriculture, which has a holistic approach that includes taking care of human beings' needs and rights, is supposed to be beneficial for all people involved at all levels. This is, indeed, an ambitious goal. But where to start? How to measure? At what point to conclude?

A significant proportion of IFOAM's 750 member organisations in about 100 countries are already working with fair trade issues. For example, the pioneers in setting and implementing criteria and standards for Fair Trade, such as Fairtrade Labelling Organizations International (FLO, Germany), and the International Federation for Alternative Trade (IFAT, United Kingdom), are both IFOAM associates. Several of IFOAM's trade associates, such as U-Landsimporten (Denmark), TWIN trading (UK) and Equal Exchange (United States of America), linked fair trade and the organic movement together from the very beginning. In addition, some IFOAM members, including the Instituto Biodinamico (Brazil), Rapunzel and Lebensbaum (both Germany) and Sekem (Egypt), have developed specific standards or codes to promote a social agenda in their own organic environment.

However, the past shows that the aim, though admirable, is ambitious and not easy to achieve or handle. The implementation of social justice within the daily organic operation has revealed specific challenges; and a social agenda for the entire organic movement, in all its complexities, means much more than just considering its place in trade relationships. Some areas in which a social agenda and organic activities are interconnected include:

- ***The development of rural areas and communities:*** organic agriculture especially with its value-adding potential, aids rural development, which has a significant positive impact on social revival.

1. International Federation of Organic Agriculture Movements, Germany.

- ***Creation of employment:*** organic agriculture is known for maintaining and creating employment all over the globe.
- ***Local marketing:*** organic agriculture encourages local and regional marketing, thus it brings people together and establishes win-win relationships between producers and consumers, which for the long term are beneficial and sustainable.
- ***Gender aspects:*** prevailing attitudes to gender are very progressive in the organic movement, giving women equal rights and respect.
- ***Globalisation:*** organic agriculture can be seen as a positive kind of globalisation, harmonised by the idea of serving people now and in future generations, as well as the environment.
- ***Financial issues in trading:*** the long-term influence organic agriculture can have on trade depends on whether specific economic structures at the financial and company level are needed to make the trade more sustainable. Under what conditions would multinationals and global financial trusts convert to a fair, socially and economically sound/sustainable behaviour in the market place?

The long history of discussions about social justice standards in IFOAM is still ongoing. According to IFOAM, it is recommended that "All ILO [International Labour Organization] conventions relating to labour welfare and the UN Charter of Rights for Children should be complied with."[2] However, how many people are aware of ILO conventions, what they are concerned with, and what impact their implementation might have on daily operations? Furthermore, is it possible to come to an agreement on the definition of social standards/codes of conducts not only for production and processing, but also for the complete organic trade chain? How can globally relevant and world-wide implementable standards and codes of conducts be developed?

One specific challenge to the organic movement in this context is the cost of inspections and certifications. High ethical standards including a detailed social quality will not be implemented on a large scale for any product unless there is market demand for it. How many consumers are willing to pay an extra social premium on top of the organic premium? Who could resist agreeing with the statement that "Organic production shall not be based on violations of basic human rights"?[3] The problem starts when it comes to defining at what precise point in a specific situation violations begin. The inspector needs clear and "measurable" indicators to evaluate social justice issues within a reasonable time frame.

Where are we heading?

In an attempt to merge the philosophical discussion with the reality in production and trade, IFOAM's World Board has initiated two programmes:

A. Working with IFOAM trade members, an *option paper for a code of conduct for organic trade* was developed and discussed at different events all around the globe. Issues covered included: What makes organic trade different? Which criteria should apply and how should they be monitored?

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2. IFOAM, *Basic Standards for Organic Production and Processing*, Chapter 11.

3. IFOAM, *Basic Standards for Organic Production and Processing*, Chapter 11.

B. The Social Accountability in Sustainable Agriculture (SASA), focussing on the inspectability of Social Standards, was brought on its way, together with FLO, Social Accountability International (SAI) and the Sustainable Agriculture Network (SAN). Under the framework of twelve world-wide pilot studies, different types of farms in different climates and on different continents will be inspected jointly in regard to different products. The result of these studies could help the organic movement define the social justice standards in more detail and will help to identify possible fields of further co-operation with the other participating organisations. The co-operation with the fair trade sector is particularly important in further constructive development. It will be mutually beneficial for the image of both sectors to use synergy effects and to avoid unnecessary competition in the market place as much as possible.

It was emphasised at IFOAM's General Assembly in Mar del Plata, Argentina, in 1998, how smallholder production systems, both in the South as well as in the North, require special attention and protection. One aspect of this is to make smallholders' voices heard by authorities, especially when a new regulation has been installed. Through its I-GO programme for developing organic agriculture in developing countries, IFOAM has recently financed two workshops specifically related to Internal Control Systems (ICS) of small-scale co-operatives. The objectives of these workshops are to harmonise the approach of relevant stakeholders, mainly certification bodies, so that they speak with one voice when it comes to negotiations, and reasonable revisions of respective regulations such as the EU regulation, or the USDA law. The positive effects of these meetings can already be seen.

Conclusions

Social standards are *"en vogue"*. Consumer awareness and concern are increasing, a fact indicated by the so-called anti-globalisation movement and the very concrete and growing fair trade market. On the other hand, the organic sector itself is also growing very fast. How should newcomers be persuaded to think beyond just the organic production standards? If the impressive growth of the organic movement over the last decade continues, what can be done to ensure the principles do not get lost on the way to achieving the target of 20% market share? There is no doubt that the organic movement needs a social agenda. However, these questions must be addressed if that agenda is to be defined and made relevant for all stakeholders, and if organic agriculture is to become even more sustainable.

In order to provide a structure to IFOAM's approach in regard to the social agenda, the World Board recently developed its own position and strategy for this field of activity. Furthermore, a code of ethics for all IFOAM affiliates is being discussed. At the IFOAM Organic World Congress with the theme "Cultivating Communities", which took place in August 2002 in Victoria, Canada, the whole range of aspects of the social agenda was brought to further discussion and refinement. The IFOAM General Assembly, which immediately followed, took into account the findings and conclusions of the World Congress.

To achieve tangible results for the social agenda in organic agriculture, IFOAM seeks input from all stakeholders concerned. In co-operation with them, we will more and more grow together what belongs together: organic agriculture and fair trade.

> *I believe that fair trade, combined with organic production, can help to reduce the kind of trading that exploits producers distant from the final market and ignorant of prevailing prices.* (HRH The Prince of Wales on "Benefits of Organic Farming", 21 March 2002, London).

Part II.

The Organic Market

Chapter 4.

Marketing and Trading Issues for Organic Products

THE ORGANIC MARKET IN OECD COUNTRIES: PAST GROWTH, CURRENT STATUS AND FUTURE POTENTIAL

David Hallam[1]

Introduction

This paper considers some features of the market for organic foods in OECD countries and consumer attitudes towards organic products and their implications for future market development. It draws on the findings of a major Food and Agriculture Organization of the United Nations (FAO) study of world markets for organic fruit and vegetables [*World Markets for Organic Fruit and Vegetables*, FAO, Technical Centre for Agricultural and Rural Cooperation ACP-EU (CTA), and International Trade Centre (ITC), Rome, 2001] and on recent preliminary work on market developments for organic meat and dairy products. In both of these pieces of work key players, including market operators, importers and retailers, were surveyed through a combination of questionnaires and interviews. The fruit and vegetable study involved market analysis in Austria, Belgium, Denmark, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States.

The interest of these studies has been in the potential market opportunities for developing countries, many of which see organic products as a high-value and environmentally sound means of export diversification. The shortfall in supplies of organic products against growing demand in OECD countries provides opportunities for developing country exporters. There are particular opportunities for supplying organic products not produced domestically in the importing markets such as coffee, tea, cocoa, spices, cane sugar, tropical fruits and bananas but also meat, dairy products and out of season fruits and vegetables too. In its reliance on cheap local inputs, and usually greater labour use, organic agriculture appears well-suited to the conditions of many developing countries. Many current production systems may already be essentially organic, but non-certified, and their products are not marketed as organic. However, developing countries face a number of obstacles in trying to penetrate these markets, including lack of technical know-how. Perhaps the most talked about problem facing exporters is the need for certification and accreditation. Certification is costly where international agencies are involved, and few developing countries have established their own accredited capacity. Some have made enormous steps in this regard — Argentina, for example — but many smaller countries see the necessary investment as prohibitive. Even when the investment is made, the multitude of different national standards in importing countries and lack of transparency constitute a practical barrier, or at least deterrent, to trade. Developing country producers also lack information and

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knowledge concerning market opportunities and requirements. This paper provides a brief discussion of some market-related issues.

Market size and growth

Both because of its recent origins and the failure of official trade data and other statistical sources to distinguish between organic and conventional products, much analysis of the market for organic products has to rely on unofficial and *ad hoc* reports.[2] However, in spite of these difficulties the broad trends in the market for organics are not really in doubt.

In terms of both demand and supply, the organic sector is principally located in the developed countries, with the European Union and the United States the main markets.[3] The most striking feature is the high rates of growth in developed country markets for organic products of all kinds. During the second half of the 1990s, a strong and steady growth in the sales of organic foods has provided these products with a viable and sometimes value added market niche. Changes in dietary habits among many segments of the population of developed countries — resulting from increased health awareness and the increasing demand for a wider variety of products, including convenience foods — have contributed to this growth. Due to major food scares, which have occurred in many countries in western Europe since the late 1990s, consumers in general have become more critical when purchasing food. Moreover, they have become more demanding regarding information on production and processing aspects (including traceability of the product).

There is little accurate and consistent information, but market growth rates in most OECD countries are estimated to range from 15% to 30% per year. Sales of organic fruit and vegetables in most developed countries have grown rapidly, at annual rates generally ranging between 20% and 30% during the last years of the 1990s. Particularly high growth rates have recently been observed in the United Kingdom and in Italy. For example, in Italy, organic fruit and vegetable retail sales have grown at an annual rate of about 85% during the period 1998-2000. In the early months of 2001, after the detection of the first case of bovine spongiform encephalopathy (BSE) in Italy, growth rates moved even higher, as concerns about safety of conventional food (mainly meat products) triggered a strong extra demand for fruit and vegetables in general and organic produce in particular. Although such high growth rates are not likely to persist, the market survey of Italy shows increased public awareness of and demand for organic fresh produce. Sales of organic fruit and vegetables in both the United States and Japan are rising, but precise growth rates could not be obtained. Annual growth of organic fruit sales in Germany is estimated at 8% and for organic vegetables, 15%. In the case of livestock products, one estimate gives a growth of 26% for organic dairy products in the European market in 2001.[4]

While in general rapid growth rates have been observed, growth seems to have slowed or even declined in some markets: in Austria, Denmark, Netherlands and Switzerland — countries with a well established organic market and a relatively high organic market share. Even in countries where

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2. FAO has developed a pilot questionnaire which seeks to gather data on organic production and trade. This is currently being tested.

3. One estimate gives the size of the world market for organic food as being USD 26 billion in 2001, estimating that the market had grown by 23% over the previous year. Of this, the European Union represents USD 12 billion and the United States USD 10 billion. Japan is also an important market. Source: Organic Monitor, quoted in *World Organics News*, 15 November 2001.

4. Organic Monitor, quoted in *World Organic News*, 9 May 2002.

the organic segment of the market is expanding rapidly, its share of total food sales is still small, and the organic sector is still a niche in the total food sector. Furthermore, as the market is growing from a small base, such growth rates are unlikely to be sustained in the longer term. Future prospects are considered later.

The total organic market in OECD countries in 2000 was only about USD 25-30 billion, which is less than 2% of total food sales. In some countries and for some products the market share of organics is greater than this overall average. Market shares of organic foods in most countries tend to be around 1% of total food sales. Somewhat higher figures are found in Austria and Switzerland, with estimated organic shares of respectively 1.8% and 2%. The organic market share in Denmark is estimated at almost 3% of total food sales, probably the highest in the world, with Germany close behind. Organic coffee, which accounts for only 0.2% of world coffee consumption, has around 5% of the US market. Horticultural products probably have the greatest share of the overall market. The share of organic sales in the fruit and vegetable sector is somewhat higher than the share of organic sales in total food sales. In most countries, organic shares in fresh fruit sales are estimated at between 3-5%, whereas for vegetable sales the organic shares are estimated at up to 10% in the United Kingdom and Switzerland for example, partly due to the high sales volume of domestically produced organic vegetables through direct sales and box schemes.

Table 1 presents some illustrative data from ITC on estimates of overall organic market size and for organic fruit and vegetables.

Table 1. Value and shares of organic markets, 2000
(figures rounded)

	Value of total organic sales (USD million)* (estimates)	Estimated share of organics in total food sales (%)	Value of organic fruit and vegetable sales (USD million)* (estimates)	Estimated share of organic in total fruit (F) & vegetable (V) sales (%)
United Kingdom	986	1	300	5 - 10
Germany	2 128	1.25-1.5**	378	2.6
Italy	978	1**	264	2
France	846	1	169	-
Netherlands	210	1.2	-	-
Belgium	138	1	34	-
Austria	195	1.8	29	3 F and 5 V
Switzerland	457	2	-	5 F and 10 V
Denmark	372	2.5 - 3	-	-
Sweden	175	0.9	31	1.7
USA	8 000	1.5**	1 450	-
Japan	350***		-	-

* Based on average exchange rate 2000.
** *Source*: ITC.
*** USD 2.5 billion for "green" labelled products.

Supermarket sales

The rapid expansion of the market for organic foods has been linked with shifts in the structure of retailing. The market for organic foods has moved increasingly into mainstream marketing and distribution channels. Whereas just a few years ago organic products could only be bought in specialist shops, today they are readily available in the major supermarket chains. The big retail chains have played a significant role in bringing organic products to a wider market and will be a major force in the future. Supermarkets account for 80% of organic food sold in the United Kingdom.

The development of stores specialising in organic produce and the growth of organic sections in supermarkets have been particularly advantageous for livestock products, as outlets which had previously traditionally sold organic products — health food stores and farm markets — frequently do not have adequate refrigeration and storage capacity to handle and present meat and dairy products. Furthermore, a segment of health food shop customers do not consume animal protein. Within western Europe as a whole, supermarkets accounted for 63% of revenues from the sale of organic dairy products in 2001. The highest share of supermarket sales, over 90%, of organic dairy products was in Scandinavia. For meat, a similar situation prevails. For example, in Ireland and the UK three-quarters of the sales of organic meat are made via supermarkets; however, not all countries have followed this trend. For example, in Germany, the Netherlands, the United States and Canada, the principal retail outlets for organic food are specialised food shops — many of which may resemble supermarkets in terms of presentation and display facilities.

For fresh certified organic fruit and vegetables, the role of the supermarket, which is the fastest-growing organic sales outlet in virtually all countries studied, varies significantly among the different countries. In the United Kingdom, an estimated 70% of all organic fruit and vegetables is sold by supermarkets. Similar percentages are found in Switzerland and in Denmark. In Germany and the Netherlands, however, supermarkets account for, respectively, 24% and 30% of sales of organic fresh produce. In Austria less than a quarter is sold by supermarkets and in France, only 20%.

The growing importance of the supermarkets obviously has implications for suppliers of organic foods. Supermarkets prefer to sell organic fresh produce year-round, with a constant quality and regular supply. International trade in conventional foods shows increasingly characteristics of buyer-driven global commodity chains. In such commodity chains, the larger supermarkets in developed countries specify the requirements for price, quality, delivery and food safety for the fresh food produced in developing countries (without owning farms or processing facilities in those countries), in order to guarantee year-round supply. With the increasing importance of supermarkets as a sales outlet for organic foods in developed countries, supermarkets will increasingly establish such commodity chains in international organic trade, as well. The generally high requirements for produce to be purchased by foreign supermarket chains can act as a barrier for some organic producers who are not able to meet such levels. However, this situation can provide considerable rewards and income guarantees for those organic producers who do meet the standards and can operate at the supply side of such chains.

Price *premia*

Organic foods typically command a price premium over conventionally produced foods at the producer level and this is carried forward to the retail level. The price premium is a result of the higher production and distribution costs associated with organic products, and the tendency for demand to exceed supply. The size of the price difference varies between countries, level of market development and product, but a premium of 20-30% is common and, depending on supply and demand, can be considerably greater.

Observed price premia in the study of fruit and vegetable markets ranged generally between 20% and 40%, but price differences from conventional produce regularly exceeded that range. For livestock products in the EU market, premia for dairy products are typically 20-30%, for beef 20-30%, for eggs up to 100%, for pork up to 100% and for poultry around 50%. Among tropical products of interest to developing country suppliers, FOB prices of organic coffee in January 2002 indicated a premium of up to 60-90% for Arabica and up to 100% for robusta, although even with these premia the production costs for organic coffee are not covered because of the depressed state of coffee prices.

While these price *premia* help producers cover the higher costs associated with organic production and consumers appear willing to pay them, they can fall to zero where demand growth fails to keep pace with supply growth. The questions of balanced growth and market imbalance are discussed below.

Consumer motivations

Future development of markets depends on expanding the number of regular purchasers of organic foods. The reasons consumers have for buying organic foods are therefore of interest.

Market research highlights a number of motivations for purchasing organic foods. These include ethical and philosophical reasons, health concerns and the view that organic foods are healthier than those conventionally produced, environmental concerns and the view that organic agriculture is beneficial to the environment, and perhaps social concerns that smallholder traditional farming should be preserved. In the OECD countries, increasing consumption of organic food has been driven particularly by growing consumer concerns over food safety following a number of highly publicised food scares in recent years — especially related to livestock products. Consumers see organic products as a "safe" alternative, although in practice organically produced food can pose some of the same health risks as conventionally produced food. With such motivations, consumers are willing to pay a higher price, or take the trouble to make purchases in specific outlets, in order to obtain food that meets their expectations.

A survey of French consumers of organic food found that concern over personal health and better taste were each mentioned by approximately 30% of respondents, while conformity with personal beliefs and concern about the environment were each mentioned by approximately 20% of those interviewed.

In the United Kingdom, a survey found that the top six concerns of organic shoppers were: pesticides on crops; food additives; antibiotics in meat; listeria or salmonella; E-coli; and BSE/CJD (Creutzfeldt Jakob Disease). Within this list, some of the concerns are met by organic production, for example the absence of antibiotics, but others, such as listeria, salmonella and E-coli, are more general public health issues and, if an item is not stored and handled correctly, could equally well apply to organic products. Further UK market research showed 36% of consumers buying organic food did so because of a perceived reduced health risk; 31% felt organic foods tasted better; 25% felt they were "more natural"; 12% to avoid GMOs and 5% to help protect the environment. People not buying organic foods cited high price (53%) and scepticism of alleged benefits of organics (22%) as their reasons. The same survey also found that 60% of organic food was purchased by confirmed organic consumers defined as those buying more than ten organic products per month. These consumers made up 10% of the sample. Nearly three-quarters of consumers bought only one to three organic products per month.

The UK Food Standards Agency survey found that, when prompted, 77% of respondents were very or fairly concerned about how food is produced but, unprompted, only 10% mentioned production method.

In the longer term, as consumers become more aware of what organic products are, a perception that they are produced with appropriate regard for the environment and animal welfare and according to agreed national and international standards, may gain prominence. However, some consumers currently find it difficult to differentiate between “organic” products and “environmentally friendly”, “natural” and “free range” labels, although the organic label denotes compliance with a very strict set of rules. Consumers can find the labels themselves confusing since there are so many different certifiers. Marks and Spencer, the UK retailer, is removing the various certifiers’ labels from its packaging since it is felt that these are confusing. Fake organic products have also recently been reported in southern Italy, casting doubt on the integrity of organic foods generally.

Livestock products have some advantages in organic markets as, along with fresh fruit and vegetables, they are often characterised by little or no processing and are therefore attractive to consumers seeking a “natural” product. While meat is most commonly sold and consumed in a relatively unprocessed state, this is not the case for some dairy products. Therefore, perhaps as a reflection of the degree of processing, within Europe sales of organic milk and yoghurt account for around 85% of the value of sales of organic dairy products, while organic cheese sales are only in the region of 10%. From the manufacturer’s point of view, as a separate processing chain must be maintained for organic foods, there are advantages in producing foods that require relatively little processing. In the case of cheese, because of the problem of separating organic and conventional milk, production tends to take place in small plants. On the positive side, producing an organic, processed product such as sausages, farm-branded organic milk and meat or an organic cheese, could serve as an effective way for a small producer to establish an identity and market niche, and present possibilities for supplying national and international markets. Obstacles to be faced the further one moves down the processing chain include whether or not ingredients, such as flavourings and sweeteners, for example in a flavoured yoghurt or ice-cream, have to be produced according to organic standards in order for a processed product to be classified as “organic”. At the same time, the development of other processed foods may, in itself, create a demand for organic products, such as milk powder or butter, as ingredients in biscuits and confectionery.

As the market becomes broader, distributors of organic products must use a wider variety of marketing and promotional techniques because the consumers that they are reaching are more diverse. In this regard, in some countries with more developed markets for organic products, it appears that a core group of shoppers, which is highly disposed to buy organic products, has been almost fully supplied and may have little potential for further expansion.[5] Consequently, future growth in the sector could be slower, as organic products seek to establish a market amongst mainstream consumers who may be more price-sensitive than committed organic food buyers who have been willing to pay a premium price. This raises the question as to just what is the effect of conventional economic factors of price and income. Consumption of organic products does appear to be associated with higher income levels. High substitutability between organics and conventional foods for many consumers means that own- and cross-price elasticities are presumably high, although there is little empirical evidence on this. A survey by the Soil Association found that high price was the major deterrent to buying organic foods.

Future potential

Future development of the market for organic foods involves two interrelated questions: will the market continue to grow without the emergence of excess supply, and will the price premium be maintained sufficient to encourage supply response for balanced growth? There is a tendency to regard organic markets as unlimited, and it has been the case that demand has outstripped supply and that organic products have commanded a price premium which can compensate for the typically higher costs associated with production and distribution. Despite ongoing conversion towards more

5. In the UK, 57% of organic food is purchased by 7% of the population.

sustainable farming methods in developed countries and government support to further boost organic production, consumption of organic foods is likely to continue to outgrow domestic production in developed countries, leaving room for significant organic imports, at least in the short- to medium-term and probably beyond. Moreover, tropical and off-season products will continue to provide an attractive potential for which many developing countries have comparative advantages.

The organic premium can only be maintained if supply growth is in line with demand. Where this is not the case, the premium will be eroded. Organic marketing channels are also limited in their capacity, and there are instances where organic products have to be marketed through normal channels undistinguished from conventionally produced foods. The market for organic food is still small and therefore susceptible to oversupply, at least at particular times and locations. While many countries report strong growth in demand for organic meat and dairy products, for example, a number of instances can be cited where supply has exceeded demand. This has resulted in either a severe reduction in the price difference between organic and conventional products or organic products being sold as conventional products. This could call into question the achievability of some west European countries' goals to increase the proportion of organic products in their domestic food consumption during this decade, as excess supply, and an associated fall in price could result in organic production becoming unprofitable. For example, prior to 2001, when export markets grew, Danish organic pork was in oversupply on the domestic market and prices were weak. Elsewhere, an estimated 20-30% of organic meat produced in Ireland is sold as conventional meat while, in Switzerland, it is reported that a number of organically produced animals — especially pigs — are sold as conventionally-reared animals. For milk, in Austria, Denmark and the UK, only one-third of organic milk is reported to be sold as such and the rest is sold as conventional milk. Consequently, some farmers' organisations in the European Union have recently cautioned against the rapid conversion of farms to organic production, fearing that it could be out of step with the growth in demand. Most recently, it is reported emerging oversupply of organic meat and dairy products is pushing producers into losses.

While caution may be needed to ensure controlled expansion of supply, there are also some reasons to expect that demand growth may moderate as further increases in sales depend more on less committed consumers with different perceptions, attitudes and requirements. While early adopters of organic products may have been driven by ethical and environmental concerns, as the market has broadened the mass market may be less motivated by such factors and more driven by conventional economic factors such as price. They may also be more sceptical of the claims sometimes made on behalf of organic products. A recent German survey of consumer attitudes towards organic foods found that scepticism was increasing following some recent food scandals affecting organic products: only 49% of respondents said they would pay more for organic food compared to 72% eighteen months previously; 77% did not believe that organic certification provided any guarantee of quality; 56% believed that organic food was no different from conventional; and 50% believed that organic labels were a swindle. Not surprisingly, suppliers questioned claimed that sales of organic products were falling.

Organic agriculture is moving into the economic mainstream, and many large food companies are developing organic products as an element of their business: Kellog, Pepsico, Coca-Cola, Kraft, Heinz, Conagra, for example, all have organic food products on the market. Large conventional dairies are already the main suppliers of organic dairy products in Scandinavia, France and the Netherlands, and this trend is likely to spread to other European countries and elsewhere. The movement of organic food into mainstream retailing, in particular supermarkets, could be the most important factor in increasing market size, by providing access to organic food to a wider public. Product developments, including organic convenience products, such as fresh pre-packed salads, will increase the acceptability of organic foods. Organic sales through supermarkets are the fastest-growing distribution channel in most markets. Consumers buying though these channels differ somewhat from other organic consumers, in the sense that environmental considerations are less important when purchasing organic produce. These purchases by less environmentally conscious consumers lend some support to the expectation of decreasing price premia in the next few years. While the movement of organic foods into the mainstream of food production and distribution has the potential to expand the market to include a broader audience, this can pose some difficulties for committed organic consumers who may see the involvement of big business as inappropriate.

The increased involvement of supermarkets, with their centralised systems of purchasing and distribution, may result in pressure to reduce the current price differential between organic and conventional products. As an extension of this trend, some supermarkets have introduced “own brand” organic meat and milk products, with such products being priced below those of competing brands. Internationally, the growth in the importance of supermarkets in distributing organic products could assist the development of domestic demand in countries where organic products are still a novelty. Thus, a supermarket chain operating in Europe would have the necessary experience of handling organic foods to promote them in other markets, such as Asia or Latin America, where the organics market is little developed.

Expansion of the organic food market also entails an increase in the geographic spread of supply, a move away from the idea of locality traditionally associated with organic food. The surveys undertaken as part of the fruit and vegetable study showed that in virtually all markets, organic consumers have a clear distrust of the authenticity of certified organic imports. This is also mixed up with concerns over “food miles” — that the environmental credentials of organic products are compromised where they are transported over long distances. The case of Switzerland is most striking, where the main domestic organic label (Bio Suisse) prohibits the transportation of organic products by plane (Switzerland is a land-locked country). Consumers in Austria are said to strongly prefer domestic organic products (preferably bought directly at the farm) and only appreciate imports during off-season periods or for products which can not been grown domestically. If imports are needed, produce originating from nearby countries is favoured. The Danish market survey mentions that consumers’ confidence in foreign organic products declines with geographical distance. Consumers in Japan and the United States also have a strong preference for locally grown organic produce. In order to successfully introduce imported organic produce into these markets, specific marketing efforts might be needed to gain buyers’ confidence. These efforts would clearly be linked to the organic importer, wholesaler and retailer. Use of the same domestic organic label in the country of consumption would help to make consumers familiar with imported organic produce, as they are more likely to recognise the equivalency of the product based on domestic standards. On the other hand, the United Kingdom and Belgium are two examples where the difference in trust between domestically grown and imported organic products is found to be relatively minor. This is probably explained by the fact that domestic organic production in these countries is not able to catch up with growing demand, and imports are therefore common practice. However, some UK supermarket chains have expressed their desire to cut their reliance on imports.

Overall, further growth in the market for organic foods is to be expected, and in general demand growth might be expected to exceed supply growth, resulting in a continuation of premium prices for organic products. However, this does not preclude the possibility of the emergence of excess supplies and falling prices at particular times and locations. More importantly, expansion of the market involves changes in its nature and, specifically, differences in the attitudes of consumers and the dominant types of business. These are likely to lead to pressure on prices, narrowing the gap between organic and conventional products. They also pose challenges to marketers to attract new consumers, and to producers to control costs and improve competitiveness.

EMERGING ISSUES IN THE MARKETING AND TRADE OF ORGANIC PRODUCTS

Daniele Giovannucci[1]

Abstract

The paper begins with a macro view of the shifting regulatory, business, and consumer environments that are inducing fundamental changes in the global trade regime and increasing the demand for standards. This in turn has profound implications especially for small- and medium-sized producers. It discusses how in the case of organics, emerging trade standards may actually benefit the producers rather than being a barrier to entry. In order for organics to expand their appeal and enter mainstream distribution channels they will likely have to adapt some aspects of modern industrial agribusiness. However, a more industrialised approach means walking a fine line because this may contradict the core organic values and risk alienating a loyal customer base. Recent research and examples, drawn primarily from the coffee industry, outline the key issues such as the certification process, quality, and consistency that will require attention. The paper considers that meeting the demands of further growth and those of mainstream distribution channels will be difficult for most producers, and will require a combination of public and private support.

Introduction

According to the International Trade Centre UNCTAD/WTO (ITC) estimates of the global retail market for organic food and beverages grew from approximately USD 10 billion in 1997 to USD 17.5 billion in 2000. For 2001, the less conservative calculations of the Organic Monitor for global organic retail sales are estimated to be about USD 26 billion. Almost all of the certified organic production is sold in OECD countries, with approximately 46% of these sales in Europe, 37% in North America and about 16% in Asia (Yussefi and Willer, 2002). World-wide, nearly 130 countries produce certified organic products in commercial quantities, including more than 90 developing countries (Kortbech-Olesen, 2000). With future growth estimates still in the 20% range, the organic product market may become a powerhouse segment in world food trade. Yet, behind the upbeat estimates are some issues that could stall or derail growth if they are not addressed.

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Macro trends in established consumer markets

To understand some of the current issues in organic trade it is important to be aware of the underlying framework that is quickly changing the nature of agricultural trade in general. Industry concentration and novel uses of grades and standards form the basic architecture of this change, which is being driven by three sets of changes:

1. There is a new ***consumer*** environment that features increased food safety concerns, a focus on health and diet, and increasingly globalised consumer tastes. In more developed markets, experts predict that social and environmental concerns, especially ethical ones, will continue to emerge as not only competitive differentiators, but as basic rules of the game and prerequisites for participation.

2. A new ***regulatory*** environment, with the World Trade Organization (WTO) and its Sanitary and Phytosanitary (SPS)/Technical Barriers to Trade (TBT) Agreements, regional trade agreements, and even governmental requirements (EU standards for aflotoxin, maximum residue levels, and so forth) make entry into fast-globalising markets more demanding than ever for products across the agricultural spectrum.

3. A new ***business*** environment features increased legal liability and requires "due diligence," such as the International Standards Organization (ISO) and Hazards Analysis at Critical Control Points (HACCP) regime, that are some of the institutional methods of standardising. Supply chain concentration also demands ever-increasing levels of standards and performance measured by global rather than local performance standards. Individual firms and chains (supermarket, fast food, etc.) are increasingly creating their own standards that they impose on the agri-food chains that they dominate in developing countries (the Ethical Trade Initiative and Euro Retailer Produce Working Group).

These changes are stimulating new standards, driving a set of quality-oriented and process-oriented changes in many markets, particularly in the United States and Europe and even the advanced Asian and Latin American economies. This implies a fundamental shift in the role of grades and standards from simply reducing transaction costs as they have traditionally done (Giovannucci, 2000). Concentration is occurring at several levels as increasing requirements for knowledge, logistics, technology and financing make it difficult for all but the most competitive companies to meet the new trade standards. In the coffee industry, Oxfam (2002) confirms that 5 coffee roasters, Kraft, Nestlé, Procter and Gamble, Sara Lee, and Tchibo buy half of the world's coffee beans. The same has happened in other commodities like sugar and cacao, and industries as diverse as grain and flowers. Perhaps the most interesting area of concentration is downstream at the retail level, where supermarkets and other large multiple retailers are enjoying unprecedented rates of growth, and gaining dominant positions in the food distribution chain in most developed markets — and even in many developing countries (Reardon and Berdegué, 2002).

Organic products have a unique advantage in that they intrinsically incorporate some of these standards and safety verifications. But the majority of these products, perhaps because of their differentiated nature, have not until recently lent themselves to smooth integration into industrial processes or large-scale mass distribution channels.

Emerging agro-industry models

Standards have shifted from being neutral market lubricants to serving as new tools of product differentiation. We are witnessing a fundamental shift in their role from reducing transaction costs to serving as strategic tools for market penetration, system co-ordination, quality and safety assurance, and even product niche definition (Giovannucci and Reardon, 1999).

As these trends emerge in many of the consumer markets, a new model for conducting the business of agricultural trade emerges. This model has distinct industrial characteristics evident in its push to standardise product inputs, processes, and outputs. Here we have supply chain co-ordination as a critical factor in achieving efficiencies that are well beyond the simple efficiencies of scale economies. Like other industrial models, agro-industries are fast adopting Just in Time inventory systems, electronically monitored low-tolerance product specifications, Total Quality Management processes, and fully integrated input and output systems.

For the small- and medium-sized enterprises that comprise the bulk of today's organic industry this presents a challenging situation. Handling it successfully requires managing a set of complex issues that range from cultivation technology to adequate financing to shipping logistics. Without considerable external support, in the form of business alliances or a supply chain, only the largest and most sophisticated producers will advance.

> *By potentially reducing some of the inherent asymmetries that put producers at a disadvantage, co-ordinated supply chains can serve as channels to improve the sustainability of differentiated or higher value production. The ability to reformulate the supply chain wherein information, finance, and sometimes even risk is more readily transmitted between the participants may ultimately help producers more than anything else. Modern supply chains that add considerable value such as the automotive and fast foods industries are tightly integrated and profoundly understand The Three Musketeers' motto, "one for all and all for one". An automobile manufacturer helps to sustain and reward its steel mill just as McDonald's supplies genetic material, growing guidelines, and long-term contracts to its potato growers in order to ensure french fry potatoes that meet its standards. The tendency in such closely co-ordinated supply chains is to develop consistent working relationships that promote continuity as a result of continuing improvements. These relationships can help commodity producers to understand and more readily meet the buyer's demands and they can therefore participate proactively in the market.* (Giovannucci and Jaffee, 2002).

Essentially, the world is demanding a new set of standards. While standards and the corresponding regulations or policies may sometimes be a burden to the average businessperson, in this case they probably constitute a singular opportunity. And this opportunity is available even for small producers.

Organics provide a useful understanding and application of some of the most basic required standards for small and medium producers. Detailed record-keeping of production inputs, field to table traceability, and third-party monitoring are basic to implementing the advanced standards necessary to effectively participate in agricultural trade with more lucrative developed markets. Participants in the organic industry may even have an advantage over many producers of commodities or undifferentiated products because of the more face-to-face nature and arm's length transactions of the organic chain. There are also other differences between conventional or commodity-oriented markets and the differentiated markets that exist for many organic products (Table 1).

Table 1. Comparison of conventional and differentiated markets

Conventional	Differentiated
1. Commodity price pressures	1. Consistently higher prices
2. Reward for quality and price	2. Reward for quality and process
3. Easy market access	3. Limited market access
4. Intense competition	4. Moderate competition
5. Government support: subsidy, ext, R&D	5. Limited government support
6. Broad market size	6. Very limited market size
7. Short learning and cost curve	7. Longer curve: certification, etc.

Source: Daniele Giovannucci.

Market requirements

As noted above, the differentiated and more standards-oriented nature of the organic industry correlates well to some of the emerging paradigms that set the rules of the game. However, there are emerging aspects of the organics trade that pose specific challenges.

Rather than generalise about agriculture, coffee can serve as a useful case study that is indicative of the issues, both international and domestic, faced by many other organic products. Coffee is also particularly relevant because it is one of the world's primary agricultural commodities. Until its recent price crash, the global value of the coffee trade was second only to petroleum. Its trade is ubiquitous, grown in more than 50 countries and exported everywhere. OECD countries are its primary processors, consumers, and on-sellers.

Coffee was also one of the first agricultural products to enjoy the use of third-party certification for international trade.[2] Coffee, because of its popularity and its important role in the rural areas of countries where it is grown, can serve as a spearhead for the organic production and certification of other crops. Coffee also has a positive environmental potential since it is an evergreen that can grow as part of an integrated forest canopy and responds well to eco-friendly cultivation.

Over the last three years new research has been conducted to ascertain the characteristics of the market for organic and other "sustainable" coffees in a number of OECD countries (Giovannucci, 2001; Giovannucci *et al.,* 2002).[3] Many of the data and findings that follow have emerged from this recent research.

2. First recorded certification, by Demeter biodynamic, is Finca Irlanda in Chiapas, Mexico.

3. The countries primarily covered are: Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Sweden, Switzerland, the UK and the US.

Constraints to growth

More than 19 million kg of certified organic coffee were sold in the major markets in 2001.[4] While that may sound like a lot of coffee, it represents less than 1% of the total global coffee trade. It should be noted that as a viable market entity, organic coffee is a relative newcomer. Although it has historically been available in small quantities through some specialty retailers in a few countries, it has only been broadly available in commercially significant quantities for less than five years in most countries. In that time, organic coffee has enjoyed an average annual growth rate of 15-20%, far greater than the overall coffee industry's 1.5% average growth.

While organic coffee now has some retail visibility, it is by no means available everywhere. Like many new products, it was first introduced to its most receptive niche audience (health-food shoppers) and has expanded to cause-conscious consumers whose buying habits are motivated by concern for the environment or the welfare of a farmer. By the mid- to late 1990s it had also reached some of the specialty and gourmet segments. Although significant, these clients still represent a fairly limited segment of the overall food industry. Its expansion has occurred almost exclusively within its core audience, and it is now facing the challenge of whether it can successfully transition to a more mainstream consumer base.

Although it is difficult to generalise about all organic products, it may be fair to characterise them in terms of product life cycle theory. Organic market characteristics indicate that these products have gained considerable consumer awareness and are beginning to move out of the introductory stage and into a growth stage. The growth stage is typically characterised by increasing product variations and competition that begins to stress competitive differences. The tendency at this stage is, of course, to dramatically increase distribution and begin to shift the pricing strategy away from price-skimming to more competitive pricing in order to gain market share. Until now organics have typically been "pull" products that have enjoyed a strong niche demand. Will many of these organic products have a potential market among the great majority of today's consumers, or will the industry reach a glass ceiling not far beyond its core group of ideological supporters?

Costs, promotion, and distribution channels will likely be the key deciding factors if organics are to reach a larger audience, especially a mass audience. Research shows that consumers will choose an ecologically friendly product over a conventional one if the price is the same or only marginally different and most other factors are equal (Rice and McLean, 1999). But for many organic products, costs of production are considerably higher than their conventional counterparts.

A portion of the price premium does reach farmers, but the downstream supply chain typically accounts for a large share of the higher price. There are several possible reasons for this. One is that distribution channels can be limited or involve very little competition among exporters, traders, processors, importers, or distributors, thereby creating oligopsony. Another reason is that retailers have relatively little organic brand competition and can afford to keep prices relatively high, especially since lower prices might only cannibalise their existing business in parallel conventional products. Also, comparatively slower sales for some products result in slower inventory turnover and correspondingly increased carrying costs. Finally, the higher costs of maintaining segregated and sometimes parallel post-harvest processing, transport, and storage systems as required for certification is usually reflected in increased prices (Giovannucci *et al.,* 2002).

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4. Considerably more was shipped from origin but for various reasons did not go out to the final consumer as a certified organic product.

Mass distribution channels[5] have already begun to pick up a variety of organic products. Recent research noted that in 2000, although many North American supermarkets either did not stock organic coffee or had only one variety, this dynamic was changing and the same is happening in many European markets (Giovannucci, 2001). The wider availability that broad distribution offers could stimulate competition and result in improved pricing for consumers as well as more volume and growth for the industry. However, moving quickly to mass distribution can be a two-edged sword. If organics do not meet the high volume sales and profitability requirements of these channels, they could promptly be dropped. Once that happens, it could take years to be reconsidered and in today's retail environment there is no other feasible way to achieve broad distribution outside of the mass channels. Another risk is that mass-market distribution, of the sort already happening in Walmart, may significantly reduce the quality-oriented reputation that many organic products currently enjoy in their existing market channels, a reputation or prestige that once lost will be difficult to recover.

The concentration of market power in the hands of retailers has enabled them to charge all suppliers, not just organic suppliers, a variety of fees for the privilege of doing business with them. These include slotting fees, positioning fees, sell-through fees, promotional fees and other chargebacks. In essence, these charges amount to considerable discounts that are often paid upfront by the supplier. In some cases, retailers actually hold suppliers responsible for minimum charges if adequate sales of the supplier's product do not materialise. These conditions for participation clearly require that a supplier be well-financed and have a certain tolerance for risk. Consequently, these barriers to entry will tend to limit the participation of small- and mid-size companies especially unproven ones in the organic field. In the US markets, where these practices are more advanced, mergers and acquisitions have helped formerly small- and mid-size companies to successfully access some of the mass market channels, although not without controversy (Pollan, 2001).

Identification and certification confusion

In recent years the EU, Japan, the US and others have made great strides with the codification of organic standards that have helped to clarify the industry's guidelines. The efforts of the International Federation of Organic Agriculture Movements (IFOAM) and Codex Alimentarius to harmonise the international guidelines and certifications have also been laudable. In the EU countries, for example, organic regulation No. 2092/91 has been implemented in national legislation to protect the use of words like *organic, ecological, eko, biological* and *bio,* limiting their use to products that have complied with a specified external certification process. Nevertheless, the details of these processes and the bodies that are accredited for certification and inspection still vary from country to country. Our current research indicates that this codification work, although necessary and useful, has not been sufficient to dispel the confusion about organics. This confusion exists at the industry level, the producer level, and the consumer level.

Apart from organic certifications, there are also a number of competing certifications, labels, and brands that contend for the same consumer's attention. Some of these are, like organic, also "cause-related" and may have been successful in part because they respond to perceived shortcomings in the standards for organic certification. The two most popular are: a) *Fair trade* — more focused on the human socio-economic aspects of agriculture and b) *Eco-friendly* — typically more comprehensive in their support for biodiversity and ecological processes.

5. Defined here as supermarkets, hypermarkets and large multiple-store operators (chains) including discounters.

A recent study notes that agriculture is the number one threat to biodiversity on the planet (McNeely and Scherr, 2001). The precepts of organic agriculture dictate working in harmony with the biodiversity of the farm and the surrounding areas. In some parts of the world, and for certain crops, guidelines have already been established in order to support the majority of a farm area's biodiversity. The growing popularity of other ecologically friendly certifications results from the failure of current organic regulations that permit a form of agriculture that does not sufficiently account for biodiversity. In all of the major national and international regulations for organic agriculture, for example, biodiversity guidelines are only suggestions and are sometimes vague.

An opportunity to give some of the world's poorest farmers a place in our global system of trade will be lost if biodiversity guidelines cannot be strengthened. If maintaining and recovering biodiversity are clear criteria for organic agriculture, then a number of rural farmers who do not over-exploit their land may be able to participate competitively in organic trade. If, instead, industrialisation of this agriculture is a priority, then these farmers, and consequently many developing countries, will be marginalised.

Some of the modern organic industry can also at times be faulted for its inadequate attention to the human and global ecology of agriculture. For example, there appears to be some contradiction of the well-accepted ethos of organic agriculture that it supports localised agriculture, requiring fewer external inputs such as fuel, extra packaging, or refrigerated transport, and local farm communities. Michael Pollan's exposé on the organic food industry (2001) points out that some of the same large agri-business firms that have been the target of the organic movement are now acquiring organic companies and following more the letter than the spirit of organic law. General Mills' takeover of Cascading Farms and Kraft's purchase of Boca Burgers, both industry pioneers, are cited as two such examples. He further elaborates that this trend parallels recent organic industry developments away from foods that some organic consumers expect, *i.e.* foods that are less processed, locally grown, and feature more humane treatment of poultry and livestock. David Gould, an organic food inspector for several major certification agencies, claims that "the organic movement has shifted away from the small farmer — and its corresponding focus on community food production — toward the techniques and problems of conventional and factory farming" (Baker, 2001).

Apart from the absence of synthetic agrochemicals, there appear to be increasingly fewer differences between this new industrial type of organic agriculture and conventional agriculture. The organic industry could suffer if it can no longer be clearly differentiated, a factor that is critical in the growth and maturity stages of an industry. Conventional agriculture has been steadily improving agrochemical compositions and their applications in terms of target specificity, reduced persistence in the environment, and Integrated Pest Management (IPM). Given such convergence, will there be enough of a clear difference for consumers to support a growing future organic industry whose primary distinction is the use of organic rather than synthetic agrochemicals?

These developments have brought us to a crossroads that will determine the future development of organic agriculture. From a business standpoint, a more industrialised form of organic agriculture enables organic products to be more cost competitive. Adapting industrial models will enable faster growth and more widespread distribution. However, caution is warranted since this is the same argument used to justify the disregard for good environmental practices evident in many conventional agriculture systems. Robert Simmons, the international team leader for Farm Verified Organic (FVO), a certification agency, notes that "The current trend seems to be a race to the bottom for standards" (Baker, 2002). Such adaptations can also result in rapid and potentially devastating consequences for the organic industry. If consumer perceptions of what organic products ought to be are not met, they may feel disillusioned or betrayed and may consequently abandon their loyalty to this entire category. Unlike some food products, organics are perceived as having a distinct commonality and are therefore vulnerable not just as distinct product categories like fruit or dairy, but also as a group.

Both European and North American markets have registered their distaste for the confusion of different certifications. More than one major European vendor has responded by issuing its own brand as a surrogate for third-party certifications. The 2001 North American industry research notes: "…it is not clear to what extent the support for a unifying super seal is a surrogate for the desire to have simpler sourcing criteria and/or clearer marketing messages rather than the complex issue of combined certification criteria. In either case, the market's interest in having clear and concise certification appears clear" (Giovannucci, 2001).

Producers are certainly not immune to the organic confusion. Indeed they may suffer the most from lack of information. Despite the introduction of regulations, the lack of unified standards concerning organic certification among different certifiers still causes confusion and inefficiencies in the trade, making it a source of conflict that comes up repeatedly in the industry surveys of different countries (Giovannucci *et al.*, 2002). For producers it is often surprising to discover the different certifiers have different requirements and different standards of verification. Learning which certifiers are accepted in different markets is another sometimes costly rite of passage. In developing countries, where a shortage of certification bodies is only surpassed by the shortage of information, farmers are often at the mercy of information from traders and exporters. Sometimes these companies even hold title to the organic certificates used by these farmers who therefore cannot choose an alternative organic buyer.

For developing country producers especially, learning and preparation, conversion time, and certification are costly and sometimes difficult. Occasionally non-governmental organisations and some donors support these processes, but these are hardly enough. Very few countries have put in place the institutional framework to help support farmers through these processes. At the same time, other certifications such as "fair trade" or "eco-friendly" are potentially available to small farmers, but achieving and maintaining more than one is beyond the economic capacity of most.

Quality is the top priority

There are many ways to measure quality but the most common methods for agricultural products are flavour and appearance. Appearance is the most obvious, especially for unprocessed products like fruits and vegetables, and is perhaps the category for which organics are most faulted. Uniform size, even coloration, and the absence of blemishes are somewhat more difficult to control under the organic system. Some vendors have even made a virtue of this in the Italian tradition of *brutti ma buoni*.[6] Flavour is a more subjective criterion but, at least in the case of coffee, ultimately the most important.

For a number of years, many certified organic coffees could claim neither flavour nor appearance as assets. With little else to recommend it other than organic certification, the volume remained very small and was fuelled only by people who supported the concept of organics. Many of these coffees were of low quality and most were inconsistent, due primarily to rustic post-harvest and processing methods used by relatively poor small farmers. These farmers, who were already accustomed to low- or no-input farming, were the easiest to certify and therefore among the first to supply the organic market. Unfortunately, this poor quality quite literally left a bad taste in the mouth of the coffee industry; a memory that in many countries continues to this day.

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6. Literally "ugly but good".

Poor quality has been identified as the primary constraint to growth in Japan. European countries agree that quality is very important and some are already finding that recent improvements are changing people's minds about how good organic coffee can be. Starbucks buyers acknowledge that there is much more certified organic coffee available and has increased its organic sales exponentially in the last two years, yet it still cannot find enough of the high-quality coffee that it needs.[7] In the US, 92% of the 2 000 firms surveyed agreed that flavour quality would be the most important factor in the success of organic coffee (Giovannucci, 2001). In fact, when asked to rate the importance of each of the following seven factors, no other one came close.

1. Specialty quality or taste
2. Opportunity for differentiation
3. Customers are asking for it
4. Better profit margins
5. Personal beliefs about chemical-free agriculture
6. Personal beliefs about biodiversity or the environment
7. Personal ethics about fair trade for the growers

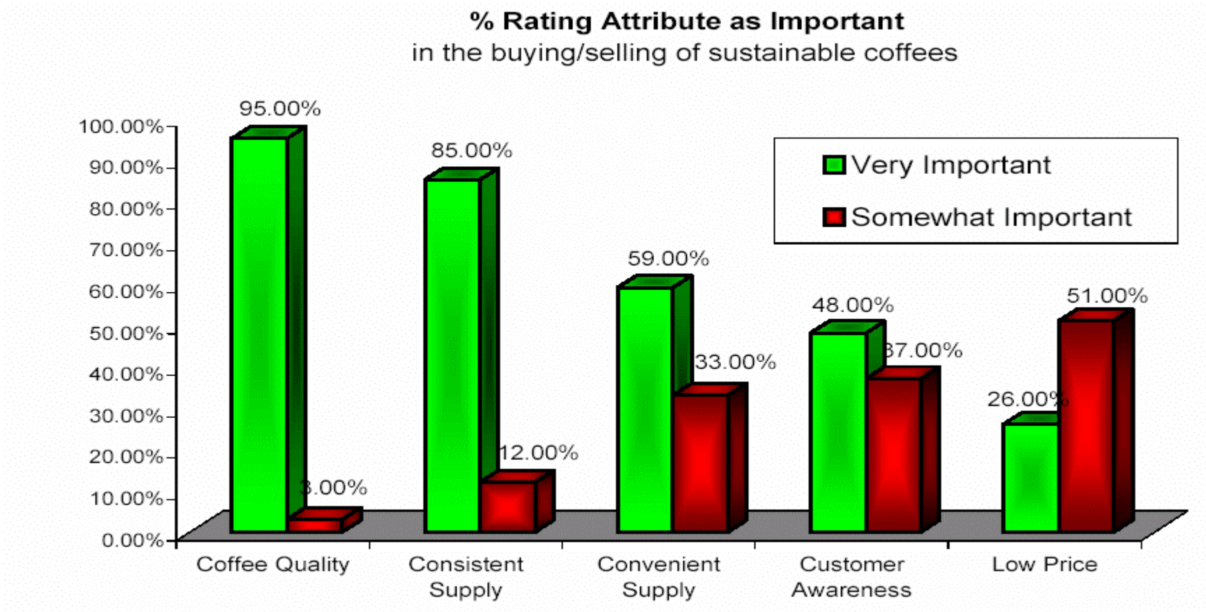
Customer demand is usually the primary driver for business. Yet, quality was even far ahead of demand (No. 3 on the list) which was rated "very important" by only 51% of those surveyed. A similar response was given for quality attributes in a related inquiry about what characteristics or attributes are important when a firm selects organic coffees (Figure 1).

For some organic products like nuts, coffee and cacao, the premiums linked to better quality have become more valuable than premiums paid for certification. Premiums for being certified are currently a reward for scarcity and, as certification becomes more common, these will likely transform into an aspect of competitive advantage and may be compensated only minimally or not at all. While many firms currently expect these premiums to continue, there is evidence that they are already shrinking. In the mid-1990s premiums for organic coffee could easily reach 100% and more. Today, premiums more typically range from 15% to 50%.

As with many commercial products, consistency of both the product and its delivery is vital for long-term trade relationships. Consistency is important not only for logistical processes and supply chain efficiencies but also in terms of the specific quality characteristics of a product. Although this is difficult to achieve with any agricultural products, it is becoming more of a requirement as many products are used as ingredients in industrial processes that can only tolerate a limited range of variation. Such consistency is likely to be even more difficult with organic products, and achieving it in developing countries presents further challenges. Consistency is, however, one of the most important characteristics indicated by the industry (Figure 1), and reflects the increasing economic, logistical, and time costs of switching suppliers. This challenge has long been acknowledged as a key factor preventing many producers, and even producer countries, from effectively competing in global trade. It is likely to be just as important for the growth of organics.

7. Personal communication with the Vice-President for Coffee and the public speech of the founding chairman at the National Coffee Association's annual conference, 2002.

Figure 1. Importance of five attributes in a firm's choice to sell organic (and other sustainable) coffees



Tools for participation

Organic products appear to be increasingly diminishing their local identity and participating more in the global marketplace. To compete effectively as the field grows, they have to meet increasingly higher standards of quality and consistency. Most small- and medium-sized producers will have to upgrade their production and post-harvest systems, as well as their business skills, to manage the logistics, marketing, finance, and risk. This is necessary if they are to participate effectively in a supply chain. However, this is a very difficult task for any individual farmer. It will require participation and strengthening of co-operatives and trade associations. For many, this is the only way in which they can rapidly develop or contract the necessary organisational and managerial capacities.

Many organic products, because of their differentiated nature, are not traded as commodities. The growers and the end-user, therefore, often know each other and sometimes have direct communication that facilitates personal relationships and business transactions. A number of organic products enjoy the advantage of supply chains that tend to be shorter and through which they can more readily exchange first-hand information and resources. This provides excellent opportunities but will likely change as more players enter the field and competition heats up.

Many of the supply chains for organic products have only developed in the last five to ten years but are becoming increasingly sophisticated and demanding. To participate in an integrated supply chain many organic producers need a measure of support. While governments can help to supply some of the necessary regulations as well as basic infrastructure and farmer extension services, these are not enough.

Producer countries must look beyond the old standard formulas. Although still important, factors like land and labour costs are not as critical to competitiveness as they once were. In order to be competitive in the future, producers will need to partner with each other as well as with other enterprises to develop these key factors:

1. A more agile, enabling environment in the form of supportive policy, regulatory, and judicial frameworks that can respond to the changing needs of business;
2. Integrated supply chains and strong distribution capabilities;
3. Improved business skills and market orientation;
4. Knowledge systems that go beyond market information so that producers can adapt to changing needs and learn to both assess and access the potential buyers for their products.

Conclusions

A number of macro trends, particularly in food safety, are driving the demand for organics beyond the niche segment of their core supporters. Reaching a broader audience may mean adapting to more industrial forms of agriculture, some of which may be inherently contradictory to organic principles. These choices must be considered in light of the long-term implications and not just the short-term business gains.

The markets for a number of organic products are relatively new and still in the formative stages. Research and examples, particularly from the coffee industry, indicate that clarity in the certification process, quality of delivered product, and consistency of both the quality and the delivery are vital for the broader success of organics. Yet many producers will require specific support to fulfil these demands. Government can provide some of the support, but market linkages via producer organisations and supply chains will be vital for long-term success.

The many differentiated markets represented by the organic industry offer viable alternatives to typical commodities trade. The new global trade regime and its standards appear to be a positive opportunity for the development of organic markets. Rigorous standards not only help to protect the industry, but also help to strengthen the necessary skills among producers for whom organics present an opportunity to participate in ever-more globalised and competitive trade. Rather than shy away from rigorous organic standards, these can be useful in helping smaller producers to participate competitively in agricultural trade.

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INTERNATIONAL HARMONISATION OF ORGANIC STANDARDS AND GUARANTEE SYSTEMS

Diane Bowen[1]

Abstract

A large array of governmental organic regulations is developing world-wide, in parallel with private organic guarantee systems and in some respects, in conflict with them. The result is at present, an increasingly chaotic system for international trade of organic products. This is ironic since one of the main aims of establishing organic standards and regulations has been to foster trade in organic products. In order to sustain and grow trade in organic products and the livelihoods of producers in developing and developed countries who depend on this trade, some means to harmonise the many organic guarantee systems seems essential. Identifying and implementing a mechanism for establishing equivalence among these systems is regarded as the best approach to the problem. IFOAM, in co-operation with the Food and Agriculture Organization of the United Nations (FAO) and the United Nations' Conference on Trade and Development (UNCTAD), presented a conference in 2002 to address issues of international harmonisation of organic systems. Core challenges and some possible approaches to them were identified. Representatives of the conference's host organisations have agreed to collaborate in a task force to carry the results forward with the aim of progressing toward solutions.

Organic standards and certification systems were first developed in the private sector at a time when "organic" was a small niche sector. The growth of organic agriculture and markets during the last decade has been accompanied by rapid growth in the number and complexity of private sector standards followed by the burgeoning of government organic regulations. Although certification was initiated to foster consumer confidence and to enhance trade in organic products, the plethora of certification requirements and regulations is now considered to be a major obstacle for a continuous and rapid development of the organic sector, especially for producers in developing countries. The organic market is now confronted with hundreds of private sector standards and governmental regulations, two international standards for organic agriculture (Codex Alimentarius Commission and IFOAM) and a number of accreditation systems. Lack of co-operation and "harmony" is a central problem.[2]

1. International Federation of Organic Agriculture Movements, (IFOAM), Milwaukee, United States of America.

2. Crucifix, David, "Report of the IFOAM Conference on Organic Guarantee Systems," 2002, IFOAM, Tholey-Theley, Germany.

A survey by the International Organic Accreditation Service (IOAS) shows that 56 countries are at some stage of regulating the organic sector. Thirty-two countries have fully implemented regulations; 9 countries are implementing regulations; and 15 countries have draft regulations.[3] In some of these countries, the regulations are limited to organic standards. Other countries also have implemented or are implementing accreditation (or similar conformity assessment requirements) for certifiers of products sold as organic. The three main importing authorities, the European Union, the United States and Japan, have implemented comprehensive regulations with standards and provisions for oversight and approval of certifiers.

In the private sector, 18 certifiers are accredited within the IFOAM Accreditation Program, and 12 certifiers are applicants for accreditation. The IFOAM Accreditation Program requires certifiers to meet the IFOAM Basic Standards for Production and Processing, and to comply with the IFOAM Accreditation Criteria. The Criteria are based on elements of the ISO Guide 65 for bodies operating certification programmes, and they contain other criteria specific to organic inspection and certification. The IFOAM Accredited Certifiers have signed a multilateral agreement for equivalency, aimed at streamlining the approval of products that are traded among their clients.

There are only a small number of agreements in the regulating countries for the acceptance of organic products from other countries, and virtually no mutual equivalence agreements between countries. The EU regulation provides for the approval of other countries, but the EU has listed just six approved countries, and the most significant importing country, the US, is not yet on the list. Japan also has a list of approved countries, and recently forged an interim agreement with the US for approval of products imported from that country. But Japan's approval of organic imports from the US and the EU in 2002 may have come too late to prevent a fall in the organic market. Sales in the Japanese organic market totalled only USD 250 million in 2001, compared to USD 3 billion in 2000. This precipitous drop is attributed to barriers to entry that were created by the implementation of the Japan organic regulations.[4] The US National Organic Program will be implemented on 21 October 2002. The National Organic Program has accredited a few foreign certifiers directly, and it is evaluating other foreign applications. However, it has not yet approved any other country or worked out any mutual agreement for the trade of organic products. Uncertainty is rife within the organic industry about the viability of organic trade between the US and EU after 21 October 2002. Because US and EU organic businesses source many of their products and ingredients from developing countries, a US/EU trade impasse would have world-wide repercussions.

Some of the systemic problems and challenges that have resulted from this labyrinth of standards and conformity assessment programmes are the following:

- Import discrimination, whereby compliance is required with standards not always suitable to the agro-ecological conditions of exporting countries;
- Multiple accreditation of certification bodies in order to access the three main organic agriculture markets (Europe, Japan and the US);
- Multiple certification of organic producers and traders in order to access the three main organic agricultural markets;
- Difficulties for traders, due to different interpretation of rules by certification bodies;
- Enormous workload (and delays) for authorities in negotiating bilateral equivalency;

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3. Commins, Ken and Ong Kung Wai, "Status of National Organic Regulations," in *IFOAM Conference on Organic Guarantee Systems Reader*, 2002, IFOAM, Tholey-Theley, Germany.

4. *The Organic Standard*, Issue 15, July 2002, Grolink A.B., Sweden.

- Limitation of the effectiveness of bilateral agreements in cases of products with ingredients sourced from around the globe;
- Lack of recognition by national regulations of private multilateral agreements such as the one between IFOAM accredited certification bodies.[5]

IFOAM organised a Conference on Organic Guarantee Systems in February 2002 which brought together representatives of the government and private sectors to identify the problems and possible mechanisms for solutions.[6] Participants unanimously agreed that the organic guarantee system could be further improved through collaboration in order to eliminate both private and governmental trade barriers and reduce administrative burdens and costs. Protection of the integrity of the organic claim and of diversity in organic agriculture can be achieved by establishing equivalence (and hence, mutual acceptance) between different systems — both private and government. The Conference explored the different models that are, or could be available, for the establishment of equivalence in organic agriculture, namely:

- Codex Alimentarius Commission guidelines for Organic Foods as well as guidance documents on Food Import and Export Inspection and Certification Systems, including the guidelines in preparation on the Judgement of Equivalence of Technical Regulations Associated with Food Inspection and Certification Systems provide technical reference points to preventing and resolving trade disputes. The Codex Alimentarius model can facilitate negotiations around inter-governmentally agreed standards and mechanisms for harmonisation and equivalency;
- The IFOAM Accreditation Program's provision for multi-lateral agreements between IFOAM Accredited certifiers through: recognition of functional equivalence (on the basis of the IFOAM International Basic Standards) and bilateral acceptance between two certification bodies (based on products and bilateral additional requirements);
- The United Nations' Economic Commission for Europe (UN/ECE) model, with its Common Regulatory Objective, international standards to be referenced and conformity assessment procedures provides a possible framework for the establishment of equivalence.

Representatives of IFOAM and the conference co-sponsors, the FAO and UNCTAD, are organising to carry forward the results of this conference into further avenues for harmonising organic guarantee systems.

Conclusions

Harmonisation of organic guarantee systems in the private and public sectors is necessary to sustain and enhance trade in organic products and the livelihoods that this trade supports. Establishing equivalence among the many private and government regulatory systems is viewed as the key tool for such harmonisation. Collaboration between the private and government sectors is essential to

5. *Op cit.,* Crucifix.

6 . IFOAM (2002), *IFOAM Conference on Organic Guarantee Systems Reader*, Tholey-Theley, Germany: www.ifoam.org.

identifying and implementing the means to equivalence. Efforts of IFOAM, FAO, and UNCTAD may give impetus to equivalence and harmonisation of organic guarantee systems world-wide.

INTERNATIONAL AND NATIONAL STANDARDS AND THEIR IMPACT ON TRADE: THE SWISS PERSPECTIVE

Patrik Aebi[1]

Abstract

While the Codex Alimentarius has taken steps towards international harmonisation of the organic regulations and markets, a proliferation of new obstacles to trade can be observed. Governmental labels excluding imported produce, bureaucratic obstacles, a narrow view of the equivalence concept and a lack of control of private organisations are seen as the main factors. Further efforts are necessary in order to remove these obstacles and to foster international trade in organic products.

Introduction

A first step towards international harmonisation of standards for the organic markets has been made with the adoption of the Codex Guidelines on the production, processing, and labelling of organically produced foods. However, there still are many obstacles to be overcome, and new obstacles are being raised by governments and private bodies in order to protect the domestic industry from imports.

Obstacles to trade

Switzerland and Swiss operators encounter various types of trade obstacles in the field of organic products, such as:

- Governmental labels for organic production which exclude products of Swiss origin — in the case of France, the governmental label "AB" (for "*agriculture biologique*") is not accessible for Swiss products, nor can this label be used for products which contain more than 5% ingredients from Switzerland.
- Extremely difficult and time-consuming equivalence assessment by some countries — in the case of Japan, the assessment procedure was started two years ago and it seems that it will take some more time. As Japan apparently does not base its equivalency assessment for certifying bodies on international standards such as ISO 65 / EN 45011, every single certifying body has to be registered by the competent authorities, which of course is a very complex task to do. For the Swiss certification bodies, this means a loss

1. Federal Office for Agriculture, Switzerland.

of time and money, due also to the fact that all documentation has to be translated into Japanese.

- Differences in interpretation of the World Trade Organization (WTO) enshrined concept of "equivalence" — in some cases, it seems that not equivalent, but identical production and processing prescriptions are required by importing countries. For example, in one case, the importing country requires that all products treated with calcium chloride solution (a fertiliser used in a very few, exceptional cases) have to be excluded by the equivalence agreement. Such an approach to "equivalence" being applied by various countries would in the long run oblige Swiss certification bodies to build specific producer groups for each export market. This might be possible for primary production (sub-group certification for every export market), but for processed products it seems administratively cumbersome and not economically viable.

- Private bodies tend to discriminate against imports from other countries by imposing supplementary requirements — in one case, Swiss chocolate producers are *de facto* forced to import milk powder from Great Britain in order to be able to get their chocolate labelled by the Soil Association for the British market. The reasoning of the Soil Association is that some elements of their animal husbandry regulations are more strict than the Swiss prescriptions (while others are not).

Conclusions

Recent developments show that notwithstanding the Codex efforts to give guidance to governments and industry in the field of organic farming regulations, obstacles to trade with organic products tend to proliferate. This is hindering the economic development of the sector. In order to counteract this, certain measures should be envisaged:

- Governmental labelling provisions or labelling requirements must not be based on the origin of the product or its ingredients (in violation of the WTO national treatment obligation), but must strictly rely on the principle of equivalence of production methods and inspection procedures;

- In line with the spirit and wording of the WTO Sanitary and Phytosanitary, and Technical Barriers to Trade Agreements, common inter-governmental rules for equivalency assessments should be established, in order to avoid a multiplication of individual procedures.

- Assessment of equivalence should be based on international standards and guidelines: for production and processing, the Codex guidelines should be taken as a reference.

- For the inspection system, the relevant ISO standards, as well as the multilateral agreements on accreditation, should be the basic reference.

- Anti-trust and competition laws should prevent discrimination of competitors by private bodies or organisations.

Chapter 5.

Issues for Producers of Organic Products

WHAT ARE THE KEY ISSUES FACED BY ORGANIC PRODUCERS?

Els Wynen[1]

Abstract

Concerns facing organic producers can be divided into two main groups, production and marketing. In the early days of the organic industry, the production problems of farmers were emphasised, and research topics were often concentrated on soil, pests and diseases. More recently, as the industry matures and international trade of organic products has grown, the importance of market-related issues has come to the fore. On the one hand, the need for harmonisation of standards and acceptance of equivalence for market development — which would facilitate international trade — is recognised. On the other hand, a more serious push towards domestic consumption seems afoot, which would advantage domestic farmers but disadvantage producers in exporting countries.

Introduction

The aim of this paper is to consider developments in the organic market from the perspective of producers. What are the key issues for producers at present, and what are they likely to be in the future? What are the expectations of producers regarding organic agriculture? What are the trade issues arising from domestic policy measures to develop organic products, including impacts on developing countries?

Many organic farmers all over the world face similar technical, economic and social problems. These are identified in the following section. However, answers to these questions depend considerably on where the organic farmer is located. The geographical location of a farmer is important because soil and climate differences influence input requirements, yields and total farm production capacity. Different policy approaches are then discussed, looking at the impact of policies on those producers for whom they are beneficial and those organic farmers in other countries that feel the consequences of those policies.

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Concerns facing organic farmers

The aim of surviving or thriving as an organic farmer can be accomplished in many ways. One component of survival is the financial viability of the farm. Farm returns are influenced by input use, total production, product prices and market access, that is, production and marketing issues. A summary of issues is provided here to serve as a background for the policy issues, discussed in the next section.

Inputs

In essence, organic farmers manage soil fertility (often called crop nutrition by conventional farmers) and combat pest problems (including insects, weeds, fungi, nematodes and diseases) in a different way than conventional farmers. Management methods may include, for example, changes in inputs (crop varieties and livestock breeds; nutrients; predators), rotations (more and different crops and livestock), and timing of activities (planting dates and harvesting dates).

Thus, one area in which organic farmers encounter problems in the production of crops and livestock is in the maintenance of soil fertility and avoidance of pest attacks, while minimising the environmental effects of their actions. The exact nature of the soil, pest and environmental issues is geographically determined. For example, in a climate where frequent small amounts of rainfall occur, weeds are more likely to be a problem, while warm and humid conditions are more conducive to fungi or pest problems in crops and livestock. Dealing with these may require a change in use of other inputs, such as labour and capital.

It is therefore not surprising that because relatively few farmers use organic practices, many of the complaints by farmers are centred around lack of knowledge about organic management methods or about inputs (where to purchase and the efficacy of the available products). In addition, inputs may be more expensive due to extra transport and handling charges for those inputs not commonly purchased (Wynen, 1992).

It is often assumed that more labour is needed in organic than in conventional agriculture, but this depends on the industry and country. Higher values for labour on organic arable and mixed farms are reported in Europe, with similar or lower values for dairy farms. In general, organic horticulture enterprises need considerable more labour (Offermann and Nieberg, 2000). In Australia, the organic cereal-livestock industry and dairy industry don’t show any signs of requiring more labour than the conventional industries (Wynen, 2000; 2001). While higher labour requirements may be seen as a problem by some and as an advantage in regions with high unemployment, the availability of the input, when required, may be a constraint.

Studies on differences in capital values of land used for organic and conventional production are more difficult to find. As land values are determined by expected returns, there should not be a large difference between the two types of farms. Organic farms may require additional capital due to, for example, changes in farm lay-out (fencing), storage, change in livestock numbers and in machinery. As these investments are needed when converting to organic farming, it is especially the farmers in transition who carry this burden.

Another issue, sometimes discussed by farmers perhaps more in the past than presently, is the moral support needed to take the step towards organic management while there is social pressure against adopting the technology (Wynen, 1992).

Outputs

Nutritional and pest constraints under organic management can result in yield decreases as compared with conventional agriculture. However, this is by no means always the case, especially not in areas where conventional agriculture is practised relatively extensively, such as in the United States, Canada and Australia [Lampkin and Padel (eds), 1994]. Some studies indicate that the difference between organic and conventional yields is widening, but others suggest that this is not necessarily the case (Offermann and Nieberg, 2000). In developing countries, the availability of conventional inputs is often restricted anyway, so that higher yields, if they were to be a result of those inputs, are not achievable. In addition, slow mineralisation of nitrogen, one of the factors that determines differences in yields between the two systems in cool climates, is not relevant in many developing countries.[2] A growing number of success stories in organic agriculture in developing countries are being recorded (FAO, 1998 and UNCTAD, forthcoming).

The variability of yield and financial returns has been a topic of study in developed countries. Little evidence has been found that the management system is a major factor in the degree of yield and financial variability, although some studies show less variability under organic management [Lampkin and Padel (eds), 1994].

The tendency towards mono-cropping in conventional farming is reversed on an organic farm. That is, less financially-rewarding production may be included in the rotation. This affects the total farm production, and has a negative effect on the gross returns.

Farm returns

From the producers' point of view, net returns to farming are an important, albeit not the sole, consideration to continue farming. These net returns are made up of gross returns for the whole farm minus input costs. The gross returns are dependent on total production (that is, yields of individual enterprises and rotation practised on the farm), product prices, and farm subsidies.

Although the level of prices influence demand for the product, it is the relative prices of conventional and organic products that are of importance in consumer decisions. This means that there are two prices that are of importance. One is the retail price of the organic product, which is only in part (depending on the product) influenced by the farm-gate price. As long as organic production is small, the off-farm costs of marketing the product (including cost of transport, insurance and distribution) will be high relative to those in conventional products. This extra cost will need to be recouped by the traders, resulting in high retail prices. However, in markets where traders have monopoly powers, the retail price can also reflect, at least in part, monopoly rent.

The other important price is the retail price of conventional products. External costs of conventional farming practices (such as problems with water quality, people's health, biodiversity) are often higher than with organic farming.[3] If these costs were borne by conventional producers instead

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2. FAO (1998): "Due to slow mineralization of nitrogen under cool growing-conditions, crops on organic farms have a shortage of nitrogen early in the season. However, in countries where low soil temperature is not a limiting growth factor, as in many developing countries, this factor should not prove significant."

3. See, for example, work carried out by Pimentel *et al.* (1993); FAO (1996); Redman (1996); Stolze, *et al.* (2000).

of by taxpayers, at least some of the costs would be passed on to the consumer, thus reducing the difference between retail prices for products of the two farming methods.

Another way in which (farm) prices can be reduced is by subsidies for organic production. They are provided in some European countries. The effect may be that the cost of production is lowered, and that the farmer can accept lower product prices in order to survive. This can be passed on to the consumer.

To obtain price premiums, organic products need to be certified as genuinely organic. In some countries certification is rather straightforward, as the infrastructure is in place. In others, any certification and especially one that is acceptable to enable international trade, can be a major problem, and rather costly.

Another issue is the availability of the market. Campaigns in favour of "domestic consumption" can enlarge the market for some producers, and restrict access for others.

So, in summary, separate marketing can be rather expensive for several reasons, including the low volume of product, the possibility of monopoly power in the trading sector and the requirements of a certification system. The taxing of pollution-causing inputs in conventional farming, and subsidies for organic farming can reduce the differences in consumer price for organically and conventionally grown products. Costs of certification to secure the possibility of (international) sales, possibly through international certification, can be a major problem (and very costly). An additional cost for producers in exporting countries is that they may have to fulfil the requirements (and organic standards) of several countries simultaneously. A separate problem for those countries is that the organic movement, especially in developed countries, may be focussed on local consumption, thus making market access for exporting countries more difficult.

Producer constraints in developing countries

A list of production constraints for developing countries closely resembles the problems applicable to organic farmers in general (Twarog and Vossenaar, 2002):

- technical know-how (due to few trained professionals in the field);
- lack of organic production inputs (composting materials, biopesticides, biofertilisers);
- lack of labour;
- little research and development (varieties and production methods);
- conversion method, with reduced yields, may be a larger obstacle than in developed countries;
- infrastructure problems (*e.g.* transport and storage) for regular agriculture makes segregation of organic production even less likely;
- limited market information and channels;
- lack of acceptance by existing standards and certification, or the need to import certification expertise in order to be able to export.

A further issue of relevance to farmers who do not own their land, possibly more frequently the case in developing countries, is investment in soils. In organic agriculture, the emphasis is on soils, where improvements are seen as essential for nutrient and pest prevention management. In those countries where farmers own their land, or where leasing arrangements are such that land cannot be taken away from the user easily, investment in the land base is not a problem, as the returns are for the investor. However, where the farmer has no land-tenure, there is no incentive for the lessee to improve soil quality. Indeed, there may be a disincentive, as improvement of land quality may be directly linked to the land being withdrawn from the user.

Some further thoughts

When listing producer constraints, it is important to realise that some issues relate to the scale and maturity of the industry, and will be resolved as the industry grows. That is, these problems are not intrinsic to the organic system, even though farmers may experience them as problems for the time being. For example, lack of information about organic practices is often mentioned as a major problem to convert to organic agriculture. Whereas this may be a problem for many prospective organic farmers at present, if future generations on organic farms continue to farm organically, a lot of the knowledge will be automatically transferred between generations — and to non-organic neighbours. Another example is the market for both inputs and outputs. There is no reason to believe that the markets for organic inputs, at least the physical ones, will behave differently from those operating for conventional farmers. The costs of processing and marketing organic produce should also decrease per unit of product, as the number of organic farmers increases. An increase in the number of traders could reduce the scope for monopoly rents. Finally, many of the problems that are genuine long-term problems for organic agriculture can be alleviated by government policies. This is the topic of the next section.

Policies: good for some, bad for others

Justification

Some countries realise that there is a role for government to play in the expansion of organic agriculture. As negative externalities in conventional farming are larger than in organic agriculture, they have decided that at least some government interference favouring organic agriculture (or adjusting the balance, some would say), is justified.

Inputs in organic agriculture often possess more of the public goods characteristic — a justification for government involvement — than in conventional farming. Changes in rotation, crop and livestock mixtures, biological processes involving predators and parasites etc. take the place of pesticides and fertilisers — private goods for which companies are willing to do research and advertising. Therefore, without government intervention, obtaining and dispersing knowledge about the most efficient use of many of the practices in organic agriculture will be carried out at a sub-optimal level. Also the development of a separate market, requiring standards and certification both for the domestic and international market, has public good aspects, and deserves government attention. Policy measures are therefore usually in the areas of subsidies for organic farmers, taxes for conventional farmers, research and extension, and product certification and harmonisation.

The last policy mentioned in this section refers also to markets. However, it is mainly a private initiative to influence the market availability for domestic producers.

Level of support

Agriculture is carried out rather intensively in many European countries, and population density is such that any negative effects of such farming would perhaps be felt earliest and most intensively by inhabitants/consumers in those countries. In addition, Europe is a region with a culture of supporting agriculture. Hence, it is not surprising to see that in Europe arguments for special aid for organic agriculture have resulted in subsidies in many areas. Under agri-environmental programmes in the European Union, direct payments to established and in-conversion farms amounted to ECU 260 million in 1996. In the same year subsidies were also provided for other purposes, such as research and development (ECU 15 million), advice, extension and information (ECU 15 million), regional development programmes (ECU 9-10 million), training and education (ECU 5-10 million) and marketing and processing (ECU 5-10 million) (Lampkin *et al.*, 2000).

In the United States, direct subsidies for organic farming practices are considerably lower. There are no federal subsidy schemes for organic agriculture *per se*. States administer the agri-environmental cost-sharing programmes (such as the Environmental Quality Incentives Program), for which only one state has classified organic farmers as being eligible. However, organic farmers do make use of the traditional commodity programmes and disaster payment programmes. Although this gives them an advantage as compared with foreign organic (and conventional) growers, it does not do so compared with the US conventional farmers. Research and education programmes for organic agriculture attracted USD 2 million (0.11% of the USDA research and extension appropriations) in 1995.[4] In 2001, USD 499 000 was allocated to the Organic Transition Program for research on conversion systems. In marketing, the USDA Market Access Program (MAP) contributed USD 48 520 for organic export promotion, representing approximately 0.05% of the USD 90 million spent on that programme in 2000. At present, organic farmers are exempt from a “tax” that producers within commodity groups place upon themselves to pay for research and advertising, on the basis that no research is conducted on organic farming.[5]

Although organic growers in other countries may well receive some support in one form or another, it will rarely be to the extent provided in Europe. Especially in developing countries, aid is often totally lacking. In some countries, governments may aid the industry, but compel them to pay for the cost of the service, or under-service. In Australia, for example, the Australian Quarantine and Inspection Service (AQIS), part of the Commonwealth Department of Agriculture, was instrumental in setting up standards and a compliance scheme for the export market in the early 1990s. (This, by the way, does not protect the word “organic” in the domestic market.) Attendance at meetings by the different national organisations involved in organic agriculture and standard-setting had to be financed by these organisations, no mean feat in a country where travel is expensive. More lately, the organic industry has been compelled to pay government a fee to oversee the scheme on a cost-recovery basis.[6] Costs of inspection and certification are paid fully by the producer, in addition to the cost of the AQIS export programme. In other cases, services provided may not even cover the payments by organic farmers. An example concerns research funding specifically for organic agriculture. Expenditure is

4. See also Lipson (1997).

5. Luanne Lohr, Associate Professor Agricultural and Applied Economics, University of Georgia, Athens, personal communications (August 2002), and Lohr (2001).

6. “The AQIS organic program will directly cost the Australian organic and biodynamic industry A$84,500 (approx. US$46,500) for the 2002-03 financial year. This sum is divided into seven certifying bodies…and I assume is then passed onto approx 1 700 clients Australia wide.” Ian Lyall, Food Program, AQIS, personal communications, August 2002.

estimated to be around USD 179 000 in 2000-2001, while organic farmers were levied USD 216 000[7] for research purposes in that year (Wynen, forthcoming).

Subsidies for organic growers

Organic farm subsidies have a number of direct and indirect effects. First of all, they allow farmers to sell their products cheaper than they otherwise could have done. This will affect the number of consumers who are willing to buy the produce, a very important aspect in building a market. At the same time, it is likely to affect the input prices into the production process, especially of land. This is the case because there is a conversion period for organic production, *i.e.* a threshold to entry. However, the price is not likely to rise too much, as other land can — in most cases — readily be converted to organic farming. The net effect for organic farmers is therefore an increase in income, depending on the price effect.

In countries where conventional farming is subsidised, (unintended) negative effects on organic agriculture by these general subsidies can occur. For example, due to a difference in crop mix on organic and conventional farms, EU policies (which pay different amounts for different enterprises) can deliver higher subsidies to conventional farms than to organic farms of the same size. This was the case, for example, in Denmark in 1996, where the average conventional farm received DKK 149 000 from EU subsidies, and the organic farm DKK 124 000 (equal farm size) (Wynen, 1998). Part of the extra subsidies specifically for organic farming — DKK 53 000 — compensated for the shortfall in conventional subsidies, and could therefore rightly be deducted from the organic subsidy. Even so, compared to countries without a subsidy, this could still be considered a significant amount.

A second class of effects is created towards producers who do not receive subsidies. If they have similar costs to producers who receive subsidies, they will become less competitive, and may go out of business. This was recognised in the UK, where the Soil Association called for similar payments for organic farmers "…as UK farmers are currently disadvantaged" (Soil Association, 2002). A similar argument is used at present in the United States — of US farmers being disadvantaged *vis-à-vis* European farmers (Lohr, 2002). However, there are many countries in which organic producers cannot expect to ever be granted a subsidy. For those producers (often exporters from developing countries), European subsidies to organic production are a two-edged sword. On the one hand, they help develop the market into which exporters may be able to sell, and on the other hand they make the European product more competitive.

Farm subsidies in general can lead to inefficient use of resources, in organic agriculture as in conventional agriculture. In other words, subsidies in one country, by affecting the price level and the quantity of production (number of farmers who can stay in business), affect farmers in other countries. This can distort the true picture of efficiency in resource use between organic farmers in different countries: bad news from an environmental perspective.

The international organic movement presses for subsidies for organic agriculture, as this is its role. But these subsidies may have an indirect effect of limiting production in non-subsidised areas. It is important to realise that organic farmers in those countries are equally farming according to organic practices, and deserve as much support by those who are concerned about minimising the world's use of resources in the quest for agricultural production. A more appropriate approach may therefore be to target the externalities generated in conventional farming.

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7. In general, the government tops up farmers' research levies. If this is added to the levies on organic farmers, the total amounts to USD 360 000.

Taxes on conventional farming methods

The market solution to the problem of ensuring that conventional farmers take more responsibilities for the externalities they cause is, in theory, reasonably straightforward, *e.g.* taxing the use of fertilisers and pesticides such that producers only use the amount of input that causes damage equal to the taxes paid. Scandinavian countries in particular have implemented such policies. For example, Denmark has taxed pesticides since the 1980s. Though it started with a modest rate of 3% in 1987, by the late 1990s this had risen to 33% for herbicides and fungicides and 53% for insecticides and soil disinfectants (Schou and Streibig, 1999).

If the intention of taxes is to make farmers carry the burden of the total cost of the input, the practicalities of a tax are not quite clear. As fertilisers and pesticides have different effects on different soil types and under different climatic conditions, the use of the same amount of the same input does not create the same environmental damage. Making each farmer pay their particular cost is therefore difficult, and an assumption of average costs in cost calculations may therefore be most appropriate.

Research and extension

Lack of funding for organic research and extension is often pointed out, and the direction of research to promote organic agriculture has also been the topic of discussion.[8] In the past, the emphasis of research has often been on farm production techniques. For example, at the International Federation of Organic Agriculture Movements' (IFOAM) Scientific Conference in 2000, almost half of the papers (and three-quarters of the posters) were presented under production-related headings (soil, plants, animals). Approximately 15% of the papers were in the market development category (including standards and certification) and a similar figure for policies.

Very little effort has gone into analysing where the limited funding could best be spent to reach the goal of expanding organic agriculture (Wynen and Vanzetti, 2000). One area that has been recognised as worthy of attention for example is that of consumer education, for example in Denmark.[9] A change in demand is expected to automatically pull the production along.

Research into more efficient use of inputs into organic farming will result, in the long run, in lower farm-gate prices, not in higher returns to farming. This means that, in an indirect way, fewer problems with production techniques result in decreased production costs, which are then passed on to the consumers.

Standards, certification and harmonisation

Product certification is an essential part of the viability of organic producers, and is important in international trade. Some countries, for example in Europe, have subsidised the setting up of these systems. State help was provided with the implementation of a national protection of the word "organic", with suitable standards and certification schemes. The aim was to recompense the private standard setting and certification bodies for their involvement in regulatory activities. State help is also

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8. See, for example, Krell (1998); FAO (2000); Lipson (1997); Lockeretz (2000); and Wynen and Vanzetti (2000).

9. See, for example, Wynen and Vanzetti (2000), and Lampkin *et al.* (1999).

provided in a number of countries, both in the EU and the US, for the inspection and certification fees that farmers may otherwise have incurred.[10]

Despite the organic movement's professed interest in local consumption of organic products (see below), there are a number of countries where exports are and will be of great relevance. In developing countries, export markets are essential for income generation, especially where premium prices can be secured in developed countries and less so domestically. In other cases, such as Australia, Canada and New Zealand, which have a high production potential and relatively low population density, domestic consumption could not take up total production. For those countries export is essential, and the question, then, is how this can be accommodated? [11]

In order to facilitate international trade, harmonisation of standards and certification over the world is needed.[12] This should not imply exactly the same standards for all countries. As agricultural conditions are dissimilar, flexibility in standards is required. IFOAM certainly recognises this.[13] However, for countries to be able to export to importing countries, their standards will need to be acceptable to the importing country. This may mean that standards need to be adopted which are not practicable to the exporting country. International trading rules permit countries to determine their own standards so long as they apply them equally to imported and domestically-produced goods. However, there is a danger that countries set particular standards to protect their own producers.

The two countries with the largest demand for organic produce, the EU and the US, have developed an organic certification scheme that deals not only with domestic organic certification and marketing, but also with international trade, that is, import issues.

EU regulations regarding imports have been in place since the early 1990s and are summarised here to provide a picture of the constraints for countries wishing to export to the EU. The EU allows three methods of import from third countries (Commins and Kung Wai, 2002). First of all, the EU established a "third country" list, which includes countries with which the EU has established equivalence. That is, products exported from those countries as "organic" are accepted as such by the EU. At present, seven countries are on the list.[14] Products from other countries can be imported if the importer submits documentation that the products are produced and certified according to rules equivalent to those of the EU. This provision (the "importer derogation") is scheduled to expire on 31 December 2005. Each consignment must have a separate authorisation. A third method of importing from third countries is to have an EU-approved certification body — within the exporting country — certify products. A recent regulation impacting on the marketing of organic products in the EU requires — for each consignment — an original *"certificate of inspection for import of products from organic production"*. This is to be produced by the approved authority or inspection body in the

10. Lampkin *et al.* (1999).

11. There are countries where a large part of the organic production is sold in the conventional market. For example in Australia, 72% of all organic wheat is sold as organic, half of the organic milk, one-third of the beef, and only 10% of the mutton and wool. The rest of the production of these products is sold in the conventional market (Wynen, forthcoming). Michelsen *et al*. (2000) mentioned that, in the Czech Republic "…only few organic products were reported sold as organic and price premiums were not obtained for most products". Also, in India, a large part of the organically-grown produce is sold on the conventional market (Jha, forthcoming).

12. See IFOAM (2002).

13. See IFOAM's website: www.ifoam.org/standard/basics.html under "Variations in Standards".

14. Argentina, Australia, the Czech Republic, Israel, Hungary, New Zealand and Switzerland.

third country from where the goods are exported. It must be submitted to and endorsed by the authority of the EU member State where the product is imported, after which the product will be able to enter into free circulation within the EU.

The United States' Department of Agriculture (USDA) can accredit certifying bodies (both domestic and foreign) to certify organic produce in third countries. In addition, foreign certifying bodies can be accredited if the USDA determines — at the request of a foreign government — that the accreditation of this body by that government complies with the USDA's requirements. A third option is that the US and a foreign government have agreed upon equivalency of standards and certification procedures, so that imports from this country are acceptable.

For producers in many developing countries, and also in developed exporting countries, these requirements mean that export of organic produce may not be easy. Many developing countries do not have a domestic organisation that can carry out the required certification. Certification by international certification bodies then becomes essential, which is likely to be expensive. This may be an insurmountable problem, particularly for small-holders in developing countries. The need to comply with different standards in different markets would add to the cost of production and marketing. In addition, time delays, due to the requirement of documentation of each consignment, may well inhibit exports.

Market availability

Although rumblings about local production and consumption have been heard for a long time in the organic movement, they have increased in intensity over the last few years. The idea behind it is that local consumption would cut down on transport costs, and therefore be better for the environment (Geier, 2001). While organic organisations may campaign for consumers choosing locally produced food,[15] the case for reduction in resource use through producing goods as efficiently as possible (through specialisation of production and international trade) seems forgotten or misunderstood (Vanzetti and Wynen, 2002). Purchases of locally-produced products at higher prices than those which international trade allows, can accentuate non-optimal resource use to the detriment of people — and environments — in all countries. The concept of the "whole life cycle" evaluation in terms of resource use is well established (Meier-Ploeger, Kjer and Simon, 1996), yet the importance is rarely mentioned when the issue of local food consumption comes up. Furthermore, exports of organic goods provide an important opportunity for many poor farmers in developing countries.

Conclusions

Concerns facing organic producers can be divided into two main groups. One is in the area of production (inputs with their effects on yield and total production) and the other is marketing (product prices, cost of marketing and market availability). In the early days, the production problems of farmers were emphasised, and research topics were often concentrated on soil, pests and diseases. More lately, as international trade of organic products has grown, the importance of market-related issues has come to the fore.

15. See press release by the Soil Association, United Kingdom, 8 July 2002, "New Partnership Launched to Promote Local Food": www.soilassociation.org/sa/saweb.nsf/d918a008fbadb58780256aae00533ff9/80256ad80055454980256bf0003f0122?OpenDocument.

Direct subsidies to organic farming, to aid conversion or to compensate for more environmentally friendly practices, and other forms of subsidies, have been obtained in some countries but not in most. These cause advantages for some (including producers and consumers) and disadvantages for others (producers in exporting countries whose competitive edge decreases). Decreases in consumer prices are essential for a growth in the organic market, which will partly happen through increased production and maturity of the market. A further realisation is the need for harmonisation and equivalence in agriculture. Serious issues regarding non-tariff barriers (such as time delays due to the need for documentation for importing purposes) are raised. A push towards domestic consumption seems afoot, which could also be seen as a non-tariff barrier: organic producers in some developed countries protecting their patch against products from exporting countries.

Rather than dividing the organic movement through promoting policies that are good for some and bad for other producers, a more useful approach for all organic producers may be to encourage governments to initiate polluter-pays policies. A tax on pesticide and fertiliser use is one such example in agriculture. Though several countries in Europe have taken this approach, far more could be done. Such policies are likely to prove beneficial to organic producers, consumers and environmentalists in all countries.

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POLLUTION THREATS TO ORGANIC PRODUCTION AND PRODUCTS

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Abstract

The focus of attention in the organic sector has shifted away from organic farmers and production methods to consumers and their expectations regarding the specific qualities of final food products. Organic product consumers, who are willing to pay more for organically grown food, expect these products to be genuinely natural and pollution-free. The organic sector is far more sensitive than other sectors to problems of pollution [by chemical products, genetically modified organisms (GMOs), etc.], which can lead to serious crises with major negative economic consequences for the professionals involved and tarnish the image of the organic sector as a whole. In response to ever-growing consumer expectations, organic professionals must become ever-more vigilant and develop a specific approach aimed at guaranteeing the quality of final food products. However, the organic sector must not confine itself to this approach alone. It is important that consumers be fully informed of the major benefits that organic production can have for the environment, the preservation of natural balances and animal welfare. It is only by making the public more aware of these benefits that we will be able to ensure the harmonious development of organic production in the long term.

Introduction

Organic farming has now become an established feature of economic and social life in France and in Europe generally. Organically grown products are widely known to the general public, particularly because of the growing interest shown by the media.

Organic farming in France was started in the 1950s by a group of committed pioneers concerned over the excesses of intensive "chemical" agriculture as the sole way of meeting food needs. These producers were in turn supported by consumer movements advocating organic farming that would respect all forms of life and preserve natural balances. Today, the new consumers are often more interested in the personal benefits that they can gain from organic products both in terms of their health (products safe from problems such as mad cow disease, GMOs, pesticides, heavy metals, etc.) and enjoyment (more tasty and authentic products). This approach is particularly prevalent in France, where there is growing demand for "naturally good" products.

Organic farming was officially recognised in France in the framework Farm Act of July 1980, which for the first time mentioned "farming without synthetically produced chemicals". The three terms of "organic", "ecological" and "biological" used to refer to organic farming in the various

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European Union countries were only introduced officially into Community and French terminology in 1991 in two European regulatory measures binding in the EU member States.

The first of these measures is Council Regulation 2092/91, which defines "rules of organic production" and also the procedures for processing, labelling, marketing and controlling products "obtained by organic production methods". It establishes a close link between "production methods" and "recognition of the product" obtained by these methods. It should be pointed out that what is currently guaranteed is not the specific quality of the product itself (which would be a "performance requirement"), but rather the production method, which is a "best endeavour" requirement. This regulation has recently been supplemented by Council Rule 1804/99 of 19 July 1999, which includes livestock production and prohibits any use of GMOs.

The second measure is Council Regulation 2078/92. It made "aid for conversion" one of the agri-environmental measures implemented to accompany the reform of the CAP (Common Agricultural Policy) with a view to supporting and promoting, including financially, more environmentally friendly and less intensive agricultural practices, thereby contributing to the CAP objective of reducing agricultural surpluses. These two European regulations have given organic farming a two-fold status by linking environmentally friendly production methods to a means of marketing organic products through a label of quality.

The goals of organic farming include to help improve the environment in which we live, promote animal welfare and respect natural balances. It is therefore practised in all geographical areas, including in environments highly exposed to pollution of all sorts. It may not be aimed at producing goods of a given quality or marketing them as organic products. This was long the case in Italy in particular, which is the largest producer country of organically grown products in Europe, where organic farming was developed through special financial subsidies to farmers practising this type of environment-friendly production. The resulting products were marketed in traditional food distribution channels without being promoted or labelled as organic. Since there is no separate organic market in this type of situation, it is clear that problems of the external pollution of organic products have very little impact.

The situation has changed considerably in recent years and organic products now constitute a large and rapidly expanding market world-wide. Total turnover is now said to be EUR 30 billion. Consumer demand is growing and production is expanding in developed countries, but also increasingly in the less developed countries, which are attracted by this market because it generates a higher return for labour and is better adapted to local production conditions.

The focus of attention in the organic sector has shifted away from farmers and production methods to consumers and their expectations regarding the intrinsic quality of food products. Although this has long been the case in countries such as Germany and France, this trend is spreading since governments and economic operators have realised all the benefits that can be derived from the effective marketing of organic products. It is clear that organic product consumers, who are willing to pay more for organically grown food, expect these products to be genuinely natural and pollution-free. On the other hand, they are likely to turn away from these products if it is shown that they contain contaminants, even if these are in far lower quantities than what is allowed in conventional production. In response to ever-growing consumer expectations, the organic sector must become ever more vigilant.

Today, organic farming in Europe consists of prohibiting synthetically produced chemicals (fertilisers, pesticides), GMOs and ionisation and radiation processing, and severely limiting the use of medical substances and additives.

Three specific forms of pollution affecting organic products will be examined in greater detail:

- pollution by chemical products (fertilisers, pesticides) that are prohibited in organic farming but authorised in conventional agriculture;
- pollution by chemical products that are prohibited in all agriculture and food products;
- pollution by GMOs, which are considered a form of pollution in organic farming.

Chemical products authorised in conventional agriculture

In Europe, the organic sector is highly monitored, both by certification bodies enforcing standard EN 45011 and by the competent national authorities. Organic farmers must comply with all the general health regulations in force as well as all the provisions specific to organic farming.

When organic products are polluted during the production cycle by chemical products unauthorised in organic farming (for example, if they are contaminated by prohibited treatment products from a nearby field of conventional crops), this can have dramatic consequences for the producer and even for the sector as a whole, depending on the stage at which the problem is detected. It can raise real suspicions that organic producers may be using unauthorised chemicals and, in any case, cause the incriminated products to be denied certification, which can mean considerable financial losses. One of the only steps that organic farmers can take if the pollution is shown to have been caused by a neighbour is to sue for damages.

This type of incident, which often has a virtually immediate effect on the final product, can only tarnish the image of a sector in which the final quality of the product is the prime consideration for consumers. When these problems arise, the good faith and honesty of the producer often count for little when media reports continually raise doubts about the relevance of organic production, with all the negative consequences that this has for the image and credibility of the entire organic sector.

To prevent these incidents from occurring, organic professionals are seeking to ensure that organic plots are more isolated from nearby fields where conventional crops are grown by establishing buffer zones or planting hedges. In order to minimise the risks of pollution by conventional crops located nearby, it would also be advisable to promote the conversion of entire areas to organic farming.

Chemical products prohibited in all agriculture and food products

There may be accidents and even illegal practices involving chemical products that are completely prohibited and may not be used on any agricultural and food products. Such incidents pose special risks for the organic sector.

Let us look at a case involving nitrobenzene, which has been totally prohibited in the agricultural sector in Europe for some twenty years. A few months ago, some organic cereals and later poultry were shown to have been polluted by this substance in an EU Member country. The publicity given to this incident by the media and certain politicians did much to discredit organic farming in the eyes of consumers. In fact, organic producers and processors were not responsible for the pollution, but rather a warehousing firm that had stored all sorts of agricultural products (both conventional and organic) in a warehouse contaminated by nitrobenzene previously stored on this site. Organic farming is subject to many more inspections and tests than conventional agriculture (thereby enhancing safety for consumers). This fact explains why the presence of nitrobenzene was detected in the organic products well before it was identified in the conventional products. Nevertheless, the incident had a very negative impact on consumers as well as serious consequences for organic producers (destruction of poultry and a sharp drop in the sales of all organic products), although this did not occur in the conventional sector. Consequently, organic products are particularly vulnerable and the organic sector is highly sensitive to any problems of pollution.

Let us look at another example, namely dioxin. This substance is not used in agriculture, but is very often found near household waste incinerators. Like other types of agriculture, organic farming is exposed to dioxin pollution, and this is even more the case for certain types of production, such as poultry. This is because free-range rearing is the rule in organic poultry production, unlike conventional production where poultry are generally raised in large barns and do not have outside access. For this reason, it is possible that in some cases organically raised poultry may be more subject to dioxin contamination because of their free-range access. Incidents of this kind have occurred in Europe, and each time they have had serious consequences for the organic sector concerned, both economically and in terms of its image.

This type of pollution clearly raises the issue of whether organic production should be confined to specific regions. Should the production of organically labelled products be prohibited in certain geographical areas (near major roads, polluting companies, etc.), unless special financial support is provided to promote organic production in these areas because of its contribution to the quality of the environment (soil, water and air)?

In any event, these contamination accidents show that a significant share of consumers now expect organic products to provide many guarantees, some of which are not directly related to the production method. They want a guarantee that their organic food is completely safe, since these consumers, or at least some of them, no longer seem to believe that this is guaranteed for conventional products.

Genetically modified organisms

The use of GMOs is prohibited in organic farming. Consequently, organic products make it possible for consumers who wish to do so to avoid genetically modified products. There are many possible sources of pollution by GMOs, such as seed, animal droppings and organic waste used to improve the quality of soil, treatment products, animal feed, veterinary products and ingredients used in food processing.

In order to comply with the principle of prohibiting the use of GMOs, economic operators in the organic sector in Europe are subject to the following requirements:

- ***for seed:*** seed manufacturers must guarantee varietal purity and the absence of GMOs;
- ***for animal feed:*** authorised feed and feed supplements that are not organic (vitamins, amino acids, micro-organisms) must be guaranteed not to contain GMOs;
- ***for processed products:*** all preparations containing micro-organisms used for making products (yeasts, rennet, lactic starters, enzymes, etc.) must be guaranteed not to contain GMOs. The same is true for certain natural flavourings, vitamins and for soy lecithins.

These requirements are progressively being extended to fertilisers and crop treatment products (which may contain genetically modified bacteria or viruses).

Despite these regulatory provisions, there are still risks that organic products may be contaminated, usually involuntarily, due to the following factors:

- some seeds, even if they are 99% pure (the maximum guarantee provided by seed companies) may contain a tiny proportion of transgenic seeds;
- organic crops may also contain transgenes because of cross-pollination with genetically modified plants from conventional fields in the same area.

Appropriate measures should be implemented to address these risks: regular testing, maintaining a safe distance from conventional plots and thorough cleaning of transport equipment and storage facilities.

It also seems necessary to identify fully the genetically modified products used in conventional agriculture (raw materials, seeds, food additives, etc.) to make it possible systematically to avoid the risks of contact between these products and organic products.

When an organic field is proven to have been polluted by genetically modified seed or pollen, the organic producer always has the option of suing the firm or producer likely to be responsible for the pollution, although this will have little chance of success and will definitely entail legal costs. There is currently no insurance available in France against this dissemination or pollution risk, but organic producers can take out legal expenses insurance that will be very useful when confronted with this problem.

Nevertheless, a major question has yet to be answered: can all pollution by genetically modified plants (essentially through pollination) be prevented effectively on a lasting basis if genetically modified and organic crops are grown in the same geographical area? Should steps be taken to establish maximum thresholds of acceptable pollution for organic products, despite the foreseeable consequences that this would have in terms of image? Or should serious consideration be given to setting aside certain geographical areas (countries, groups of countries or an entire continent) in which only crops strictly certified as not being genetically modified could be grown, and others in which genetically modified crops could be planted, bearing in mind all the consequences that either decision would have in economic terms and in terms of image?

Conclusions

The shifting of attention in organic farming away from production methods to the final products reflects citizens’ growing expectations regarding the qualities of the organic products that they consume. Consumers are often very ill-informed about the methods used to produce the organic products they buy and their beneficial effects on the environment (soil, water and air) and animal welfare.

Given this demand for more natural products free of chemicals and GMOs, the organic sector must be more vigilant regarding the final quality of products. If it fails to do so, any problem of pollution of an organic product could be very costly to the sector as a whole, both financially and in terms of its image, even though this seems particularly unfair since much of this pollution is caused by conventional agricultural practices.

Although confining organic production to specific geographical areas would be one way of responding to the demand for high-quality final food products, it would completely side-step the broader environmental aspect of organic production, which is specifically aimed at improving the quality of our environment.

Although responding to consumers' expectations regarding the quality of final food products is a legitimate concern, it is also indispensable to develop outreach aimed at educating the public about the key benefits that can be expected from organic production for our environment (soil, water and air), the preservation of natural balances and animal welfare. The increasing use of highly traditional advertising fails to make a growing segment of consumers aware of this aspect by focussing solely on food products, even if the message conveyed is the naturalness of these products. Although organic production aims at eliminating most synthetic chemical products in food (pesticides, antibiotics, artificial colouring, preservatives, etc.), it cannot be entirely free from outside pollution and there can be no zero risk. Consumers must realise that the benefits of organic farming are not called into question by the occasional accidents involving the pollution of organic products. It is important that consumers be given clear and relevant information on the environmental benefits of organic production in order to promote healthy and coherent development of the different segments of the organic sector that is sustainable in the long term.

TO CONVERT OR NOT TO CONVERT TO ORGANIC FARMING

Eric Regouin[1]

Abstract

At the end of 2002, the Netherlands had approximately 1 500 organic primary producers. From the mid-seventies onwards, the area under organic farming grew by about 16% annually although this growth has been slowing down since 2001. According to some studies conducted in the Netherlands, only a very small percentage of conventional farmers seriously consider conversion to organic production methods. There are even cases of organic growers returning to conventional agricultural production. This paper explores some of the many factors that influence such decisions and their consequences for the policy making process. A principal conclusion is that not just technical constraints, nor negative market perspectives, nor other limitations, should be addressed as the single main target of government policy. Only an integrated policy approach that addresses reality as it is and as conventional farmers perceive it will result in increased interest for organic agriculture. Most of the information in this paper is the outcome of various projects undertaken by the National Reference Centre, in which farmers and other stakeholders, both in the organic farming community and outside, gave their views and thoughts on the subject of conversion.

Introduction

Support policies for organic agriculture often lack a coherent and integrated analysis of the many factors that can and will influence a farmer's decision to convert or not convert to the organic farming method. More often than not, policies are limited to addressing income reductions in the period immediately after conversion and to resolving technical constraints in growing crops or raising animals.

Much research has been conducted on factors that influence when and why farmers adopt innovations of any kind. It is not my intention to present those to you. Rather I would like to apply some of this knowledge to the innovative process, which the conversion to organic agriculture is, using various studies conducted on this issue in the Netherlands in recent years (Box 1). They show that only a very few conventional farmers are considering conversion to organic production systems (Table 1). Over 80% of farmers questioned on the subject affirmed that they would never consider this change. Also investigated were the motives of some organic farmers for ceasing their production activities or for returning to non-organic production methods (Tables 2, 3 and 4). The number of

1. National Reference Centre of the Ministry of Agriculture, Nature Management and Fisheries, the Netherlands. The National Reference Centre is an internal policy advisory body of the Ministry of Agriculture, Nature Management and Fisheries. The information offered and the opinions expressed in this paper do not necessarily suggest, or lead to, present or future policy choices by the Dutch government.

farmers ceasing organic production appeared to be a cause for concern. It was found that many of them ceased their production activity altogether, but that their number did not exceed the number of farmers continuing production. In fact the percentage of organic farmers ceasing their activity is smaller than the national average for all farmers, which was about 4-5% in 2001. Many interrelated factors appeared to play a role in the farmers' decision.

Box 1. Recent Dutch studies conducted on motivations of farmers to (not) convert to organic farming methods or to return to conventional farming

- In 1999, the National Reference Centre conducted a major study of the motives of conventional farmers for not converting to organic production by means of a questionnaire, that resulted in over 500 useable answers.
- In early 2002, about 50 farmers who had withdrawn from certified organic production, were asked about their motives for their decision.
- In 2002, the Institute of Agricultural Economics published a study, commissioned by the Ministry of Agriculture, Nature Management and Fisheries, with an inventory of farmers' major motivation for converting to integrated or organic production methods.
- A local 2001 survey amongst farmers in Flevoland Province provided additional information.

Table 1. Farmers considering conversion to organic agriculture

Agricultural sector	May convert to organic agriculture within five years	May some day convert to organic agriculture
Arable crops	1.9%	11% (both sectors)
Field horticulture	4.5%	

Table 2. Number of organic farms ceasing their organic production activities

Year	Number of farms withdrawing from the organic certification scheme
1998	61
1999	37
2000	80
2001 (until 29.11.01)	76

Table 3. Main activity of terminated organic farms

Agricultural production sector	Number of farms
Arable field and horticultural crops	28
Mixed farms	6
Mushrooms	7
Animal husbandry	33
Other	3

Table 4. Main reason for termination of organic production activity

Main reason for withdrawal	Number of farms (and percentage of total)
Cessation of production activities	31 (40%)
Lack of market	9 (12%)
Not economically viable	8 (11%)
Not able to conform to restrictive legislation	6 (8%)
Other	12 (16%)

My aim is to bring to your attention my view that only an integrated policy approach addressing all these factors can ultimately be successful in bringing about the intended changes. The focal point in this presentation is the farmer him/herself. It is in the mind of the farmer that all private, social, economic and technical considerations converge, and make him or her take a decision.

Private situation of the farmer

Personal background of the farmer

Research in the Netherlands shows that the background of organic farmers and conventional farmers is to a large extent the same and differs only in a few aspects. The following similarities and differences were found:

- there is little difference in gender ratio: over 92% of farmers in both categories are male but there are more woman organic farmers;
- there is no significant age difference between both groups;
- as regards to vocational training organic farmers had significantly less agronomic training (only 72%) than conventional farmers (92%);
- average farm size of organic arable holdings is 40 ha; for conventional holdings it is 73 ha;
- there seem to be no differences in church affiliation between the two groups.

Presence of successor

The number of agricultural production units, *i.e.* farms, in the Netherlands has been decreasing at a rate of between 2.5% and 4.5% annually over the last decade. Apart from the expansion of non-agricultural landuse, one of the important factors contributing to this phenomenon is that many farmers' children opt for careers outside agriculture, leaving their parents with no successor. Organic farmers too are subject to this development and part of the organic area that converts back to non-organic area can be attributed to complete cessation of production after which land is sold to non-organic producers. This was true for 14 out of 32 farms that had stopped organic agricultural activity between May 2000 and November 2001.

The average age of the farming population is increasing. Older farmers without a successor are much less likely to invest in innovations like organic agriculture, as conversion is a long-term undertaking. In the Netherlands, young farmers and older farmers with a successor are potential organic farmers.

Type of farm

Conventional farms with a low degree of intensity of production can convert more easily than those with a high intensity of production. The decline in production and income during the conversion years is far greater on highly intensive farms than on more extensive farms. In the Netherlands, but not only there, this has meant that over 50% of organic agricultural area is pasture land. Highly intensive systems like poultry production, greenhouse vegetable production and comparable sectors, are far less likely to convert to organic. The financial risks involved are just too high for many farmers. Amongst the organic producers who had returned to conventional production systems were pig and poultry producers. They were not able to cope with specific "technical" problems like slow weight gain and cannibalism.

Psycho-social factors, curiosity, flexibility, willingness to take risks, persistence

Traits like curiosity, flexibility and the willingness to take risks are preconditions for many innovations, if not all. It can be argued that conversion to organic agriculture depends even more on these factors. Often traits like persistence and creativity in exploring innovative marketing approaches are also needed.

Some years ago, the idealistic nature of organic agriculture gave strong support to the acceptance of risk and even to maintaining a high spirit in years of disappointing results. Today, farmers converting to the organic production method are generally less ideologically motivated and do not accept economic uncertainty.

In general it can be said that most conventional farmers have a very low opinion of organic agriculture. This poses a barrier that needs to be overcome before they turn into would-be converters. Conventional farmers see quite a few disadvantages in organic agriculture. Organic farmers generally share their view but they put less weight on these disadvantages. The following aspects are perceived to be disadvantages:

- organic farming takes (too) much time;
- organic farming requires employed labour which requires management skills;
- organic farming is physically (too) strenuous;
- labour is not sufficiently available.

Organic farmers and would-be organic farmers see the advantages more clearly. Organic agriculture is perceived to be better for the environment and the fact that it requires more skill is something to be proud of. Conventional farmers share the perception of these advantages to some extent.

Idealism

Prior to converting, many organic farmers in the Netherlands had become wary about the use of pesticides, considering that they were exposing nature, their families, and themselves to poison. This was an important motivation for many to convert to the organic production system. Farmers who do not consider conversion to organic agriculture, do not perceive the use of pesticides as very hazardous to the environment, pointing out that modern synthetic pesticides have a much lower environmental impact than the earlier generations of pesticides

Among both organic and non-organic farmers there is a consensus that you need a certain mentality to be an organic farmer. One farmer who returned to conventional production explained his decision by saying “We just were not that type of people”. Another farmer, a dairy producer, could not convince his organic dairy processor to stop collecting milk on Sundays and subsequently converted back so he could follow his religious beliefs.

External pressures to convert to organic agriculture

In the Netherlands, the area owned by nature conservation societies is increasing. These organisations have nature preservation as their most important goal. Agricultural activities take place inside the boundaries of many protected areas. The farmers have rental contracts, which often include restrictions on production activities. This can result in lower yields and/or higher costs, which in turn can make it more attractive for farmers to “officially” convert to organic agriculture so they can at least enjoy the higher market prices for their products.

Social environment and knowledge networks

Emotional and social support is necessary to take important steps in innovating the farm. The more advanced organic farmer does not necessarily offer a role model for today’s potential converters. The earlier generations of organic farmers were often ideologically motivated and are therefore less convincing for more rational farmers who are turning to organic farming these days. Organic farmers derive most support from their spouse. Other organic farmers are important too. Some positive support is felt from consumers and acquaintances.

Conventional farmers agree with many organic farmers that organic production is a high knowledge input undertaking. However, the traditional knowledge network of conventional farmers, *i.e.* farm advisors, banks, the National Farmers Union (LTO), input supply firms, marketing co-operative, and neighbours, tend to have rather traditional views on production. They tend to favour increases in productivity and technical innovations, rather than a step that is by many still considered to be a step backward. Both organic and conventional farmers find this network to be a negative influence on the consideration to convert. Organic farmers are positive about the Dutch agricultural advisory services and the advice provided by the only Dutch organic certifier Skal. However, the high cost involved in obtaining from these commercial sources the proper information suitable to their individual farm was seen by many farmers as an obstacle to conversion.

Economic considerations

Conventional farmers see many economic disadvantages in organic agriculture. Most organic farmers would subscribe to those perceptions but to a far lesser extent, and feel that many of these disadvantages are compensated by the advantages. In general, conventional farmers will not easily convert to the organic production system, if the expected family income in the new situation is going to be less than it used to be.

Present production cost differences and future expectations

The cost of agricultural production has increased over the past few decades and this rise has not been matched by a proportional increase in market prices. The farmer's response has been to increase efficiency and productivity, decreasing the profit margin per unit of production.

The cost of organic production is higher than that for conventional production because of lower productivity and higher production costs especially in regard of labour and mechanisation. Higher productivity does not seem to be a realistic prospective for organic production. Labour costs can only go down with increased mechanisation, which is now a priority in various research programmes in the Netherlands with a focus on mechanised weeding.

One particular factor contributing to production cost is the price of control and certification. In the Netherlands, all organic operators have to be certified in order to become eligible for government subsidies or for preferential treatment in respect of some articles of environmental legislation. For at least two organic farms surveyed, the cost of certification was too high. But for their local customers they didn't need the certificate. In Sweden, both certified and non-certified organic farms exist; the latter are not allowed to market their produce as organic but they are eligible for agri-environmental subsidies.

Another interesting factor that came out of the studies on farms that withdrew from certification was that the average size of the 50 farms was about 13 hectares. Contrast this with those farms that have been converting to organic agriculture recently, with an average size of about 28 hectares. It may be concluded with some caution that small farms for some reason are less viable.

Present market price differences and future expectations

At present the price difference between conventional and organic products is considered to be too small by most organic farmers. Consumer prices, however, show differences of 30 to 200%. The profit margins in the retail sector do not seem to be passed on to the primary producers. In addition, yields are generally lower in organic production systems and vary more from year to year than yields in non-organic systems, adding a high degree of uncertainty about future financial returns. Low market price differences linked to low yields were mentioned by many of the interviewed organic farmers that had returned to non-organic production systems.

Especially difficult is the situation in sectors with large yield fluctuations between seasons, and/or with an absence of marketing guarantees from their bigger customers, like supermarkets. For areas like fruit production the first reality is a major problem. For a production sector like the pig industry the latter has been the main constraint for conversion to organic production methods. In egg and broiler production, very similar problems exist, albeit to a lesser extent.

In many agricultural sectors that depend on speciality crops supplying a niche market, prices are extremely vulnerable to saturation and oversupply of the market. In the organic sector this is no different from the non-agricultural sector, with the added problem of production costs having been higher. In practice this means that certain products with a highly limited seasonal production peak, which in a stable niche market may fetch high prices, could be worth very little when only a bit more volume enters the market. The Dutch Policy Plan on Organic Farming specifically targets the marketing chain in order to arrive at long-term agreements on marketed product volume and price per unit.

One agricultural sector that has been a cause of concern in many European countries is organic dairying. In many countries, organic milk surpluses have been too large to maintain present price differences. In the Netherlands, organic dairy plants restrict the number of suppliers using a system of waiting lists. In at least one case an organic dairy farm converted back to conventional production.

Perception and acceptance of risk on income

Not all farmers can afford to take the risk of increased production costs and little or no guarantees of higher product prices. The willingness of banks to support conversion mostly depends, like with all loans, on the availability of assets that the bank considers a guarantee against defaulting on debt payment. In the Netherlands, some of the most modern agricultural enterprises, especially those in fertile areas reclaimed from the sea, do not own their land. Banks are not willing to take risks with these farms. Bankruptcy in bad years is a real possibility in certain sectors. Farmers with rented land and small financial reserves will think twice before taking financial risks.

Labour availability

Labour availability has a technical component. Labour can be substituted by mechanised systems. However, for the time being, on many organic farms the need for manual labour is high and labour costs are high. Even so, labour is hard to come by. In most areas of the country it is virtually impossible to interest Dutch unemployed workers to engage in field work. In farming sectors where this problem exists, conversion to organic production does not seem to be a viable alternative. About 50% of farmers who, when asked, at this moment in the Netherlands do not consider converting to organic farming name non-availability of labour as their main motive. These farmers expect large fluctuations in income because of the current difficulty in procuring labour during labour peaks.

Government policy

A stimulating regulatory environment is an import source of motivation to engage and persist in innovations in agricultural production. Even with a governmental policy that at present supports conversion to organic agriculture, Dutch farmers do not consider the government as trustworthy. The policies of today can be radically different tomorrow. Two examples illustrate this:

- Low interest loans for organic agriculture were available in recent years through a fiscal construction known as “green funds”. As of January 2003 these green funds will not be available anymore.
- Most natural pesticides, of importance to organic agriculture, can be freely used in many European countries but not in the Netherlands where they need to be registered, a costly and lengthy procedure.

Legislation that is not directed at organic producers sometimes has unwanted negative effects for them. Organic producers often look for closer ties with their consumers and with society as a whole. Sometimes they need a broader economic base for their existence and would want to engage in on-farm processing of produce or to attract tourists. However, some organic farms find their initiatives severely hampered by rural planning legislation that applies a strict and limited definition of “agricultural activity”. One organic farmer who stopped his activities explained that environmental legislation and the total administrative burden of compulsory registration of his activities was becoming just too much for him.

Existence of alternative and/or additional sources of income

In the Netherlands many farmers depend on farm income for most of the family income. In many other places in Europe this dependence is much smaller. If a substantial part of the family income is derived from wages earned outside the farm the financial risk to the family of conversion to organic is smaller. The development of on-farm processing or agri-tourism can be limited if the geographic or market situation is not conducive to these sorts of initiatives. Potential converters will think twice before moving towards a full dependency on an uncertain economic future in organic agriculture.

Technical considerations

Crop and animal protection, pesticides

The Netherlands has a highly productive agricultural sector. To a large extent this is due to inputs like chemical agents for pest and disease control, and the application of chemical fertiliser. When, as in organic agriculture, many of these inputs are not used, the decrease both in yield per hectare and in product quality is substantial. The humid Dutch climate favours fungal disease in plants. The production sectors where this is felt most are those with big disease problems and few or no organic means to counter these: apple and pear production, potatoes and ornamental bulbs. Development of resistant cultivars takes much time, especially in perennial crops. For many farmers these technical problems are just too big to consider going organic.

At the same time, many organic farmers look for, and find, solutions to many of the technical problems they face. Choice of crop species and cultivar, choice of animal breed and race, sequence of crops in rotation and duration of rotation, etc., are all options to decrease the importance of certain technical problems.

Availability of seeds and planting material of satisfactory quality

Under the European Regulation for Organic Agriculture, the use of organic planting material is compulsory. A derogation until 31 December 2003 has been provided, but already problems arise in certain sectors. Availability of organic seed or planting stock does not necessarily mean that its quality and choice in variety corresponds to the farmers' technical needs or to market and consumer expectations.

Availability of breeding stock of satisfactory quality

The qualities needed in organic animal breeds are different from those that are most popular today. The argument here parallels the one on seeds and planting material in that new, well adapted chicken breeds, with for instance low incidence of cannibalism and certain food needs, do not come about very easily or quickly.

Conclusions

In the decision to convert to organic agriculture, Dutch conventional farmers have to overcome a number of problems of various magnitude. They need to see certain agronomic problems solved; they need to feel economically secure in the medium to long term; and they need support from their social and knowledge network. In addition, organic agriculture has to be technically possible, which means that it won’t be possible for every crop or farm animal. Neither will it be possible in the absence of an available and willing labour potential.

The number of farmers deciding to cease producing in an organic way does not seem to be a cause for alarm. The number of farmers concerned is relatively low and most are quitting altogether for the same motives as any other farmer who stops. In fact the percentage of organic farmers who cease all production activity is lower than that of non-organic farmers. If age, absence of a successor, encroachment of cities, etc., are not the reason to cease organic production, the other motives are too varied to make them a focus point for policy attention.

Government policy should not only be directed at the factors making farmers reluctant to convert to organic production. If government policy is perceived by farmers to be erratic, not much progress will be made. An integrated policy on organic agriculture comes from a government that makes long-term commitments to farmers and that shows its intentions by actions. This long-term and transparent policy should address the real risks that innovators are having to face; guarantee a degree of long-term minimum income security to farmers converting to the organic production system; and undertake research to solve the technical problems in arable cropping and animal husbandry.

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Chapter 6.

Issues for Consumers of Organic Products

WHAT ARE THE KEY ISSUES FOR CONSUMERS?

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Abstract

"Organic" is a complex term that to some producers and consumers implies fundamentally different values from those of mainstream society and conventional agriculture, whereas for others it has to do mainly with not using certain unacceptable materials, especially synthetic fertilisers, pesticides and additives. Therefore, organic foods are attractive to consumers in various ways, some related to the products themselves, some related to how they were produced, especially their presumed lower environmental impact, more humane treatment of livestock, and the shorter distance and more direct connection between producer and consumer. This means that although organic production standards are becoming more uniform both nationally and globally, as the organic market expands we can expect this expansion take different forms, not just in the kinds of products offered, but also in how they are distributed and sold.

Consumer issues in organic farming are both interesting and confusing, for several reasons. First, organic farming has a history going back some six decades, during which time we have seen drastic changes in the relationship of organic consumers to organic food producers and the food marketing system; especially notable is the emergence of several other much more recent "ecolabels" that may have been inspired in part by organics, and in any case compete with organic products for consumers' attention. Second, "organic" is a very complex concept, one that most consumers (and possibly some farmers, and almost certainly some bureaucrats who are responsible for regulating it) do not fully understand. Third, organic farming is intended to offer benefits not only for consumers, but also for farm workers, livestock, the environment, and the farmer; thus its appeal can be to the consumer as a citizen, not simply as a consumer. Finally, despite the fact that consumers might be more concerned with what a food does for them or to them, "organic" is primarily a "process" claim concerned with how the product was made, not a "product" claim that says anything about healthfulness or nutritional value, for example.

In the early days of organic farming — which I will take to be the 1940s, although one could also start the story in the 1920s with the emergence of Biodynamics — organic products occupied a very small, specialised niche. There was no control over the word "organic," and while consumers and farmers had a general idea of what the concept meant, there were no detailed standards covering what organic farmers had to do, should do, or must not do. The small volume of organic products was sold mainly through specialised health food and natural foods stores. The credibility of the term "organic"

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depended on consumers trusting the stores where they bought organic foods, and in turn on the stores trusting the farmers who produced those foods.

All that has changed now. Well-defined standards for organic production, which came on the scene in the 1960s, have been under continuous development ever since. With the emergence of standards came third-party certifying agents (both private and public), whose seal assured the consumer that the products could legitimately be labelled as “organic”. A notable subsequent development was the globalisation of the organic market, which in turn required certification of products that might be consumed half-way around the world from where they were produced. This meant that some order had to be made out of the different standards and certification procedures; clearly, consumers’ person-to-person trust of organic farmers, or even their trust in a local certifying body, no longer was enough to ensure organic integrity. There is a great irony here, in that the founders of organic farming emphasised close ties between producers and consumers. But as their ideas caught on worldwide, the subsequent growth of the organic sector made it attractive to traders dealing on a global scale, a concept that could be seen as the very antithesis of the organic idea.

With the growth of the organic sector came a host of related label claims, such as “low-spray,” “integrated pest management,” or “grown without chemicals.” How consumers respond to these labels, and to what extent they accept them as equivalent to organic, in turn depends on how well consumers understand what “organic” means, a much more complicated term. To some consumers, “organic” mainly means “no synthetic chemicals”. To them, these other labels may be just as good as “organic.” In contrast, only more sophisticated consumers will understand that an organic system is defined as much by what must be done — conserving soil, improving soil quality, building up natural pest control processes, promoting biodiversity, and so forth — as by what must not be done, notably not using most synthetic pesticides and fertilisers. There is a real risk that “sort-of-organic” labels might swamp the organic market unless the organic sector does an adequate job in getting consumers to know the differences.

A further complexity is that the most persuasive arguments for organic farming are its benefits at the production end of the system rather than at the consumer’s end. When organic farmers use natural pest controls, we know that this benefits the environment substantially by decreasing the use of toxic pesticides that can harm wildlife, contaminate water supplies, or harm farm workers. It also lowers the level of residues in the food, but it is very hard to know how big a benefit this confers on the person eating the food, especially in a country that does a reasonably good job in monitoring pesticide residues in foods and where the observed levels typically are well below what is regarded as a “safe” limit.

Similarly, organic farming attempts to improve the welfare of farm animals — in principle at least, although much more needs to be done in this area. Organic principles call for more humane kinds of housing and handling, and also restrict the allowed feeds and medications that are used in livestock husbandry. Some of these requirements may also benefit the consumer (*e.g.*, less chance of contamination by antibiotics because they may be used only to treat a disease, but not routinely to prevent disease, or a difference in the quantity and kinds of fats in beef raised primarily on pasture rather than on a highly concentrated diet in a feedlot). However, the main beneficiaries here are the animals. Thus, for organic farming to realise its full value in the marketplace, the consumer must understand how organic husbandry works and give it credit for how it treats the animals, not just how it affects the product itself.

This greatly complicates the decision to buy organic foods, because so much more is involved than with most other ecolabels. “Dolphin safe” tuna fish, for example, offers one benefit, one that has entirely to do with the environmental effects of the production process, but in no way claiming to improve the product itself. On the other hand, the statement “no artificial additives,” for example, is entirely a statement about the product itself, not about its environmental impact. Organic foods, in contrast, may be attractive to the consumer as a health-conscious eater, or as a good citizen, or both.

But even if we confine our discussion to the product as such, producers and sellers of organic foods still have an additional problem in capturing the full potential appeal of their products, namely that the term “organic” refers primarily to how the product was made, not to the product that resulted. (This discussion applies mainly to fresh fruits and vegetables, fluid milk, eggs, and other unprocessed or minimally processed foods; standards for processed organic foods include prohibitions on many additives that definitely would affect the product itself, perhaps more significantly than they affect the environment. The same is true for the non-use of hormones in animal production, which has health implications that some consumers definitely care about.)

For example, organic standards prohibit the use of genetically modified organisms (GMOs), and it is entirely permissible to say so. However, the statement must be something like “no GMOs used.” It may not be “contains no GMOs”, because there is no foolproof way of preventing GMOs to get into organic foods unintentionally, *e.g.*, by pollen drift. While organic products may be tested for the presence of GMOs and rejected if the level is above some agreed-upon threshold, an absolute standard of *zero* GMOs would effectively drive most organic farmers out of business in a country such as the US, where GMOs are widely used by conventional farmers. The same goes for a claim of “no pesticides used,” as opposed to “contains no pesticide residues,” since environmental contamination makes the latter impossible to achieve, even if, as is required by organic standards, the farmer has made a *bona fide* effort to prevent drift from a neighbour’s farm, say.

All these considerations point to the same conclusion: that consumers are faced with a multi-layer set of messages regarding organic foods, and the decision whether to buy them entails considerably more than many other food choices. But this is not necessarily a problem, because organic consumers (or prospective consumers) are not a homogenous group, and different kinds of consumers may be attracted to different aspects of organic foods.

In discussions of such matters one commonly hears about *the* organic consumer — how he/she is older/younger and more/less educated, has a higher/lower income, and has more/fewer children than people who don’t buy organic foods. One also hears about *the* reason that this consumer chooses organic foods, most commonly their health and that of their families.

But this is a great oversimplification. Just as the concept of organic farming entails much more than “no synthetic chemicals,” so, too, consumers have varied relationships to organic farming. In the research literature, this relationship is operationalised simply by how much organic food the consumer buys, and perhaps also in their “willingness to pay” various hypothetical price premiums for the organic version. But buying an organic product means different things to different people.

For some, organic food is part of a more “natural” lifestyle, and perhaps also a reflection of spiritual and religious values. Stereotypically, this was the organic consumer of the early days, when the popular image of organic farming was not exactly flattering.

For others, organic food offers very tangible benefits, such as lower pesticide levels in the food, or less contamination of soil and water by pesticides and fertilisers. This group would not identify themselves as “organic” people, although they share many specific values with them.

Yet another group — the importance of which may be greatly underestimated in research on the organic market — may not care at all about the fact that they are buying organic foods. Rather, they do so because the product is more attractive by the same standards as apply to conventional foods. That is, they may choose an organic vegetable because it looks fresher or tastes better than its conventional counterpart, or they may choose the organic version of some processed food because that particular brand is more appealing; that it is organic is of little or no consequence, provided that its price at most is only slightly more than that of its conventionally produced counterpart. With more and more organic products becoming readily available, this group may become an increasingly important share of the organic market.

The commitment of these various groups to the organic idea varies from total to nil. But this variation cannot be measured simply by how much they buy; it also has to do with what is going on in their minds in choosing to buy. Because of this diversity among organic shoppers, the future of the organic sector could take many forms, particularly regarding the way that organic food gets to the table and the kinds of foods that are offered. Both were of concern already in the early days of organic farming, and remain so today.

To those for whom organic foods are part of a lifestyle choice, the kind of store they are sold in is likely to matter. Typically they would prefer buying their organic foods either directly at a farmers' market, or at a modest-size store that was largely devoted to health foods and related natural products. Such a store not only might offer a greater variety of organic products, but also will have more of an organic "feel" that these consumers would favour, in contrast to the conventional supermarket, which in its size and global reach is decidedly not an "organic" marketing channel. In addition, it is plausible to suppose that these consumers feel more confident about the organic integrity of the products offered in an organically oriented store; despite certification and standards, trust no doubt is still a factor, as it certainly was in the early days. In contrast, these consumers may see supermarkets as treating organics as just another product line. The fact that the "local" supermarket may be owned by a corporation based in another continent doesn't exactly enhance its appeal to those who are committed to the organic idea.

In contrast, for the other two groups (especially those who buy organic products when and only when they are attractive by traditional criteria), the marketing channel might not matter at all. Indeed, a supermarket might be more attractive because of convenience: one can buy both organic and conventionally produced foods in the same trip.

The second issue concerns the kinds of organic foods offered. From the earliest days, organic farming proponents stressed the importance of a wholesome diet based on a variety of whole or minimally processed foods. This was at least as important as avoidance of toxic chemicals, and it remains important for those devoted to the organic idea. However, in the past several decades a new version of eating organically has gained ground among other consumers; it could be characterised as "same diet, same products, but from organic raw materials". We are seeing a growing number of organic products that no doubt would have shocked the pioneers, such as organic breakfast cereals with 35% sugar. As long as the grains, sugar and other ingredients all are organic, the cereal may be labelled organic too, without any consideration of the nutritional implications of eating such a product.

This is the counterpart of what at the production end of the organic food system is called (usually derisively) the "input substitution" or "organic lite" version of organic production. That is, one substitutes organically permitted fertilisers and pesticides for their prohibited conventional counterparts, without also doing the things that organic farmers are supposed to do to become less dependent on pesticides and fertilisers of any kind brought in from off the farm, such as controlling pests by rotating their crops and building up soil fertility by applying compost produced from their own herds' manure.

Of the three groups, those in the first no doubt regard highly processed organic foods as a perversion of fundamental organic principles. People in the second group, who in part buy organic foods for health reasons, probably change their diets too, along with buying organic foods, but not as drastically as would the first group. The last group would likely change their diets not at all, or at most very slightly, since they buy specific organic products that they see as better for reasons unrelated to health and nutrition.

What does this mean for the future of organic farming from the consumer's standpoint? Mainly it means that there probably will not be a single future. There are many different kinds of consumers, motivated by various considerations. Their preferences could drive the market, or could be driven by what happens in the rest of the organic sector — what kinds of products are offered, at what price, and so forth. In any case the trend today is for more global trade in organic products, more highly processed organic foods, and more selling of organic products in mainstream supermarkets. No doubt this trend will continue. But for a segment of organic consumers, this trend will not fulfil their notion of what it means for a food to be considered "organic". Perhaps what today is called *the* organic consumer will become more clearly and explicitly differentiated into two parts: a larger group that welcomes the convenience of processed organic foods and their ready availability in conventional stores, and a smaller group that adheres to a more all-inclusive notion of "organic," one that cannot be fulfilled if the organic food sector models itself on the conventional food industry.

Such questions provoke heated debate in organic circles among both producers and consumers, and no doubt will continue to do so. With its continued growth, organic farming is constantly faced with new situations that need to be analyzed with appropriate attention to its fundamental principles and traditions on one hand, and the need to remain dynamic and flexible on the other. Any time it thinks it has *the* answer to the kinds of questions raised here, it's in trouble.

ORGANIC AGRICULTURE: THE CONSUMERS' PERSPECTIVE

Bjarne Pedersen[1]

Executive summary

Organic farming was identified as a sustainable method of food production in the context of the World Food Summit, at the United Nations' Food and Agriculture Organization's (FAO) Rome Declaration and Plan of Action in 1996. Governments, in partnership with all actors of civil society and the support of international institutions, were urged by FAO to promote policies and programmes which encourage appropriate farming techniques and sustainable methods for food production. In relation to consumer organisations, the TransAtlantic Consumer Dialogue resolution of February 2000 put forward consumers' recommendations on organic foods (TADC, 2000). The European consumer organisations, the Bureau Européen des Unions de Consommateurs (BEUC) and the Association of European Consumers (AEC), also have positions relating to organic production.

From a consumer standpoint, the overall goal of supporting organic agriculture is to stimulate sustainable production and consumption patterns. Consumers International (CI) expects at least an annual growth of 10% of this sector: however, 20% should be the aim. CI also expects organic agriculture to provide a number of well-defined benefits to consumers.

- ***Environmental benefits:*** among different agricultural systems, organic agriculture is characterised by setting up high standards on sustainability. Organic agriculture should ideally be defined as a self-sufficient agri-environmental production system in equilibrium and is based on local, renewable resources. Thus, organic agriculture includes environmental considerations that go beyond the conventional agricultural production model. Some of these considerations are: ground water protection from pesticides and, to a certain degree, nitrates; optimum animal health and welfare; biodiversity in the farming fields and surrounding areas; and positive influence on rural and social development.

- ***Health-related benefits:*** To many consumers, organic agriculture is regarded as providing added health benefits. The organic products are looked upon as pure and relatively uncontaminated by pesticides. Better animal welfare conditions that ensure healthier animals also appeal to the consumers. Many national organic certification bodies have stricter rules, for example banning nitrites in meat products, due to concerns about health risks. Thus organic foods can be seen as giving consumers added

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benefits compared to imported conventional foods. Organic farmers are expected to use other types of seeds and livestock breeds with better resistance against pests and diseases. To many consumers that means healthier plants and livestock with a strong natural resistance, which further enhances the perception of organic products as healthy food. This, however, needs further documentation. Some consumers also express scepticism about levels of natural pollution, zoonoses and mycotoxins. More research is needed on health aspects of foods, in relation to conventional and organic food production. There is no doubt, however, that organic agriculture is becoming part of a healthier lifestyle where an increasing number of consumers care more about the origins of their food, *i.e.* how and where it has been produced.

- ***Ethical and moral benefits:*** Organic farming builds on an integrated ethos that encompasses the environmental, economic and social aspects in agricultural production. Currently, increasing numbers of consumers are concerned about degradation of standards, food quality, media-exaggerated food scares, amongst other issues. In this context, it would be easier to demand strict rules, high standards, and efficient inspection in organic agriculture. Higher moral and ethical standards are what consumers often expect. Consumers want to ensure that organic farmers do not exploit either the soil or the livestock. In addition, consumers need to know that they are not being exploited when buying the organically produced food. To a certain extent, this moral expectation is a result of the level of knowledge of the organic production method. The distinction between organic and conventional agriculture is a difference in farming practice; and not always a measurable difference in the finished product. Therefore, inspection and labelling are essential prerequisites to obtain and preserve consumers' confidence.

Consumer-driven development?

Development of organic agriculture has hitherto been driven by farmers with certain ideals about how to run a farm. The development of the organic movement has been guided by either ideals or moral values, which can be summed up as a quest for wider sustainability in food production. Development is determined by a diversity of stakeholders, including consumers, retail chains, governments, the European Union, Codex etc. With the introduction of the consumer as the pull factor for further development, ideals or moral values can no longer secure the development of organic agriculture without a possible loss of consumer confidence and a growing risk of fraud. From a consumer's standpoint, initiatives like the upcoming Organic Action Plan of the EU can take this role. Thus opens up the possibility for the European Commission to become a legitimate, independent and trustworthy partner in the ongoing institutionalisation process.

When consumers are entrusted with the responsibility for a continued development of sustainable food production, it is necessary to thoroughly examine the ability of the market to drive such a development. In this respect, there might be problems with a pure market model, where the consumer is expected to carry the full burden of the extra costs of the organic production. As long as the external costs of conventional agriculture are not included in the prices of conventional food and the societal benefits of organic agriculture remain unacknowledged, the competition with conventional agriculture will never be equal. Competition issues and other market factors (such as "loss leader" strategies from certain supermarket chains) are also bound to create problems. CI sees a special threat coming from some chemical or biotechnology company interests, public relation companies and some academics defending agri-business, that have already being campaigning against organic farming.

In order to enable consumers to decide about the future of organic food production, certain basic consumer demands must be met in the market. These are:

- price transparency in the production chain;
- an agricultural subsidy scheme that does not stimulate quantity over quality;
- internalisation of external costs, which at the present non-sustainable status of agricultural practice will highlight the differences between conventional and organic products;
- awareness rising among consumers through information campaigns, education, etc.;
- access to detailed, truthful and attractive market information that will enable consumers to make well-informed choices; and
- better competition rules for the retail sector.

Subsidy schemes

CI sees the need for current subsidy schemes to be revised for a number of reasons. In relation to sustainable farming practices in the OECD region, abolishing perverse subsidies should be a priority. In addition, encouragement should be provided for consumers and producers who are willing to support organic agriculture. At present, neither EU nor US agricultural policy supports this. CI strongly recommends that the EU and the US use their powers and resources to strengthen organic farming and thereby increase sustainability, environmental considerations, social rural development, and facilitate a stronger producer/consumer contact in agriculture.

Production standards

Consumer expectations regarding organic standards need to be addressed through research and careful monitoring, an area where OECD can take a key role. The discussion on standards is at the very core of organic agriculture.

It is important that global regulations do not undermine higher national or local standards. A combined use of different labels is confusing, yet inevitable as long as some labels stand for higher standards. From our point of view, and as outlined in the TransAtlantic Consumer Dialogue resolution on organic farming, the common rules should allow higher standards to be put in place. Control bodies should be accredited by the International Federation of Organic Agriculture Movements (IFOAM). Small or recently established control bodies may also be acceptable if the body undertakes to join IFOAM's Accreditation Program as soon as possible.

From a consumer standpoint, the production standards of organic agriculture and food production should cover the whole chain. This goes beyond current farm-to-table considerations and recognises farming as a long-term activity that must support future generations to come. The overall goal of sustainability should be a main parameter when developing such standards.

Effects on the environment

Consumers have a myriad of concerns and expectations regarding the effects of farming on the environment. Despite many assurances from experts regarding conventional farming, especially about pesticides and fertilisers, consumers are not satisfied with information regarding long-term effects of modern, intensive farming practices. Consumers cannot always be expected to trust data regarding toxicity and other aspects of risk evaluation associated with conventionally farmed foods. There is a need to discuss and evaluate how toxicity data are collected and presented to all concerned parties and why expert groups such as the Joint FAO/WHO (World Health Organization) Meeting on Pesticide Residues (JMPR) and the EU Scientific Committees, which do not include consumer representatives, set residue level standards.

Regarding long-term systemic effects on the environment, areas such as freshwater safety and soil quality, as well as farm-based biodiversity, need much further study. Organic farming has being developing over the past 40 years and today is the most successful type of sustainable food production. Other sustainable food production methods with different environmental standards are also welcomed by consumers, but are not as well known as organic farming. The positive effects of integrated pest management (IPM) systems, for example, may also be used to reduce pesticide use, but as they do not eliminate the use of toxic substances completely, they may be considered insufficient — and not sustainable — by concerned consumers.

In the CI document *Consumers and the Environment: Meeting Needs, Changing Lifestyles*, a variety of environmental concerns was examined, including the impacts of rural and urban consumers of diminishing freshwater supplies. In recent studies, pollution of water has been found to be reduced on organic farms. Farmers near drinking water sources should be especially targeted by campaigns to assist them to convert to organic farming.

There is a growing understanding of how organic farming contributes to increased farm-based biodiversity, which is seen as a very positive effect. Consumers find it desirable to know that weeds, flowers, insects and birds as well as “wild” animals will thrive in an organically farmed landscape. Maintaining biodiverse habitats has been shown to assist biological control, thus reducing the need for pesticides. Moreover, biodiversity is increasingly seen as a very important factor for the health of all plants and organisms. There is a need to redefine the goals of plant breeding, to recognise that conservation is crucial for our survival and to acknowledge that farming is dependent on access to biological resources found primarily in countries elsewhere, especially in developing countries around the equator.

Effects on the welfare of livestock

Animal health and welfare must be considered in the context of how organic farming has evolved in the past decades. Research studies in Sweden have indicated that dairy cows in organic farming systems have better udder health and that there were fewer bacteria in the milk than in conventional dairy farming. While this result may not directly influence the health of the consumer who drinks a processed organic milk product bought in a supermarket, it provides some level of ethical and moral satisfaction and may actually add to the consumer’s psychological well-being. Eggs from hens in organic systems do not look different from conventional eggs, but for the consumer there is an added value, depending on his or her understanding of the way in which the eggs are produced. A number of such examples, also looking at how rules and standards for animal transportation and other PPMs (production and processing methods) are perceived, should be collected and evaluated. CI welcomes other studies and further work to attempt to explain how animal welfare is actually perceived as a valuable benefit to many consumers. For consumers who choose to pay more for organically labelled meat or eggs this is a conscious and responsible consumption strategy. Hence, consumers expect controls and inspections of how organic farming affects animals in order to have continued confidence in organic farming with regard to animal health and welfare.

Optimum animal welfare has repeatedly been shown to decrease the need for antibiotics and other veterinary medicines. Necessary medication should never be withheld from sick animals, and consumers understand that even in the most ideal organic livestock farms, animals can get sick. The rules and standards for organic livestock farming should be explicit in this regard. In the EU there seems to be a very strong awareness about the rising number of cases of antibiotic resistance in both humans and livestock, and CI is glad that antibiotics will not be allowed in conventional animal feed for growth promotion from 2006. This is an example of how the rules and standards of organic farming, that have never allowed such use, are now influencing the legislation regarding the conventional farming system as well.

Studies in the United States have indicated that consumers are concerned about the way in which pork is produced and that they want to purchase organic pork in response to that concern. In an interesting paper by Wheatley (2001), a number of studies are summarised, such as that by Hurley and Kliebenstein (1998), who researched consumer preferences for pork produced in such a way as to minimise the environmental impact and found that many consumers do value environmentally conscious pork production.

Finally, abattoirs for organic animals should be designed for the best possible slaughter methods, with as little stress for the animals as possible.

Animal breeding

Animal breeding for organic food production must be encouraged to take animal health and welfare concerns into account. Of interest is how the body, muscles and organs develop, as well as how the entire lifespan of the organism is affected. Even animals destined for slaughter at an early age should be bred for a lifespan of healthy living. Rules and standards for minimum slaughter age should be set to allow for a balanced growth of the livestock, depending, among other factors, on the particular breed.

The agrogenetic diversity in domestic livestock allows farmers to select stock or develop new characteristics in response to changes in the environment, threats of disease, market conditions and the needs of society. Traits that are not recognised today may also turn out to be very valuable in future. FAO has shown how landrace livestock breeds may possess valuable traits such as disease resistance or good maternal qualities that form the basis of sustainable agriculture. Further work should be encouraged in this area, both in support of organic and conventional breeding strategies. CI cannot accept fraud in the organic sector, just as it is not accepted in any other food production system. Policies in the area of organic food production need to pay attention to this and suggest possible strategies on how to deal rapidly with incidents, for example by assigning responsible officials who can be prepared to communicate with the public and media if necessary. Consumer organisations can act as a watchdog and report products that are labelled or marketed in a fraudulent or misleading way.

Rules regarding transition farming must be clear and unambiguous. From a consumer perspective it is not desirable to have both organic and conventional food production on the same farm. The issue of transition periods is not necessarily a consumer concern, but it could become a concern if the transition is not handled properly. The rules should be easy to understand and ideally the same everywhere, except in heavily polluted areas, where longer transition periods are inevitable.

Need for wider sustainability

Consumers expect organic farming policies to pay special attention to responsible practices that ensure that farming will continue to be possible both on the small family farm and in the larger industrial setting. There is also a need to consider rules and standards for processing and distribution beyond the farm gate *i.e.* packaging materials should be recyclable and made from safe substances.

Life Cycle Assessment (LCA) could be a very useful tool to evaluate the total cost in a production system, and LCA should also be increasingly used for evaluating organic foods. Food miles should be considered to avoid unnecessary transportation. It is not necessarily in correspondence with consumer perceptions of the organic concept to have organically farmed foods transported over large distances. Frozen processed organic foods in particular may need special attention to avoid dilemmas where the consumer starts to question if the final product can really be considered environmentally friendly, even if each ingredient has been farmed organically.

Other concerns regarding energy use and preservation should be considered. It is necessary to develop policies that allow organic farms to convert to sustainable energy sources, such as wind power or solar power, through special tax breaks or low-interest loans.

Trade and marketing

A study by the International Trade Centre (ITC) has made it clear that there are good reasons to conclude that the market for organic food and beverages is growing rapidly in most developed countries, as well as in a few developing countries, though to a lesser degree. The fact that the share of organic food is still small in all of them indicates a very large long-term potential. According to the work done at ITC, expectations of growth are underscored not only by a strong and increasing consumer awareness of health and environmental issues, but also by more goal-oriented and aggressive marketing and promotion by the major retail groups. Product development and innovations in packaging by food processors and manufacturers, as well as supportive government policy in many countries, will also help to increase consumer demand.

Codex Alimentarius

The standards agreed on by FAO/WHO Codex Alimentarius Commission (Codex) are important for consumers in all countries as they ensure some level of safety protection and also because they may facilitate trade in foods. Organic foods have been discussed by the Codex Committee on Food Labelling that has developed guidelines for the production, processing, labelling and marketing of organically produced foods. The Codex guidelines for organic food were adopted by the 23rd Session of the Commission and revised by the 24th Session of the Commission in 2001. The Codex guidelines for organic food are significant since many different certification schemes had evolved around the world. CI welcomes the Codex guidelines which are important for producers, consumers, regulators and enforcers. Also, in its recent strategic vision statement, Codex recognised the growing interest in organic foods, which, it predicts, will capture a significant share of the international market in future.

The continued work on international organic standards will also affect EU and other regional and national standards. It will, for example, be very difficult for a state or government organic control body to justify banning processes or substances that have been approved by Codex. This is due to the status that Codex standards, guidelines and other recommendations have acquired under the WTO

Agreement on the Application of Sanitary and Phytosanitary Measures. The WTO Agreement on Technical Barriers to Trade is also of great relevance, given the significance of the provisions pertaining to product description, labelling, packaging and quality descriptions for consumer information and at the same time fair practices in trade. Codex wants its norms to be applied to the widest extent possible by all members. Thus OECD countries, in close co-operation with consumer organisations, must actively participate in Codex work regarding organic food.

Consumers have recognised the importance of Codex while also asking for a number of changes and reforms as the standards are becoming so important for a growing number of people on our planet. One major issue and challenge for CI within Codex has been to ensure that consumers' views are acknowledged at all stages in the decision-making process. In addition, it is vital that undue attention is not placed on the demand to base Codex standards only on science, in isolation from other important principles such as health protection, food labelling, and Other Legitimate Factors (OLF).

The precautionary principle should be a cornerstone of food legislation. The OECD countries should clearly define and enshrine the principle in Codex to improve international food legislation. With regard to animal welfare and health legislation that may not easily be scientifically proven to directly affect consumer health, WTO rules must not be used to influence organic legislation in any way. Consumer organisations and many health professionals have strongly urged Codex to take scientific uncertainty into account and recognise the need for the precautionary principle.

Identification of organic products in international trade

The issue of country-of-origin labelling and geographical indications (GIs) has been discussed by consumer organisations, which strongly support better rules in this area. Some argue that all organic foods should be clearly labelled so consumers will know where a fruit or vegetable has been farmed. Others think this may place an unnecessary burden on the producer and retailer. For meat products there is a general regulation for traceability that gives consumers this information, regardless of whether the meat is organic or not. The country-of-origin rule only applies to European meat, but a label on the imported product will have to state that the meat was produced outside the EU. As this is still in the start-up phase, consumers are impatiently waiting for better controls and monitoring. The work in this area must take organic meat products into consideration.

CI strongly supports improved traceability systems that may aid the identification of organic foods. This is important to make sure that consumers are given full information, as detailed as possible, about all ingredients and the final product.

Country-of-origin labelling is also discussed in the Codex Committee on Food Labelling. Consumers have voiced concern that they might be misled about the country of origin of their food. The country-of-origin label must neither be obscured nor misinterpreted by consumers.

Codex has defined traceability as: "The ability to trace the history, application or location of an entity by means of recorded identifications". Traceability is closely linked to product identity, but it can also relate to the origin of materials and parts, product processing history, and the distribution and location of the product after delivery. On the basis of this definition, it is possible to show that traceability is a recognised process in adopted Codex texts and texts under elaboration, even if the word "traceability" has not been used. A recent report from the Codex Secretariat cited some 13 examples of adopted or proposed texts that are either based on, or acknowledge, traceability. Codex has identified consumer confidence as one aspect that is linked to traceability.

The WTO Doha Ministerial discussed issues relating to the extension of the protection of GIs to products other than wines and spirits, as provided for in Article 23 of the WTO TRIPS Agreement. This will be addressed in the Council for TRIPS. Discussions on this issue, however, need to be speeded up, and the Ministerial Declaration simply acknowledges that these are on-going without committing members to a resolution. CI sees important links between the issue of consumer confidence in organic foods and international protection of GIs.

In the TransAtlantic Consumer Dialogue resolution of February 2000, it was proposed that the country-of-origin must be stated on all organic foods. In response, the European Commission argued that there seemed to be no particular reason for this request. Moreover, the Commission "did not understand" how such a requirement should be applied to foods with ingredients originating from several countries. CI believes a debate on this issue would be very useful to encourage an open discussion on this matter, with a special focus on how inspection and traceability can increase consumer interest and confidence in organic food.

Consumer involvement

In many respects, the objectives of organic farming are more important to consumers as citizens than as purchasers of food. Not only do consumers eat the products, they also live in countries where agriculture has changed the landscape through the centuries. As taxpayers, they also pay for the intervention and support through the various support schemes. As for all other resource-consuming and polluting industries, consumers and citizens set up conditions for our support to agriculture.

Consumer education will have to focus on raising the awareness of organic food and farming among national consumer organisations. Misunderstandings must be cleared up and concerns be answered, for example though more dialogue between consumer organisations, farmers, retail and other stakeholders.

The consumer choice of organic products has been explained as a risk-reducing strategy; *i.e.* consumers, through their choice, attempt to eliminate environmental or health risks. However, consumers are not necessarily rational choice-makers with a built-in probability estimator. Therefore, risk-reducing strategies explain only part of the demand for organic production. As previously indicated, a broader view on the reasons consumers desire organic food is required. These include: the wish to support local producers, better animal welfare and health practices, the search for trustworthy exchange-partners, and a wish to make a political statement are also reasons often interwoven with the traditional marketing explanations.

In general, consumers connect organic products with raw or pure products. The more elaborated or processed a food product, the less likely it is to be sold solely for its organic quality. When it comes to basic foodstuffs and less-processed food like raw meat, milk, fruit and vegetables, consumers do, in general, prefer products from their own country. These are the products most consumers want to buy organic. The increasing international trade with organic products has therefore a built-in weakness: it is difficult to make consumers buy imported organic products, especially when similar products that are locally produced are available.

Another shared consumer expectation is that organic products have added value compared to conventional products. This expectation has at least two explanations: the organic product is often more expensive to the consumer, which leads to an expectation of higher product quality. Another explanation is that the organic producers often have to find a niche to penetrate the market, which often results in specialised or even luxurious products, which are then associated with the organic origin. What different consumers refer to when they discuss quality is much harder to summarise: to some the environmental considerations in the primary production is enough, to other consumers the organic product needs to taste better, and still others consider that the producers must in general display a less exploiting market behaviour for their products to be perceived as high quality.

Finally, retail firms need to be strongly encouraged to develop environmental policies that include a commitment to organic foods. Binding agreements should be formulated. For example, in the United Kingdom, the market has been benefiting from a period of less intense price competition as well as the emergence of new high-end sectors, such as luxury own-brand meals, organic foods and other high-margin products.

CI is especially concerned about some global retail chains with a high level of vertical integration. Competition policies need to be strengthened. The establishment of large, low-price stores with "loss leader" policies has been found to give consumers fewer products in each store, which is a worrying trend.

Research

CI supports research programmes that include consumer concerns and expectations, as well as other projects that attempt to develop more environmentally friendly and sustainable methods of agricultural production. Considering the vast amount of resources spent on genetic modification research, there is a need for support to projects that try to develop weed control and pest resistance through natural means. Projects dealing with crop rotation also have an obvious priority, as this is fundamental to organic farming. Good experiences and results should be shared rapidly through magazine and/or Internet publication.

It is desirable to support continued and co-ordinated research into organic production and the link to best practice in terms of sales. This includes research on processing, marketing, and consumer expectations and demands. Research into animal breeds is time-consuming and may be very expensive, but it should be given high priority and also be viewed over a very long-term perspective.

The *Label Rouge* breeding programme in France started as a grassroots movement over 40 years ago. The products are vividly distinguishable from industrial poultry products in areas such as quality and flavour.

As a national certification programme French farmers are making use of speciality poultry genetics, processing and marketing and outreach techniques that have been a success among consumers. Another attractive feature is that the grow-out period for the *Label Rouge* chicken is 81 days, compared with 45 days for standard broilers. The *Label Rouge* system focuses on providing chicken with much lower levels of salmonella contamination than conventional systems (*e.g.* only 2% of *Label Rouge* birds have been found to be contaminated with salmonella compared with 70% of birds from flocks produced in conventional systems).

An essential element of such programmes is that a national organisation can collect a levy from the sale of each bird to fund national consumer education and publicity campaigns for the organic products. The *Label Rouge* programme has also been recognised in other countries outside the EU. Similar projects should be designed that would benefit the development of organic farming, not only in Europe, but all also over the world.

Conclusion

The following quote from the FAO illustrates consumer interest on the matter:

Interest in organic agriculture methods is growing, especially in areas where the present farming system has degraded resources essential to agricultural production (especially land). Non-production factors, such as the farmer's health, are also mentioned as a reason for shifting to organic management. Consumers also have an interest in organic agriculture. Consumer awareness of the environmental costs of agriculture (such as the deteriorating quality of drinking water and soil, and the impact of agriculture on landscape and wildlife) is increasing. The awareness of environmental quality and health is often promoted by environmental groups, especially in developed countries. The resulting demand for organic products creates the opportunity to sell organic products at premium prices, enabling organic farmers to continue, and often expand.

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CONSUMER PREFERENCES FOR ORGANIC FOODS

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Abstract

The Danish market for organic foods is especially well suited for consumer analyses because it is relatively mature, meaning that it does not suffer seriously from the supply shortages and barriers which dominate most of the markets outside Denmark. The well-functioning Danish market makes it possible to collect and analyse reliable data on purchases. Our study distinguishes itself by being based on observations of stated as well as actual purchasing behaviour of a large number of organic as well as conventional foods. The project applies information at the individual household level (panel data), which makes possible a detailed and informative approach. The panel data were provided by a marketing research company. In addition, the modelling is supported by a questionnaire, surveying households in the very same panel as applied in the model estimations. An essential feature and the ultimate strength of the project is that it can reveal differences between actual and postulated behaviour and enlarge the analyses by information on attitudes, values, food habits/eating patterns and food interests. In the paper, preliminary results from the project are presented.

Introduction

Demand for organic foods has increased considerably during the past decade, though organic consumption still only constitutes a small percentage of total food consumption in most countries. Consumption has especially increased in Denmark, which today is estimated to have the highest *per capita* consumption of organic food in the world (Wier and Calverley, 2002). The Danish market is especially well suited for consumer analyses because it is relatively mature, meaning that it does not suffer seriously from the supply shortages and barriers which dominate most of the markets outside Denmark. This holds especially for organic dairy and cereal products, and these products exhibit higher budget shares than other organic products. Consequently, the Danish organic market may offer information about future markets of organic foods in other countries.

The well-functioning Danish market makes it possible to collect and analyse reliable data on purchases. Very few studies on the estimation of demand for organic foods, based on actual purchases, have been published previously. The few exceptions are Brombacher (1992), Glaser and Thompson (1998, 2000) and Jörgensen (2001), who all use sales data from market researchers in Germany, the United States and Sweden, respectively. Our study distinguishes itself by being based on observations

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of stated as well as actual purchasing behaviour of a large number of organic as well as conventional foods.

Almost all previous studies on organic foods are based solely on postulated behaviour, *i.e.* stated willingness to pay. Several studies (Beharrell and MacFie, 1991; Bjerke, 1992; Bugge and Wandel, 1995; CMA, 1996; Coopers and Lybrand Deloitte, 1992; Drake and Holm, 1989; Fricke, 1996; Grunert and Kristensen, 1995; Jolly, 1991; Krämer *et al.*, 1998; Misra *et al.*, 1991; Scan-Ad, 1998) report consumer interviews about their willingness to pay for organic foods, and thus hold information on this issue. However, stated willingness to pay may not reflect revealed behaviour (Cook 1991; Kramer 1990). The literature on contingent valuation (CV) has studied the issue of strategic bias in depth. For quasi-public goods, Carson *et al.* (1996) undertook a large meta-study of 616 estimates from 83 studies where CV estimates were compared to revealed preference (RP) estimates for the same good. Based on the sample of 616 comparisons, the mean CV/RP ratio was 0.89. Other studies typically find that hypothetical (stated) willingness to pay exceeds revealed willingness to pay (Cummings *et al.*, 1995; Frykblom, 1997). In our particular context, Hansen and Sorensen (1993) conducted both (in-store) interviews and (in-store) experiments on purchases of organic products. When comparing results from these two different approaches, they found that elicited willingness-to-pay has a tendency to be overestimated in comparison to "real" willingness-to-pay from experiments.

The Danish market

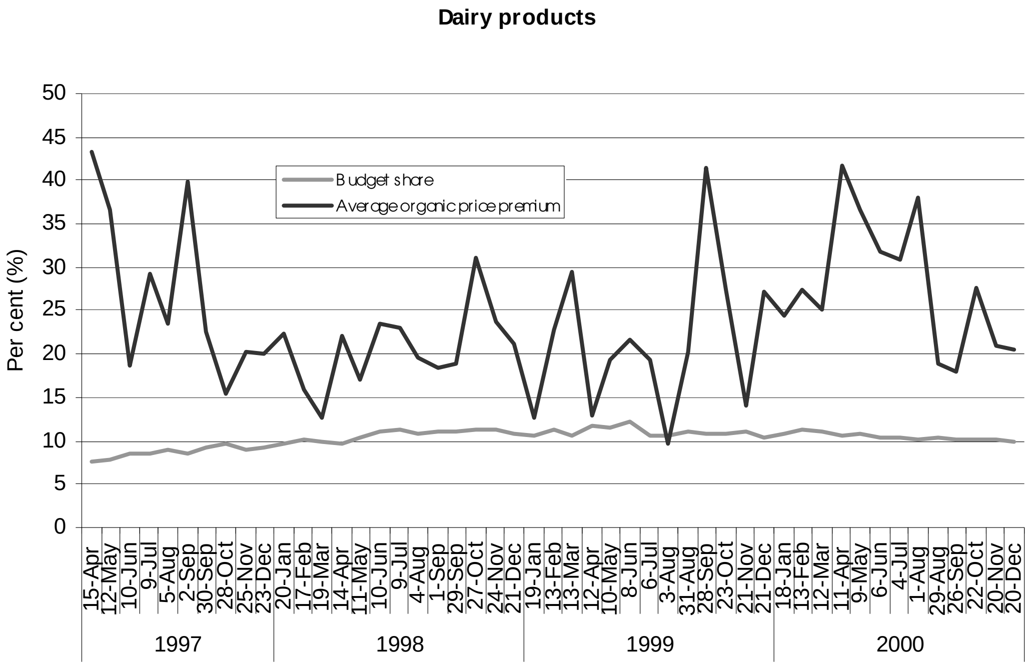
Budget shares, price premiums and growth of organic products

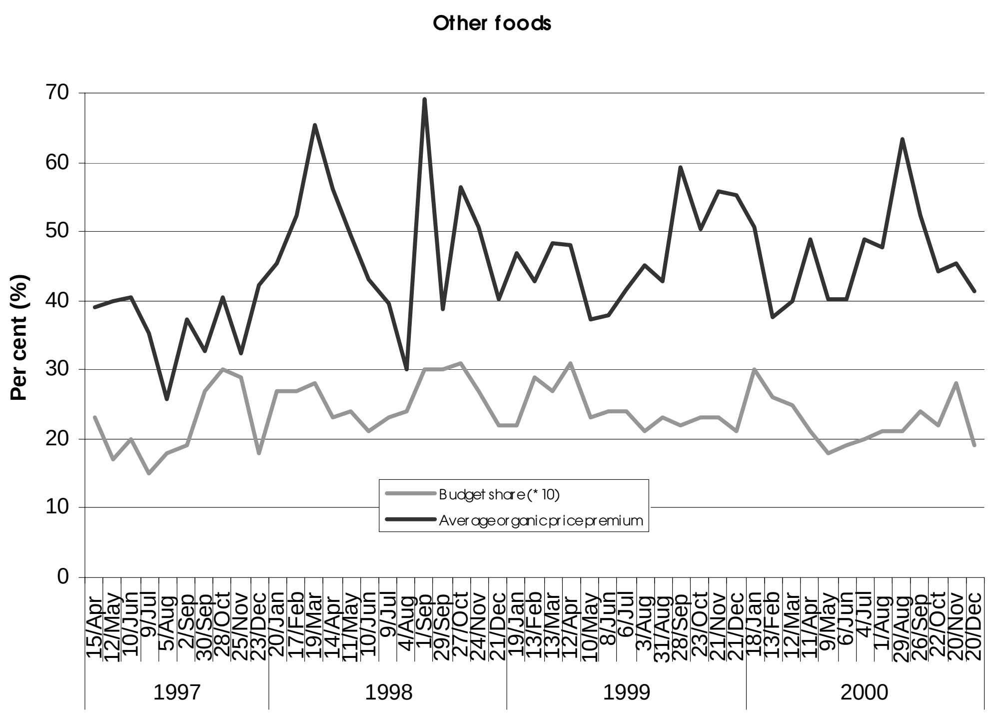
Figure 1 shows the development in budget shares and organic price premiums (four-weekly observations) of 3 aggregated organic products between 1 April 1997 and 31 December 2000. The budget share is defined as the ratio of budget of organic on total foods, and average price premiums are calculated as the mean of individual price premiums within the group, using individual good budget shares as weights.

Dairy products hold the highest budget share, followed by cereal products. There was a steady upward trend in the budget shares for dairy products and cereal products (bread, flour, cereals, pasta, rice, etc) until late 1999. From the middle of 1999 and onwards, budget shares were decreasing somewhat for these two food groups. Analogously, average price premiums decreased continuously for dairy products and cereals until the middle of 1999. From mid-1999 onwards, no clear trend in development of price premiums can be observed. The group of "other foods" (including meat, fruit and vegetables,) has much lower budget shares and much higher price premiums than the dairy and cereal products do, and no clear trend can be observed.

Within the three aggregated food groups, a large variation in budget shares can be observed. Table 1 shows various estimates for the five most established products, within each food group for the period 1 April 1997 to 31 December 2000. For each product, the table shows the average budget share and the average percentage organic price premium, the average organic consumption in euros per family per week, and the average annual growth in this weekly consumption. Milk and eggs hold equally high budget shares at 23%, followed by carrots, rye bread and pasta. The lowest price premiums are observed for cereals, various dairy products, rye bread and eggs. The highest price premiums are observed within the group of other foods, for oil, carrots and onions. This group also encompasses meat products (not shown in Table 1 as no meat products reach the top five), where lamb holds the highest budget share (budget share 5.8%, price premium 22%), followed by minced beef (budget share 2.2%, price premium 58%).

Figure 1. Development in market share and average price premiums for three aggregated organic product groups





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Cereals

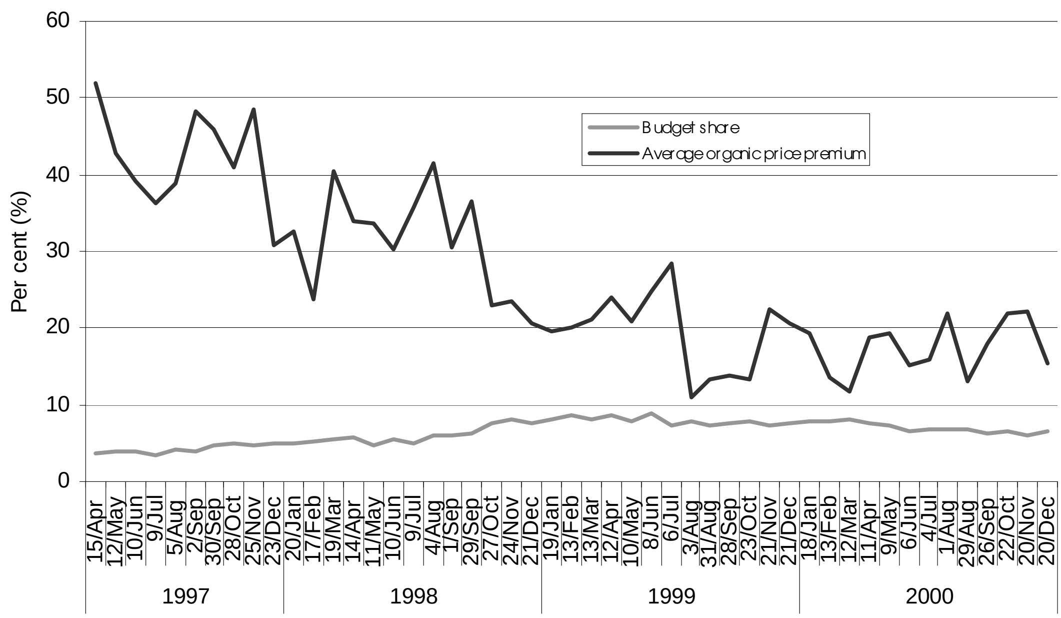


Table 1. Top five within each aggregated food group, April 1997-December 2000

	Budget share (%)	Average price premium	Average organic consumption per family per week* (euros)	Average annual growth rate (%)
Dairy products				
Milk	23.00	22.53	0.57	8.23
Yoghurt	7.30	12.87	0.06	11.53
Cream**	6.20	13.35	0.03	-6.40
Butter	5.60	5.62	0.05	21.17
Cheese	2.40	22.30	0.05	-3.47
Cereal products				
Flour	13.40	50.62	0.03	15.70
Rye bread	9.40	18.10	0.10	12.97
Pasta	9.30	40.59	0.02	43.77
Cereals	7.10	5.91	0.04	8.70
Rice	6.20	53.82	0.01	24.10
Other foods				
Eggs	23.00	19.74	0.16	9.40
Carrots	20.70	62.28	0.05	1.27
Onions	9.00	59.32	0.01	5.90
Oil***	6.70	115.50	0.01	-17.60
Potatoes	6.00	43.64	0.04	-1.60

* The Danish kroner/euro rate was 743.40 on 30 April 2002.
** Includes observations from 1 June 1999 to 1 June 2000 only.
*** Includes observations from 1 July 1999 to 31 December 2000 only.
Please note that price premiums are calculated from all prices, including special offers.

During the period, the highest growth was experienced for products in the cereal group, as many of these products were introduced during the period 1997-2000. Consumption of organic oil, cream, cheese and potatoes actually decreased. Carrots and onions, which have been supplied since the 1980s, experienced low growth rates, too. Looking at annual growth rates (not shown in the table), a general pattern of decreasing growth rates can be observed for almost all food types. Until 1998, organic consumption was still booming, but negative growth rates are observed from 1999 and onwards for many products.

Is the Danish market different?

There are substantial differences between the European countries in their consumption of organic foods (Wier and Calverley, 2002; Michelsen *et al.*, 1999) and these differences cannot be explained solely by differences in consumer preferences. Wier and Calverley (2002) argue that differences across countries are not only due to differences in consumer demand for organic foods, but also to market barriers, which prevent the potential demand being fulfilled.

Most studies show that consumers primarily buy organic food because of health considerations (CMA, 1996; von Alvensleben, 1998; Meier-Ploeger *et al.*, 1996; Sylvander, 1995; Infood, 1997, 1998; Land, 1998; Scan-Ad, 1998; Coopers and Lybrand Deloitte, 1992; Byrne *et al.*, 1994; Huang, 1996; Huang *et al.*, 1990; Jolly, 1991). German consumers, for example, are very concerned about health and food safety (Kafka and von Alvensleben, 1998). Brunsoe (1996) and Brunsoe and Bredahl (1997), compare consumer segments in various European countries, and show that German consumers are more interested in organic food than Danish consumers. But the market share of organic food in Germany is considerably below the market share in Denmark where, in spite of having the world's highest consumption of organic food *per capita*, consumers are not very concerned about health and food safety (Kafka and von Alvensleben, 1998).

In Denmark, consumption of organic foods was low until 1993, the general market share of organic foods being less than 1-2%. Until 1993, the main driving force behind the expansion of the organic foods market was government subsidies and advisory services to organic farmers during the conversion period (Hamm and Michelsen, 1996). However, consumption began to increase in 1993, when supermarkets lowered the prices of organic products by 15-20%, increased supply considerably, and initiated intensive marketing of organic products (Hamm and Michelsen, 1996).

The current Danish market fulfils three important conditions for a well-functioning market. First, organic foods are primarily sold through conventional supermarkets, ensuring stable supplies and promotion of organic products where most of the consumers do their shopping already. Secondly, there is a very well-functioning and trustworthy labelling and certification program. Finally, price premiums for organic products are in most cases relatively low. In most other countries, at least one of these barriers is prevalent (Michelsen *et al.*, 1999).

Distribution and sales channels

Several studies (Vogtmann, 1988; Haest, 1990; Sylvander, 1995; Bugge and Wandel, 1995; CMA, 1996; von Alvensleben and Altmann, 1986; Krämer *et al.*, 1998; Menghi, 1997; Hack, 1995) note that one of the most substantial barriers to the penetration of organic goods is that it is difficult for consumers to locate and identify organic commodities, and that only a few organic products are offered regularly in supermarkets. A considerable number of European markets for organic products suffer from insufficient supplies.

However, the distribution of organic products in the EU is, to an increasing extent, being taken over by conventional supply channels (Produce Studies, 1998). This is especially true for Sweden, Denmark and the United Kingdom, where a relatively small number of conventional retail chains and organic food distributors dominate the market. In Sweden and Denmark, 85% of all organic goods are distributed through conventional sales channels (75% in the UK) and the majority (85-95%) of these sales pass through supermarket chains.

In contrast, the Netherlands and Germany for example, are characterised by a completely different sales structure (Produce Studies, 1998). In these countries health food stores and direct sales have dominated the distribution of organic products for many years and are still powerful, even though their growth is stagnating compared to the growth of organic products in supermarket chains.

Labelling

Since it is impossible for consumers to check the authenticity of organic products, it is necessary to build up a control system with clearly defined rules for production methods and labelling of certified products (McCluskey, 2000). Previous consumer studies suggest that trustworthy labels guaranteeing organic production are very important for the consumers. The results indicate that clear and unmistakable labelling is an important condition for buying organic foods (Trijp *et al.*, 1997; Hack, 1995; Sylvander, 1995). In many countries, however, there are many competing labels. This has been a problem in Germany, for example, where consumers have had great difficulty identifying the authenticity of organic products (Hamm and Michelsen, 1996; Krämer *et al.*, 1998; CMA, 1996).

The Danish certification label, which is controlled by the Danish state, is well known by a majority of all consumers, and consumers in Denmark have great confidence in the Danish control system (Infood, 1998; Scan-Ad, 1998; Bjerke, 1992). Preliminary results of our own suggest that in 2000, 96% of Danish consumers recognise the Danish label, and 64% state that, in general, they trust the label. A large majority have a good understanding of the rules of organic production; 96% know that application of synthetic pesticides is not allowed in organic production, 90% know that fertiliser application is not allowed, and 71% know that organic production encompasses requirements for animal welfare. In general, however, consumers believe that the standard of the Danish label is more comprehensive than it actually is: 20% believe organic production has a requirement of energy conservation, and 35% believe that packaging of organic products must be environmentally friendly.

Price premiums

High price premiums for organic goods limit demand. Results from Glaser and Thompson (1998, 2000) and Wier, Hansen and Smed (2001) indicate high price sensitivity in demand. These studies modelled substitution between various (organic and non-organic) food types, using the AIDS system on actual purchase data. In these studies, a similar pattern appears: demand for organic products are much more price-elastic than demand for conventional products. In contrast to these results, however, Jörgensen (2001), who estimated demand for various cereal products and coffee using an *"ad hoc"* specification and Swedish GfK data, found comparatively low price elasticities for certified organic products.

In addition, several studies evaluate consumers' willingness to pay, most often based on interviews. For a review, see Thompson (1998) or Wier and Calverley (2002). Based on consumers' own statements, Fricke and von Alvensleben (1997), Krämer *et al.* (1998), Meier-Ploeger *et al.* (1996), Haest (1990), Hack (1995) and Jolly (1991) point to high price premiums as one of the most important reasons for not buying organic foods.

In Denmark, price premiums are in general low, compared to other countries (Michelsen *et al.*, 1999). Results from Michelsen *et al.* (1999) suggest that the average price premium is reduced by increasing volumes and increasing sales through supermarkets.

The data

The data used in our study are provided by a market research company, GfK Denmark, part of the GfK Group (www.gfk.com). GfK Denmark registers the consumption of approximately 2 300 households of (certified) organic and conventional foods and the corresponding prices (www.gfk.dk). Every year, 20% of the households change, partly because of households leaving the survey, and partly in order to ensure that the panel is representative of the Danish population. The panel is representative with respect to the location and size of the household, as well as the age of the consumer. The consumers respond by recording their weekly purchases in a diary. This record encompasses a large variety of commodities, representing 80% of the consumer's budget for grocery shopping. Data for organic foods exist from the beginning of 1997 and onwards. For this paper, data were available until the end of 2000.

The modelling is supported by a questionnaire, surveying households in the very same panel as applied in the market research. An essential feature and ultimate strength of the project is that it can reveal differences between revealed and postulated behaviour and enlarge the analysis by information on attitudes, values, food habits/eating patterns and food interests. In summer 2002, we mailed the panel a questionnaire in order to reveal information on attitudes, values and food habits, with special attention to valued food attributes and perceived food-safety risks. In addition, we asked the panel members their stated willingness to pay, making it possible to compare stated (revealed from questionnaire data) and actual (revealed from purchase data) willingness to pay for the same individuals in the panel.

Comparing stated and revealed preferences

For the present paper, questionnaire data are not yet available. Instead, we use pre-test data from a sample of 400 respondents. The pilot study was mailed to 400 households, representatively distributed across geographical regions and within each region, randomly chosen. The response rate was 31%. The questionnaire consisted of four sets of questions: questions on purchase habits and food culture (choice of store, important product characteristics, statements on risks from eating certain foods); questions on organic food production (identification of the Danish O-label, statements on organic production and its effects); questions on habits and environmental attitudes (use of recycled toilet paper, aluminium foil, membership of environmental associations, statements on the consumer's role in environmental protection); and finally questions on willingness to pay for organic milk. The respondent had to indicate whether (s)he agreed with the attitudinal questions on a scale from 1 to 5. The respondents who stated a positive willingness to pay were asked a follow-up question requiring them to rate whether different characteristics of the organic product were more or less important in their decision to pay more for the organic product (taste, absence of pesticide residue, environmental concerns, good conscience). For more details, *cf.* Millock *et al.* (2002) or www.akf.dk/organicfoods.

The elaboration of results from the test sample indicates the following characteristics of the Danish consumers:

- Salmonella, pesticide and medicine residues are the top food safety concerns for foods in general. Cholesterol and mad-cow disease ranked lower.

- Avoidance of chemicals is a top concern and the most highly-valued product attribute for organic foods.
- The order of valued attributes does not vary across organic product types.
- Stated main barriers for not purchasing organic foods are too high price premiums, poorer appearance, and lack of trust in control.
- 64% of consumers lack confidence in imported organic foods.
- 25% of consumers state that a large supply of organic foods is a main reason for store choice.
- 66% state that even if organic standards were totally obeyed, organic agriculture would make no difference to the environment: 57% state it would make no difference to the health of consumers eating organic.
- 35% of consumers willing to pay more for all types of organic products have been members of an organization that protects nature. In comparison, 18% of consumers, not willing to pay more for any organic product, have been members of an organisation that protects nature.

A large part (59%) of the pilot sample stated a willingness to pay more than the conventional market price for organic milk. Average stated willingness to pay is a price premium of 32% for a litre of milk. In comparison, purchase data during 1 June 1999-31 May 2000 shows that on the market, 55% of all consumers in the household panel are willing to pay more for organic milk. The average price premium (revealed willingness to pay) — estimated from purchase data — is 24% for organic milk. Thus, the consumers are on average actually paying less for organic milk than they state they are willing to pay. This may indicate two things. First, consumers may state that they are willing to pay more than they actually are, suggesting that contingent valuation may be associated with uncertainty. Alternatively, the results may indicate a considerable consumer surplus, as consumers would be willing to pay more than they actually are.

As part of the analysis of the pilot study, we performed logistic maximum likelihood estimates on the probability of being a BUYER, defined as willing to pay more for organic milk in the survey (*cf.* Millock *et al.,* 2002). We used the attitudinal information in the questionnaire to construct indicator variables for environmental behaviour and awareness, health risk concern, nutrition concern, good conscience from buying organic products, price sensibility, and the attitude towards the statement that "environmental problems are exaggerated". We also constructed an indicator variable based on attitudes towards three statements on the impact of consumer behaviour on the environment.

The estimated model seems to generate good predictions of buyer behaviour, with the model correctly predicting buyer rate for 82% of the sample. Among the significant variables, price consciousness and the belief that "environmental problems are exaggerated" decrease the probability of being willing to pay for the four products by about 100%. The presence of small children in the household has a positive significant influence on the probability of being willing to pay more. However, based on this limited sample, we did not find any significant impact of the indicator variables on health, nutrition and environmental awareness.

Price and income sensitivity in demand

A demand model system based on purchase data from the beginning of 1997 to the end of 1999 has also been developed (*cf.* Wier and Smed, 2000; Wier, Hansen and Smed, 2001; Wier and

Smed 2002). Results from these studies suggest that price sensitivity in demand for organic products is high, compared to other food demand studies. An important reason for the high elasticities is that the organic and conventional products are close substitutes. Furthermore, it appears that organic products respond much more to price changes than conventionally produced products. This is partly due to the high budget share of conventional products, and indicates that organic products, often newly introduced on the market, may be subject to more price comparison. Similar results can be found in other studies on demand for organic foods (Glaser and Thompson, 1998; 2000).

In the preferred model specifications, the budget elasticity was set to unity. However, if this restriction is relaxed, the budget elasticity for organic products is larger than 1. This indicates that organic foods are luxury goods, as the budget share increases with the budget.

Organic products are demanded in all types of households. However, some household characteristics are associated with higher propensity to buy organic foods. Previous studies have found that household size is positively correlated with buying propensity for organic foods. This result cannot be confirmed in our study, as it is the age of children in the household and not the mere presence of children that yields higher volume shares. Thus, families with small children have a higher buying propensity than families without children or with teenage children.

Some studies find that urbanity is positively correlated to organic buying propensity, and this is partly confirmed in our study. The highest organic budget shares are found in the metropolitan area and the lowest in rural areas in western Denmark. Households in eastern rural Denmark are an exception to this rule, however. Regarding consumer age, previous Danish studies conclude that younger consumers have a higher buying propensity. Most studies on countries other than Denmark confirm this, but in addition some studies find that also the oldest consumers have a high buying propensity. In our study, we find that younger consumers, especially between 30 and 40 years, exhibit higher organic budget shares than other consumers. The dependence of age, however, varies somewhat across product type.

Price sensitivity of demand varies across different household types. This implies that reducing the price premium for organic foods will cause an increase in consumption, but this will, however, primarily happen in some household types. In general, households with low organic budget shares show the highest price elasticity in demand and *vice versa*. This indicates that the price premium is an important reason for not buying organic foods in some households, and policies aimed at reducing price premiums will be highly effective with respect to these households. In contrary, other household types will respond more to other policy measures.

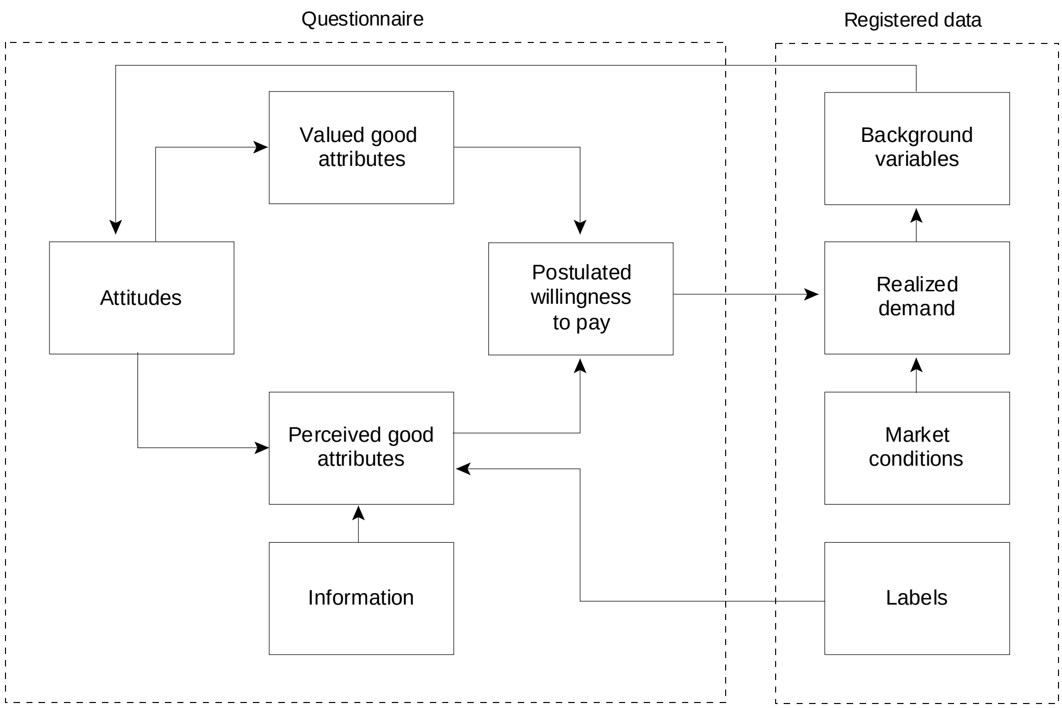
Current and future research

At present, we are developing and improving the demand modelling on household purchase data from 1997-2001. We are currently applying micro-econometric estimation of demand for aggregated food groups, utilising the panel nature of data. In the model, the individual household's consumption of organic foods is modelled, and its dependence on important factors such as prices, household income, geographic location, consumer's occupation, age, number of children, etc. In the current modelling work, we hope to confirm our previous results, described under *Price and income sensitivity in demand*, in addition to accomplishing new insights.

Three main approaches are followed: first, we have had good results when modelling demand for the aggregated food groups of dairy goods, bread and cereals, and other foods (including meat, vegetables and fruit). Another approach — also with good preliminary results — is modelling demand for various meal types. The meal types are breakfast and lunch (bread, filling and spread for sandwiches, cereals, etc.); dinner (meat, fruit and vegetables); basic foods, *i.e.* food types that may appear in any meal type (flour, milk, sugar etc) and, finally, additional food, *i.e.* food consumed in addition to ordinary meals (coffee, wine, candy, cakes, fruit). The third approach is modelling-revealed preferences, *i.e.* modelling demand for (and implicitly valuing) products' characteristics like fat content, with/without organic label, small/large producer, convenience and origin. At the current stage this is done for the milk market. At present, however, it is too early to evaluate the contributions from these estimations.

The core of the project is to establish the parameters of a utility-based model of household preferences for organic food, incorporating explicit representation of valued product attributes and relevant underlying attitudes. The GfK Group has household panel data from several other European countries and in the project we will apply data from other countries as well. Data for parameterisation can be divided into nine types and will be collected through two vehicles (Figure 2).

Figure 2



The detailed demand modelling at household level will enable us to evaluate the effect of policy instruments such as subsidies, labelling, information, etc. on total consumption as well as on individual consumer segments. It is of particular interest to examine differences in consumers' confidence in organic product labelling, differences in food culture (attitudes towards imported goods, preferences for prepared/unprepared products), and differences in sales channels (supermarkets, direct sales, health food shops, etc) among countries and among different consumer groups within the individual countries. Identifying differences in demand parameters for different types of households is both important as part of understanding the willingness to pay (for organic foods as compared to conventional foods) of different consumer segments and as part of an evaluation of the market potential.

Conclusions

Today, Denmark probably has the highest consumption of organic products *per capita* in the world. This high consumption of organic foods in Denmark is not due to higher consumer interest in organic products, because this interest is just as strong in many other countries. The preconditions for this high consumption are as follows: first, Denmark has a relatively well-functioning and reliable certification and labelling system; secondly, the majority of organic foods are sold in supermarkets, ensuring stable supplies; finally, price premiums for organic products are low, compared to other countries. In most other countries, at least one of these barriers is prevalent. Consequently, the Danish market is a well functioning market, where consumers in general have easy access to the organic foods, trust the authenticity of organic products, and can afford to pay for them.

Econometric estimations reveal that price sensitivity in demand for organic products is high, compared to other food demand studies. Thus, it appears that organic products respond much more to price changes than do conventionally produced products. This may be due partly to the fact that the organic and conventional products are close substitutes, and may partly indicate that organic products, often newly introduced on the market, may be subject to more price comparison. In addition, the budget elasticity for organic products is larger than 1, indicating that organic foods are luxury goods.

What can be learned from the Danish market? Our results suggest the following:

- It is crucial that consumers can identify the food as organic or else they will not be willing to pay a premium for it. Thus, establishing a well-known and trusted labelling system is essential.
- Future expansion requires increased supply in supermarkets, which are able to reach a wider range of customers, especially the busy, urban consumers, who do not have time to shop in speciality shops or at farms.
- A substantial fall in price premiums is likely to increase sales. Higher prices today are mainly due to an immature market, hindered by inefficiency and a costly processing and transport sector. Gradually, as markets mature and more production is initiated, processing and transport will be possible on a larger scale, and prices will, in all probability, stabilise at a lower level.
- Wherever the consumption of organic food is very price sensitive, policy measures affecting price premiums will be highly effective. Thus, our study indicates that measures such as subsidies to organic products or production, levies on conventional agricultural products, or levies on pesticides or commercial fertilisers may have remarkable effects on the consumption of organic foods.

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Part III.

Policy Approaches To Organic Agriculture

Chapter 7.

Labelling, Standards and Regulations

THE ROLE OF GOVERNMENT STANDARDS AND MARKET FACILITATION

Kathleen Merrigan[1]

Abstract

This paper provides an update on the US Department of Agriculture's (USDA) organic standards implementation process, offers reflections on organic controversies, and outlines the opportunities for government intervention to facilitate the marketing of organic products.

Introduction

What are standards? The International Organization for Standardization (ISO) defines standards as "documented agreements containing technical specifications and other precise criteria to be used consistently as rules, guidelines and definitions of characteristics, to ensure that materials, products and services are fit for their purpose." It goes on to say, "standards thus contribute to making life simpler." To those of us involved in the political debate since 1989 over the US National Organic Program (NOP), however, life seems only to have become more complex. Yet, is life not better for having national organic standards? Yes, it is and let me back this assessment by addressing ten frequently asked questions about US organic standards and government actions to facilitate organic markets.

What is organic agriculture?

I appreciated that Dr Liebhardt opened the conference with a definition of organic agriculture from the NOP, which captures the environmental objectives of organic production (see paper by Liebhardt in the Introduction). In a larger sense, however, this same definition does not clearly define organic agriculture. When the legislation was written in 1989, the objective was to establish an environmental standard and only one rule was set, that is a requirement for the "safe" use of manure, and a nod to animal welfare.. This rule is in fact essentially an environmental standard allowing for only a few exceptions. For example, consumer demand rather than environmental objectives led to a ban on genetically modified organisms (GMOs) and irradiation.

While many of us believe there are nutritional benefits to organic food, this has yet to be scientifically documented and USDA never misses an opportunity to claim that organic food is no better than conventionally grown food. At the time this rule was passed, many of its supporters also

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viewed organic agriculture as a surrogate for the family farm debate, meaning that supporting organic agriculture was synonymous for helping small and moderate-sized farms to survive. Yet much of the criticism of the current NOP has to do with its failure to explicitly deal with social aspects of organic agriculture, like farm size and treatment of farm workers. These are important issues that are not addressed by the rule as written nor in the authorising statute. The present discord on social objectives is creating consumer confusion that will, if continued, undermine organic markets.

Have standards facilitated the entry of corporate agriculture?

This is the implication in many press accounts. Michael Pollen of the *New York Times*, for example, explored this tension in an article last year focusing on Cascadian Farms and its purchase by General Mills. Dr Jim Hanson has echoed his view at this workshop, stating that NOP standards have created commercialisation forces that favour larger farms. I respectfully disagree.

An example is our experience with the "natural" label, which was very much on my mind when I drafted the Organic Foods Production Act of 1990. Indeed, Mel Coleman (founder of Coleman Natural Beef), who witnessed USDA's watering down of the requirement for obtaining the label "natural" so as to favour big industry access, advised the creation of strict standards and labelling regimes. Many small farmers were also alarmed by the growing interest of corporate agriculture in organics following the Alar pesticide scare in 1989. The truth is that corporate agriculture was going to enter this market, with or without standards. Thus, the law established both strong standards and the National Organic Standards Board (NOSB), a citizen board that gives consumers, environmental groups and organic farmers a voice in determining NOP operations.

How prescriptive should standards be?

Too many so-called organic standards are in fact statements of principles, rather than measurable, enforceable practices. This is not the case with the NOP. In fact, the opposite is most likely true in that there is too much detail. Part of the demand for detailed standards stems from the organic community's fear that industry will attempt to twist the programme to meet its own needs. However, there are many downsides to having overly prescriptive standards. It takes a long time to build national consensus on standards and to fulfil the required notice and comment procedures of the Federal Register. This means the system is not flexible and cannot react quickly when changes are needed. It also limits the discretion of the certifying agents. I have always envisioned an important role for certifying agents in developing farms and handling plans with their clients — adapting national standards to local conditions. I would not want our standards to become so prescriptive as to limit the value of individual planning. It may be counter-intuitive, but there are times when less is more.

Will the 21 October deadline for NOP implementation be met?

USDA received 117 applicants for accreditation. About 40 of those applicants were foreign, with the greatest number of European Union (EU) candidates coming from Germany. As of September 2002, 56 of the 117 organisations were accredited, at least conditionally, and most applications will have been reviewed by USDA by 21 October 2002.

International trade will continue in some areas without disruption, but there are growing problems. Japan has recognised the NOP crop production standards as equivalent to their own, with the exception of three materials. The USDA has not yet recognised Japanese standards. There have been six requests for recognition of foreign accreditation programmes, but these are still under USDA review. The EU and USDA began their joint technical review of standards in October 2002, and the process promises to be a long one.

Materials are regularly reviewed and approved. In September 2002, the NOSB approved 32 materials which , along with previously approved materials, will be published in the Federal Register as allowed under the NOP. If USDA does not publish the Federal Register notice before a certain date, certifying agents can assume all NOSB approved materials have been approved. To date, the Secretary has never used her power to delete materials from the Proposed National List approved by the NOSB.

The commercial disputes involving chicken and fish have been resolved, at least for now. USDA is adhering to the Final Rule, despite great political pressure to do otherwise. Thus chickens must have access to the outdoors and consume 100% organic feed. USDA has declared that fish can be organic if they can be certified. However, organic production standards for fish have yet to be developed.

USDA has resolved the issue of back inventory. Companies will have two years to empty their warehouses of pre-existing products labelled as organic, even if it does not meet the new standards. Anything produced as of 21 October 2002 must conform entirely with NOP standards. Finally, no state organic programmes have been approved, although four have been submitted for review.

What are the major challenges ahead of us?

a) **Materials approval policy**. The NOSB, and therefore the NOP, has yet to define the materials needing NOSB review, although they have gone beyond what I had imagined in drafting the law. For example, the use of pheromones is not guaranteed under the NOP because a particular pheromone likely contains undisclosed inerts on the US Environmental Protection Agency's "List 3" (a list of inert materials in pesticide compounds that are of unknown toxicity) and the NOSB states that it therefore requires review. However, the statute explicitly cites pheromones as desirable organic inputs. Much of the NOSB's time is consumed in the evaluation of food processing agents beyond anything conceived of in the authorising legislation.

b) **Regulation of retail markets and restaurants**. Under the NOP, retail markets and restaurants are required to follow the standards but certification is not required. This is a glaring gap in the programme that must be addressed. Frankly, grocery stores are a powerful lobby and the government may need their co-operation to achieve this goal.

c) **Enforcement resources**. No resources have been dedicated for enforcement at the federal or state levels. I expect that USDA will be alerted to fraud by suspicious consumers and, more likely, by business competitors. In turn, they will seek to enforce a few high profile cases and use them as a warning to all those in the industry. The penalties are in place — USDA can impose up to USD 10 000 per violation. Nevertheless, there is no plan for proactive enforcement.

d) **Equivalency determinations**. This will likely take many USDA and US Trade Representative (USTR) hours as we try to negotiate equivalency with other countries. The concern here is that other non-organic issues may be on the table as trades are made. Public disclosure of these negotiations will be critical.

e) **Complementary standards**. USDA is continuing discussions with EPA on establishing a labelling regime for biopesticide products approved under the NOP. Currently it is up to organic farmers to determine whether such products are allowed under the NOP. Clear labelling would reduce the risk that farmers make mistakes and certainly make their lives easier.

f) **Food safety and manure**. Critics of organic agriculture cite the use of manure in organic systems as troublesome, which is true. Organic foods are no more or less safe than conventionally produced foods with regard to manure since both production systems rely upon its use. We have not answered the scientific questions surrounding safe use of manure. The government needs to make an investment in scientific investigations to determine safe manuring practices.

g) **GMO-free standards**. Organic products must be produced without the use of genetic engineering or "excluded methods" as defined in the NOP. We are waiting for the government to fully resolve standards for adventitious presence, testing and labelling. This is not solely the organic community's burden, but it does affect organic marketing in a very dramatic way.

Will there be defections come 21 October 2002?

Yes. In general, organic farmers and processors will continue under the NOP because interstate and international commerce require a marketing standard that can be understood along the entire food distribution chain. However, some small farmers have declared that they want no part of this NOP, that it is overly restrictive, expensive, and bureaucratic. Some of the smallest farmers, who direct market their products, will certainly bow out of the NOP and create new labels for their goods. For example, Elliot Coleman, a respected organic farmer in the state of Maine, is now marketing his produce as "authentic" to stay clear of the NOP. Given the close relationship Elliot has with his customers, I think this is just fine.

I also expect that labels that go beyond organic will appear following NOP implementation. Since organic has crystallised primarily as an environmental claim, I expect that food companies will seek to add additional claims on organic products such as "fair trade", "socially just", produced without particular inputs that would otherwise be allowed under the NOP (*e.g.* Chilian nitrate), "locally grown", etc. This is not necessarily a negative verdict on the NOP, but rather fascinating marketing opportunities.[2]

What do consumers want, need, and understand?

The labelling categories under the NOP will dramatically alter the organic market and represent the most important achievement of our national programme. Requiring a minimum threshold of 70% organic content for the word "organic" to appear on a product's principle display label provides the kind of protection consumers seek. It will also increase the demand for organic at the farm gate as companies who label their products as organic will have to substantially increase their

2. On 7-9 November 2002, the Friedman School of Nutrition at Tufts University hosted a conference on ecolabels and the greening of the food market to better understand the issues these new label claims present.

procurement to maintain their claims. It would be useful for USDA to supply market information to accompany these new labels and then evaluate their effectiveness.

Consumers have been full partners from the beginning of this process. The Center for Science in the Public Interest and Public Voice are two prominent consumer groups who helped get the legislation passed. The tens of thousands of letters denouncing USDA's first proposed rule were mostly from consumers. They are the power behind organic farmers. That's the good news. The bad news is that the customer is "always right". The outright ban on GMOs may have some negative implications for organic farmers and handlers, limiting their access to some critical materials such as animal vaccines.

The major consumer challenge in the post-21 October 2002 era will be developing a consumer consciousness of what organic is, rather than what it is not. Most consumers will tell you organic equals no pesticides, fertilisers, hormones, antibiotics, etc. They will not tell you about the positive elements, *i.e.* the NOP requires crop rotations and other soil-building techniques. There are other negative claims labels in the marketplace — no GMOs, no detectable residues, no hormones or antibiotics. If organic is to trump all these competing claims, communication work is necessary to promote our message.

How important is consensus?

There was a comment from the floor that policymakers unfairly expect organic advocates to speak with one voice. In my various policymaking roles, I have often demanded that the organic community speak with one voice and in concert with consumer and environmental groups. Is it an unfair burden? I think not. That is the foundation of the organic movement's strength. Unlike other industries, it seeks to operate by consensus. Yes, it takes longer but the results are more profound. The very voting structure of the NOSB gives environmental and consumer groups a veto-like power over the organic industry. If this programme is to work, and if organic advocates hope for more than a foothold on government policymaking, consensus will continue to be important.

What other policy initiatives should the government undertake to facilitate the organic market?

There is a broad spectrum of activities government could undertake that would aid the organic sector. I will focus my list on marketing initiatives and of government activities within the US context for the sake of being specific, but understanding that such activities are generic and could be replicated across the world.

a) **Regulation of look-alike labels**. This is really the domain of the US Federal Trade Commission (FTC) as the government agency responsible for protecting consumers from fraudulent label claims. The explosion in the ecolabel sector may require scrutiny for any negative impacts on organic. Furthermore, after all this effort to define appropriate uses of the term organic on food product labels, it is possible that companies can circumvent the NOP by having the term organic as part of their name (*e.g.* Great Organic Cereal Company). Without FTC intervention, this could limit the value of our standards work to date.

b) **Collection and analysis of market data**. The USDA Economic Research Service (ERS) and the Agricultural Marketing Service (AMS) have both begun to collect data on the organic sector, although much more is needed. AMS efforts, in particular, are minimum compared to what is undertaken on behalf of conventional agriculture. Several times a day, AMS employees across the country post prices for various commodities to provide market information for traders. This could be done for organic products as well.

c) **Distribution of consumer information**. The NOP brings about profound change in the organic sector, especially in terms of labelling. A national education campaign should accompany NOP implementation. Furthermore, the Environmental Protection Agency should once again attempt to provide a consumer information booklet on food choices and pesticides for distribution in grocery stores. Unfortunately, any effort to educate consumers about organic agriculture is attacked by conventional agriculture as disparaging non-organic products.

d) **Assistance with slotting fees**. I do not know the answer to this problem, but it is a significant barrier to entry for small firms trying to bring new products to market. If the government sees value in organic goods, perhaps it could develop an assistance programme to help organic companies defray slotting fee costs when they first begin. Maybe USDA could, in exchange for various USDA services, require a certain percentage of supermarket shelves be provided for new goods. Perhaps antitrust authorities could be exploited to find ways for the government to disallow prohibitively expensive fees that result in market concentration by large firms.

e) **Collection of foreign market information**. The USDA Foreign Agricultural Service (FAS) has begun this process and reports on the organic markets in dozens of countries. Information on organic markets from China to Mexico to Germany is found on FAS' webpage.

f) **Collection of pesticide residue data**. The USDA AMS has a pesticide data programme that collects food at supermarkets across the country and tests it for pesticide residues. Recently, AMS began to test organic produce in addition to conventional produce. As a result, Chuck and Karen Benbrook and Brian Baker were able to publish a powerful comparative study between organic and conventional produce that underscores the value of organic to the consumer. The analysis of that data is presented in a user-friendly form on the Environmental Working Group's webpage which encourages consumers to do the comparison themselves. While the AMS data are elucidating, much more needs to be collected for firm conclusions, especially post-21 October when all farmers will be producing under a unified definition.

g) **Procurement of organic food**. The government is a very big business for the food sector. Food purchased for the military, the National School Lunch Program, the USDA cafeteria, elderly feeding programmes, etc., could be organic as a matter of government policy. We already have built-in preferences or set-asides for small and minority-owned businesses. Why not do the same for organic?

h) **Institution of organic crop insurance**. USDA has begun looking at this, but organic farmers need it now. USDA has proposed a rule now open for public comment. Organic crop premiums must be accounted for in insurance programmes, as well as crop loss from genetic drift (GMO contamination).

i) **Diversification of the farm sector**. Organic farmers are not insulated from the massive consolidation that is occurring in agriculture. USDA must find ways to empower farmers in contract agriculture and maintain a diversity of market opportunities. USDA has always been reluctant to exercise their full anti-trust authority or to comment on contracting arrangements, but such involvement is critical to the survival of small and moderate-sized farms.

j) **Determination of an adventitious presence policy and testing regime**. The organic community is vulnerable to GMO contamination and needs the government to determine a *deminimus* level of GMO residue (*e.g.* 1%) that would allow a product to maintain an organic label if the producers and handlers acted in good faith but were victims of inadvertent contamination. Furthermore, the government, as it is now contemplating, must develop or at least certify credible testing regimes for GMO presence because the market impact of such findings is immense.

This is a short list of ideas that USDA and other government entities could undertake within the marketing realm that would benefit organic agriculture. A full accounting of all government actions — regulations, disincentives, incentives, research, subsidies, etc. — would make for an extensive list. My point here is that in the US we are about to celebrate the institution of our national organic standards, but that we have just begun to contemplate the many roles government can play in support of this sector.

Is the organic experience unique?

Many of the farmers and NGO representatives with whom I have had the privilege to work in the field of organic agriculture are creative, visionary, moral leaders. I was struck by the slide in Dr Nieberg's presentation depicting the economic success of organic farmers in several European countries. Without exception, the organic curve paralleled the conventional curve and her point is that organic farmers have more in common with conventional farmers than not. The vagaries of weather, markets, etc., affect all farmers. Understanding that, we do not want to isolate organic within USDA, but fully integrate it into all the programmes suggested above. Farmer Brown needs crop insurance no matter what her choice of production methods. Organic agriculture is not unique.

Are the wars on standards unique? Much has been made of the record-breaking 300 000+ public comments USDA received on its several rule publications. While unprecedented in the level of participation, the difficulty in achieving consensus on standards is not unique. This was confirmed, for example, by Glenna Carlson, Chairperson of the Poodle Club of America. Do the poodle people have standards debates and implementation issues like us? The answer is yes. In her 25 years with the organisation, Ms. Carlson has never known a standard to change, although there have been many proposals and great acrimony. Consensus even among her small organisation is difficult. The Poodle Club of America did publish an *Illustrated Standard* after years of debate. Words are one thing, she counselled, but when you ask ten people to read the same description and then draw it, you're sure to get ten different drawings.

This is where we stand as we enter the next phase of organic standards. We are completing our debate on the choice of words and it is time for farmers to state how well we have captured the essence of their best efforts for replication across the land. Every farm presents a different picture, although our standards are a common marketing language and seek to protect consumers. If these standards fulfil their promise, they will be flexible enough to accommodate individual iterations and evolutions in knowledge.

THE IMPACT OF CONSUMER STANDARDS AND MARKET FACILITATION IN KOREA

Gi-Hun Kim[1]

Abstract

Interest in sustainable/organic agriculture in Korea has increased significantly in the last few years. Sustainable/organic agriculture is still a small but growing part of the agricultural industry, and has now become one of the important elements of consumer choice. The production and distribution of agricultural products are increasing by 30-40% every year. The government is promoting a sustainable agriculture that uses a minimum amount of chemicals and chemical fertilisers, and organic agriculture that does not use any chemical resources such as agricultural chemicals and chemical fertilisers. An Agricultural Product Quality Certification System has been developed to assist the supply of sustainable/organic agricultural products to consumers. In 2001, a survey on Consumer Inclination Analysis towards Sustainable/Organic Agricultural Products indicated that 88% had purchased sustainable/organic agricultural products. Vegetables turned out to be the most commonly purchased item category. The biggest reason for purchasing these products was for health and the prevention of chronicle diseases. However, the majority of consumers complained about the high price. By building consumer confidence towards sustainable/organic products through the establishment of the Agricultural Product Quality Certification System, reducing the product cost, and diversifying the distribution channel, we expect the consumption of sustainable/organic agricultural products in Korea to continuously expand in the coming years.

Introduction

Until the late 1980s, Korea promoted the expansion of agricultural production as part of a national policy to address food shortages. As a result, problems relating to insufficient food supply have been resolved. However, the excess use of chemicals and chemical fertilisers has resulted in environmental contamination. In turn, sustainable agriculture in Korea is now being threatened.

In order to continuously develop our agriculture, actively cope with the increasing national interest in environmental conservation and food safety, and meet the increasing national demand for safe and high-quality agricultural products, the government has been promoting a Sustainable Agricultural Promotion Policy ever since the latter half of the 1990s. In 1994, the government launched a new Sustainable Agriculture Division under the Ministry of Agriculture and Forestry and established a Sustainable Agriculture Upbringing Law, which became the foundation of the Sustainable Agriculture Upbringing Policy in 1997. It also implemented a Sustainable Agriculture Direct Payment Service in 1999 and a Rice Field Agriculture Direct Payment Service in 2001.

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1. Deputy-Director, Sustainable Agriculture Division, Ministry of Agriculture and Forestry, Korea.

Korea is promoting both sustainable agriculture and organic agriculture that do not use chemical resources such as agricultural chemicals and chemical fertilisers.

Korean Agricultural Product Quality Certification System

The Korean government is facilitating the distribution of sustainable/organic agricultural products and reinforcing quality control through the implementation of the Sustainable/Organic Agricultural Product Quality Certification System and expanding the production and distribution of such products by building consumer confidence. Under this system, a professional certification institution examines and identifies safer sustainable/organic agricultural products for consumers under a strict standard, and the government guarantees product safety. The government now allows the certification by both the public and the private sectors. To date, including Hulksalim, there are three private certification institutions.

The sustainable/organic agricultural product certification granted by the government is divided into two categories: agricultural product and animal product categories. The animal product category includes the organic animal products and the transitional organic animal products. The agricultural product category includes:

a) Organic Agricultural Products: agricultural products cultivated for more than three years without using chemicals or chemical fertilisers.

b) Transitional Organic Agricultural Products: agricultural products cultivated for more than one year without using chemicals or chemical fertilisers.

c) Chemical-Free Agricultural Products: agricultural products cultivated without using agricultural chemicals.

d) Low-Chemical Agricultural Products: agricultural products cultivated using agricultural chemicals but not exceeding more than half of the recommended safety standard.

Output and distribution of Korean organic products

Recently, the number of certified farm households and cases have increased substantially. Following such trend, the output of sustainable/organic agricultural products has increased by 30-40% each year. In 2001, the number of farms that produce organic products accounted for 899 households, the areas that cultivate organic products 962 ha, and organic product outputs 31 105 tonnes. In terms of organic agricultural products according to cultivated crops, vegetable outputs take the lead, accounting for 26 000 tonnes, or 82.9%. Cereal, such as rice, accounted for 2 000 tonnes, or 6.4%; fruit 1 900 tonnes, or 6.0%; and miscellaneous 1 400 tonnes, or 4.0 %.

Table 1. Status of organic production in Korea

Year	**1999**	**2000**	**2001**
Farm households	601	669	899
Cultivation area (ha)	528	667	962
Output (tonne)	16 805	19 257	31 105
Organic products (A, ’000 tonne)	16.8	19.2	31.1
Agricultural products (B, ’000 tonne)	18 944	19 311	19 696
Ratio (%, A/B)	0.1	0.1	0.2

Source: Ministry of Agriculture and Forestry, *Status Quo of the Production of Organic Products*, 2002.

Out of the total agricultural output in 2001, the share of organic agricultural products was 0.2%, not a very substantial level. Nevertheless, this figure is expected to steadily increase, as it is increasing by 30-40% every year.

Consumer inclination analysis on sustainable/organic agricultural products

In the past, there were only a handful of producers and consumers who exchanged small quantities of organic agricultural products through direct transaction. Today, thanks to increased advertisements in the media, improved income levels of the consumers, heightened interests about the environment and health, and increased doubts about ordinary agricultural chemicals and overused chemical fertilisers, the consumption of such products are gradually increasing.

In 2001, Dr Lee conducted a survey of 366 consumers nation-wide on Consumer Inclination Analysis towards Sustainable/Organic Agricultural Products.[2] The main results were as follows:

- ***The purchase behaviour of consumers:*** 75% of consumers sometimes buy sustainable/organic agricultural products; 12.8% always buy; and 11.8% do not buy or do not know. In short, the consumers who bought (88.2%) sustainable/organic agricultural products outnumbered those who did not (11.8%).
- ***The categories of the purchased sustainable/organic agricultural products:*** vegetables and rice took the lead, accounting for 54.9% and 36.5% respectively. Fruit accounted for 4.5% and cereal, agricultural processed products, and miscellaneous 4.2%.
- ***The reason for purchasing sustainable/organic agricultural products:*** those who replied “For health and the prevention of chronic diseases” accounted for 41.2%; “Because people say it is good”, 35.3%; “Because they have “good taste and flavour”, 16.2%; “Because you can eat without worrying about chemical substances”, 5.9%; and “For the protection of the environment” and “Miscellaneous”, 1.4%.
- ***Consumer opinions about the price of the sustainable/organic agricultural products:*** 70.1% thought they were expensive; 16.7% adequate; 7.9% didn’t know; 4.9% extremely cheap; and 0.3% relatively cheap. In all, 75% of the consumers considered the sustainable/organic agricultural products to be more expensive than ordinary agricultural products.
- ***Price of sustainable/organic agricultural products deemed adequate by consumers:*** when asked to suggest a price for the sustainable/organic agricultural product, 50% of the consumers suggested a price that is 1.5 times higher than the ordinary agricultural products; 31.1% suggested the same price; 6.9% a price that is two times higher; and 4.4% a lower price. Finally, 7.5% answered that they would buy regardless of price. In sum, the price of the organic agricultural products preferred by the consumers was a figure 1.5 times higher than the ordinary agricultural products.

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2. Lee, Jong Sung, “Current Status of Sustainable Agriculture and Consumer’s Taste in Korea”, Department of Agronomy Graduate School, Dong-A University Busan, Korea, 2001.

Measures to expand organic agriculture production

In order to nurture organic agriculture, increase the number of farm households that produce organic agricultural products, expand cultivating areas, and raise output, the Korean government has established the Organic Agriculture Upbringing Mid- and Long-term Comprehensive Countermeasures. It is planning to expand the share of organic agricultural products in total output to 0.5% by 2005 and 2.0% by 2010. It will also expand the number of organic farms from the current 899 households to 2 000 households by 2005 and 5 500 households by 2010. The cultivating area of organic agriculture will be expanded from the current 962 ha to 3 200 ha by 2005 and to 14 300 ha by 2010.

To this end, the government will develop adequate species and technologies, reinforce government support for those farm households that practice organic agriculture, secure skilled human resources by newly establishing an organic agricultural engineer system and establish regulations for standardised usage of organic agriculture resources.

Measures to expand consumption of organic agricultural products

At the moment, the output and consumption of organic agricultural products are continuously increasing. But to boost consumption even further, the most important thing to do is building consumer confidence towards the Sustainable/Organic Agricultural Product Quality Certification System. If we are not able to secure consumer confidence towards organic agricultural products, we will face difficulties and limitations in popularising their consumption.

In order to secure consumer confidence towards the Sustainable/Organic Agricultural Product Quality Certification System, the consumers must be able to trust the quality and safety of the organic agricultural products before they can purchase them. In order to receive high premium, the producers must produce high-quality organic agricultural products that are in line with the certification standard.

The government must establish an organic agricultural product management system in order to secure consumer confidence over organic agricultural products from the initial production to final consumption phases.

- ***Farm households:*** by observing the certification standard from the initial production phase, the producers should market high-quality organic agricultural products that will help build consumer confidence.
- ***Certification institution:*** reinforce the organic agricultural product quality test and management at the production and distribution phases.
- ***Government:*** expand the sales network of organic agricultural product, strengthen advertisement, and support the producers.
- ***Consumer:*** participate actively in the consumption of fresh and high-quality organic agricultural products.

ORGANIC AGRICULTURE AND NATIONAL LEGISLATION IN TURKEY

Meral Özkan[1]

Abstract

Turkey is one of the most suitable countries for organic agriculture due to its ecological and climatological conditions. Organic agriculture in Turkey started in the 1980s due to demand from importing countries. At first, dried sultanas, apricots and figs were the first exported crops grown organically. Most of the products are grown in the Aegean region. Since then, organic production has expanded to all regions and various crops have been grown. However, dried fruits are still the main products for export. Until 1994, organic agricultural production and exports in Turkey were regulated according to EU Regulation 2092/91. In 1994, National Regulation on organic agriculture was prepared and published in harmony with the EU Regulations. The National Regulation of 1994 was revised according to the amendments of EU Regulation and new Turkish Regulation named "Regulation on Principles and Application of Organic Agriculture" was published on 11 July 2002.

Introduction

Organic farming began in Turkey in the mid-1980s following demand by European importers. Organic production was mainly concentrated in the Aegean region. Dried sultanas, apricots and figs were the first items produced organically. Today, Turkish organic products have increased into various categories, such as dried fruits, fresh or processed fruits and vegetables, pulses, edible nuts, cereals, spices and herbs, and industrial crops. Some of the processed organic products are frozen fruits and vegetables, and fruit juice concentrates. Most of the organic production goes to the export market. The domestic organic market has been developing over the past ten years but the overall market share for organic product is still small. Organic products are sold in some supermarkets, hypermarkets and specialised retail shops.

The first national regulation on production, processing and marketing of organic agricultural products was published on 18 December 1994 and an amendment to this regulation was made on 29 June 1995. The National Regulation of 1994 was based on EU regulation 2092/91. Since then, amendments to the EU basic regulation have been followed and a new regulation was prepared and published on 11 July 2002. Further amendments to the EU regulation will be adopted. With the publication of comprehensive national legislation, most of the issues from the field to the fork of the consumer are covered. The aim of the Ministry of Agriculture and Rural Affairs (MARA) is to build up trust in the organic sector. The Organic Agriculture Committee (OAC) at MARA is the competent

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authority to prepare and implement the regulation on organic agriculture, to give permission to control and certification bodies, to inspect these organisations and co-ordinate all other activities to improve organic agriculture in Turkey. Prime Ministry Undersecretariat for Foreign Trade and MARA are the authorities for regulating import and exports of the products certified as "Organic".

Organic agricultural production in Turkey

In 1996, 1 947 farmers dedicated 6 789 hectares of farmland to organic agriculture. Organic production was 10 304 tonnes with 26 kinds of product. According to the data of 2000, 18 385 producers grow 237 209 tonnes of 95 different kinds of organic crops on 59 984 hectares. Production data for year 2000 is given in Table 1. Some of the organic products for export include hazelnuts, walnuts, pistachios, dried figs, dried apricots, raisins, pulses, spices and herbs, and industrial crops, such as cotton, frozen fruits and vegetables, fruit juice and concentrates, olive oil, and rose and rose products. Some of the exported organic products are given in Table 2. These products are exported to more than 20 countries, with the majority of exports going to European Union countries. The major importing countries are Germany, France, the Netherlands, Switzerland, the United Kingdom and the United States of America. Organically produced dried figs and apricots, fruit juice and concentrate, and olive oil are exported to the US. The Aegean Exporters' Union (AEU) co-ordinates the exportation of organic products. According to national export regulation, certified organic products must be registered before exportation. Therefore, the export certificate given by inspection body must be submitted to the AEU.

Table 1. Organic production, number of farmers and acreage in Turkey

Crops	Number of farmers	Acreage (ha)	Production (mt)
Apricot	316	1 723	40 800
Figs	1 045	3 858	7 635
Tomato	341	674	15 534
Apple	3 232	2 337	34 605
Sultanas	1 190	2 584	7 583
Peach	60	63	1 738
Lentil	1 063	6 860	7 163
Chickpea	240	1 622	2 054
Hazelnut	1 842	4 244	4 142
Almond	130	534	508
Plum	62	188	3 463
Pear	67	261	6 186
Olive	1 134	2 379	12 875
Olive oil	782	1 200	1 620
Honey	7	5 000	259
Rose and rose products	447	225	69
Cotton	740	5 344	23 091
Garden sage	157	203	264
Linden	27	140	159

Source: Ministry of Agriculture and Rural Affairs, 2000.

Table 2. Organic agricultural products exported from Turkey

Crops	Amount (tonnes)		
	1998	1999	2000
Dried sultanas	2 839	3 289	4 028
Dried figs	1 469	1 580	1 733
Dried apricots	953	1 045	1 050
Dried prunes	20	116	213
Hazelnuts	742	879	1039
Pistachios	19	36	52
Lentils	335	616	897
Chickpeas	590	934	679
Apple juice	-	555	290
Other fruit juices	-	15	236
Cotton	75	169	175
Pepper	29	131	145
Poppyseed	213	137	165
Olive oil	21	381	15
Others	724	1 796	1 330
TOTAL	8 029	11 679	12 047

Source: Aegean Exporters' Union.

National legislation

In 1994, the "Regulation on the production of livestock and vegetable products by ecological methods" was adopted and published. A year later, an amending regulation adding articles related to sanctions was adopted. These regulations were prepared in harmony with EU Regulation 2092/91 and worked well for years in organising and controlling organic agriculture in Turkey. With the changes in EU regulations, our national regulation needed to be revised. Some 20 amendments of EU Basic Regulation 2092/91 have been worked on and instead of amending our original regulation, a new regulation has been prepared. Recently, the "Regulation on Principles and Application of Organic Agriculture" was published in the Official Gazette of the Republic of Turkey (OGRT) on 11 July 2002. This comprehensive regulation has 6 parts with 17 sections and 10 annexes. This regulation has been prepared in harmony with the EU basic regulation on organic agriculture and its amendments, and also local needs were taken into consideration. The new regulation deals not only with the production of vegetable and livestock products but also brings very strict rules related to official controls in organic agriculture. In order to apply sanctions and penalties, legislation was prepared and submitted for approval of the legislative body.

The six parts of the "Regulation on Principles and Application of Organic Agriculture" cover the following topics. The first part contains information about general rules that explain aim, definitions, legal base and scope of the regulation.

The principles of organic agriculture and the rules on how to start organic production are explained in the second part. In this part, the rules for the operators who wish to produce organic foods are explained in detail. For example, an operator has to apply to one of the Control and Certification Bodies and signs a contract with them. Upon agreement, the control body has to inform the OAC and Provincial Directorates. This part also contains rules about organic vegetable and livestock production.

The first section of this part covers general rules for vegetable production. For example, organic vegetable production has to be carried out under the control of control bodies, rules relating to conversion period and also methods for protection and preparation of soil, sowing, planting, harvesting rules and using of fertilisers, plant-protection products and irrigation methods. Rules relating to production in greenhouses and mushroom production are explained in this part. The second section of this part is related to organic livestock production. This section covers the following topics: the origin of animals, methods for supplying feeding stuffs and feeding of animals, animal health and veterinary treatment issues, shelter, transport and slaughter conditions, handling procedures for animal manure and organic bee-keeping. The next section is about organic fish production. The second part of the regulation also contains information about production, packaging, labelling, storing, transportation and marketing rules of organic products.

The third part of the regulation is about how the control and certification system works in Turkey. Authorisation for control and certification, necessary documents for the controls of production units and operators, control procedures, principles of certification system and preparation of certification reports handled in this part. Upon demand, raw product, processed product, export or import certificates can be prepared.

The next part regulates operating principles of control and certification bodies. Rules related to permission to conduct control and certification activities in Turkey, conditions and documents to apply for this permit, sanctions to be applied in case of violation, approval of inspectors and regulation of control, and certification fees are covered in this part.

The fifth part is related to the Official Committees in organic agriculture. There are four different Committees in this area. First is the OAC in MARA. Other Committees are: the “Organic Agriculture National Guidance Committee (OANGC)”, “Organic Agriculture National Trade Committee (OANTC)” and “Organic Agriculture Research and Projects National Committee (OARPNC)”. These Committees are at the national level and have members from other ministries, NGOs, the Exporters’ Union, different associations and chambers, research institutes and universities. The OANGC and the OARPNC gather twice a year. OANGC determines development strategies for organic agriculture. Their decisions are submitted to the OAC as advice. OARPNC prepares project proposals, organises research programmes and sends the results to OAC. The third National Committee, OANTC, gathers four times a year. This Committee discusses issues related to marketing of organic product in and outside the country, determining the difficulties in supplying necessary substances such as fertilisers and soil conditioners, and developing strategies for the improvement of trade. Its advisory decisions are submitted to OAC.

The sixth part concerns the establishment of an advisory body. Provisions related to consulting organisation handled in this part. Necessary documents for the application, necessity of an accreditation from Turkish Accreditation Institute (TAI), rules related to experience of personnel and the conditions to establish an official or a private advisory body explained here. The last sections of this part are about legal issues. The inspection body has to determine which court to apply in case of violations.

There are 10 annexes for the application of the issues referred in the articles of this regulation. Most of them were prepared in harmony with EU regulation 2092/91. The tables are in the same format as those presented in the EU regulation and the content of the tables is revised regularly according to the amendments of EU basic regulation. The annexes include: tables related to fertilisers and soil conditioners, plant protection products, ingredients of non-agricultural origin, such as food additives, processing aids which may be used for processing of ingredients of agricultural origin from organic production, ingredients of agricultural origin which have not been produced organically, minimum surface area indoors and outdoors for livestock production, characteristics of housing in different species, maximum number of animals per hectare, feedingstuff and cleaning materials used in production unit.

"Annex 3" has provisions for the use of Turkish Organic Logo (TOL) on the packaging material, competent authority to print and distribute TOL in different sizes and colours that can be printed are explained. Sample pictures of TOL are also displayed in this annex. TOL is designed similar to EU logo in order to be easily recognised in EU countries.

Some of the annexes are prepared to meet local needs. A sample organic product raw material certificate, organically processed product certificate, organic product import and export certificates are designed in tables to get information from inspection bodies in the same order. "Annex 8" includes charts for the activities of the production units such as plant production activity explaining name, address of the arable field, size of the area, cultivation, plant protection and harvesting methods, amount of production and yield. Similar charts about livestock production units, fisheries and shelters for animals are also included in the same annex.

Duties of the Organic Agriculture Committee

- To apply obligations of this Regulation.
- To give working authorisation to Control and Certification Bodies, unauthorise them or permanently stop their authorisation in case of violation of rules of this regulation.
- To give a code number and identity card to Control and Certification Bodies, inspectors, trainees and farmers, and processors.
- To inspect Control and Certification Bodies, inspectors, trainees and farmers and processors.
- To warn Control and Certification Bodies, inspectors, trainees and farmers and processors if they fail to apply rules of the Regulation and apply sanctions if needed.
- To forbid Control and Certification Bodies, inspectors, trainees and farmers and processors from organic agriculture in case of not complying with the rules of the Regulation.
- To encourage organic agriculture in Turkey, pursue unfair competition in organic agriculture, apply for legal acts for situations that are against the interest of Turkey.
- To get opinions of the other three national Committees related to organic agriculture and call for a meeting if needed.
- To work closely with NGOs and collaborate with universities, institutions, research organisations and press agencies, and also with other related official and civil organisations, to improve organic agriculture in this country.
- To prepare seminars, symposiums, congresses and fairs on organic agriculture area.
- To follow the amendments of the regulations of other, especially EU countries. And also to make necessary changes in this regulation to harmonise with amendments of EU regulations.

- To co-operate with international organic agriculture organisations.
- To follow international seminars, symposiums, meetings, congresses and fairs on organic agriculture.

The Committee meets ordinarily every month on Thursday. In extraordinary situations, the Secretariat can call an urgent meeting. Decisions are made on a majority vote basis and they are binding. Work of rapporteur is done by the Secretary member chosen from the Council of Research, Planning and Co-ordination. Decisions are signed by members in ten days and submitted to approval of Ministerial Authority, and come into effect after signed by the Authority.

Control and certification bodies

Currently, inspections of organic production are carried out by private control and certification bodies. These bodies must receive a permit from OAC to perform activities related to control and certification. OAC supervises the activities of these inspection bodies. OAC members make both notified and random visits to these bodies and also to the organic farms to control their inspections. Currently, two national and five foreign organisations work as inspection bodies to control organic agricultural products in Turkey. IMO, BCS, INAC, ECO-CERT and, SKALL are active foreign bodies, and EKOTAR and ETKO are national bodies in this field. Another foreign control and certification body, BIOAGRICOOP is not currently active. Information about addresses and origin of control and certification bodies active in Turkey is given below:

- Institute for Mareketecology (IMO) (Swiss)
- ECOCERT (French)
- SKAL (Dutch)
- BCS OKO-Garantie GMBH (German)
- International Nutrition and Agriculture Consultancy (INAC) (German)
- ETKO Gözetim Hizmetleri Ltd., Sti. (Turkish)
- EKOTAR (Turkish)
- BIOAGRICOOP (Italian) (not active).

Conclusions

Turkey's organic producers are mainly focused on export markets. The domestic organic market has only a small portion of the Turkish food market. The majority of consumers in Turkey are price-sensitive and because of the higher costs of organic foods, consumers prefer conventional food products. Currently there is no governmental support to organic production such as supporting farmers during conversion period. Besides its regulatory duties, OAC organises seminars and courses on organic agriculture. OAC aims to build confidence in Turkish organic products. To do so, control and certification bodies are inspected regularly. A draft of the Law on organic agriculture has been prepared to lay down penalty provisions and the provisions on administrative fines to be applied in case of violation by operators, control and certification bodies and consultant firms.

ORGANIC AGRICULTURE IN JAPAN:
DEVELOPMENT OF A LABELLING SCHEME AND PRODUCTION POLICIES

Yukio Yokoi[1]

Abstract

Policy development on organic agriculture and future perspectives in Japan are discussed. The general public is now greatly concerned about food safety issues owing to the recent incidents of bovine spongiform encephalopathy (BSE) and the detection of excess pesticide residues and the use of prohibited pesticides. Policies on organic farming and organic food have been developed in terms of the "JAS Organic" accreditation system and technological support of organic farming. While there is potential for further shifts to organic agriculture, more technical support will be needed. The Ministry of Agriculture, Forestry and Fisheries (MAFF), having shifted agricultural policy to give high priority to consumers, is to provide more administrative as well as technical support for organic agriculture.

Introduction

The general public is concerned about food safety issues owing to the recent incidents of BSE and the detection of excess pesticide residues and the use of prohibited pesticides. Consumers consider "organic food" to be value-added food and are concerned about the traceability of food. They are, therefore, actively promoting the production of safe food directly/indirectly, thus resulting in a steep increase in environmentally friendly farming practices. MAFF has done its utmost to reinforce the inspection system of both domestically produced and imported food, and has also pushed forward environmentally-friendly farming, including organic farming, and the establishment of an accreditation system for "JAS organic". Agricultural co-operatives (JAs), NGOs, private sectors and consumers have been promoting "organic farming" co-operatively and/or on their own. The purpose of this paper is to describe policy developments in organic agriculture and future perspectives in Japan.

Historical development of "JAS Organic"

In the 1970s, agricultural products with the label "organic" first appeared in Japanese markets. At that time, no regulations and no guidelines had been established, and the quality of such products and cultural practices for its production greatly varied. In those days, "organic" products ranged from "truly organic" — without any chemicals — to "organic fertiliser used", in which organic fertilisers such as compost and manure were used together with pesticides, chemicals and the like. Thus, there was no accepted term on a national level for "organic", making it difficult for consumers and retailers to know what they were getting when purchasing "organic" products.

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1. Deputy Director, Sustainable Agriculture Office, Ministry of Agriculture, Forestry and Fisheries, Japan.

In 1992, MAFF issued guidelines describing farming practices necessary for a grower to label produce "organic" and no or reduced use of pesticides and/or chemical fertilisers. The guideline lived up to people's expectation to a certain extent. However, as it was no more than a guideline and did not have any enforcement tools, consumers and producers were not yet satisfied. Designed primarily to protect consumers from fraudulent labelling, the guidelines were criticised by a variety of consumer groups, who argued permitting use of such labels as "reduced pesticides" only confuses the buying public. They insisted that the word "organic" should be reserved exclusively for products without any chemical use in the production.

In July 1999, the Codex Committee adopted "Guidelines for the production, processing, labelling and marketing of organically produced foods". International standards for organic products resulted in stronger pressure from producers and consumers who wished to have national legal standards. MAFF revised the Law of Japanese Agricultural Standards, establishing an inspection and accreditation scheme, which came into effect in June 2000. The Ministry also established standards for organic agricultural products and organic agricultural processed products, following guidelines adopted by the Codex Committee. In April 2001, the standards also came into effect; labelling of "organic" came to legally require compliance with the standards.

Inspection and accreditation scheme of "JAS organic"

In the Japanese accreditation scheme, either domestic or foreign bodies, which have been pre-registered with the MAFF, provide accreditation to producers, processors, re-packers and importers who are to handle accredited organic products. Those accredited inspect the would-be "organic" products and issue the label "JAS organic" and then, allow it to be sent to the market if the products meet accredited standards. Thus, the scheme traces all the processes from producers to consumers and ensures that the products be organically produced, processed, and packed.

Producers, processors and re-packers who export "organic products" to Japan are required to be accredited by either:

- registered Japanese accreditation bodies (Figure 1); or
- registered foreign accreditation bodies in advance (Figure 2). The accredited producers, processors, and re-packers must inspect their products themselves, and then only label products "organic" which meet standards; or
- for countries which are recognised by the Japanese government as having the equivalent accreditation standard and scheme to Japan, the government of the exporting country attaches a certificate to the products to prove that they are "organic", and that the products can be exported to Japan through accredited Japanese importers (Figure 3). Such countries currently include the EU-15, Australia and the United States.

As of August 2002, the numbers of registered accreditation bodies and accredited cases are as follows:

- registered Japanese accreditation bodies: 63;
- registered foreign accreditation bodies: 8;
- accredited processors, groups of producers, re-packers and importers: 3 000 (Figures 5 and 6);
- accredited producers: 5 700 (Figure 7).

Figure 1. Accreditation Scheme (a): Exports accredited by registered Japanese accredited bodies

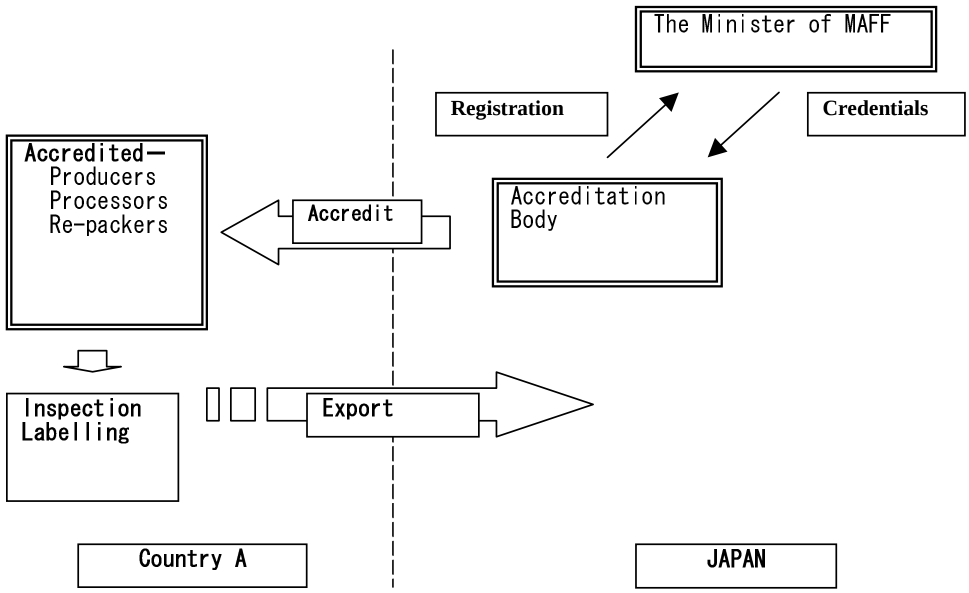


Figure 2. Accreditation Scheme (b): Exports accredited by foreign accredited bodies

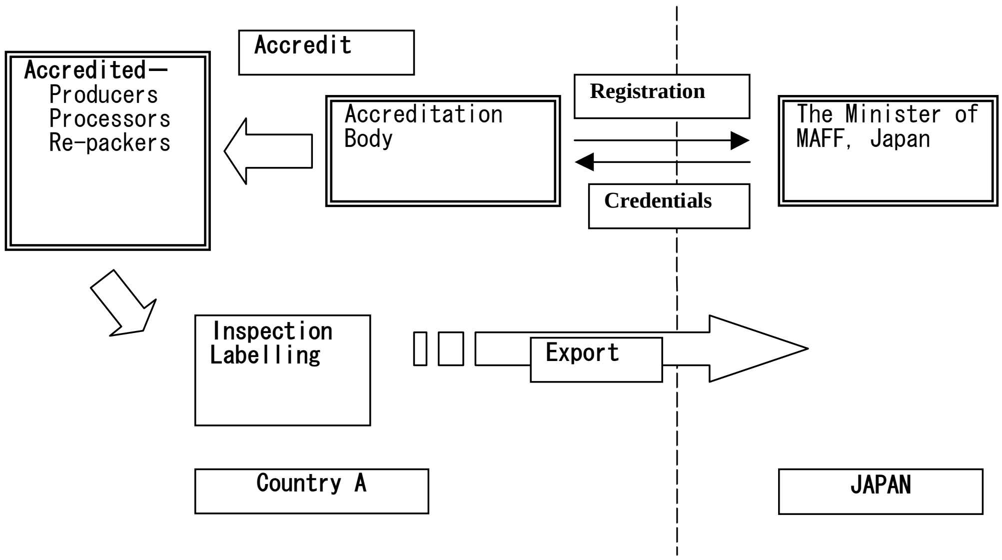


Figure 3. Accreditation Scheme (c):
Exports from countries with equivalent accreditation standards

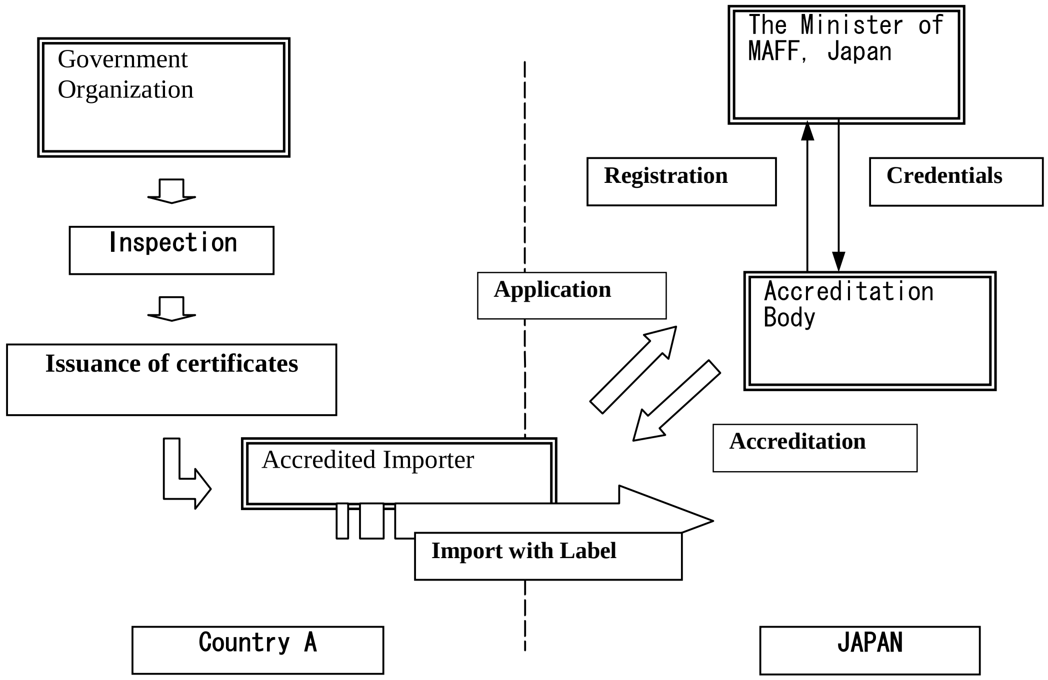
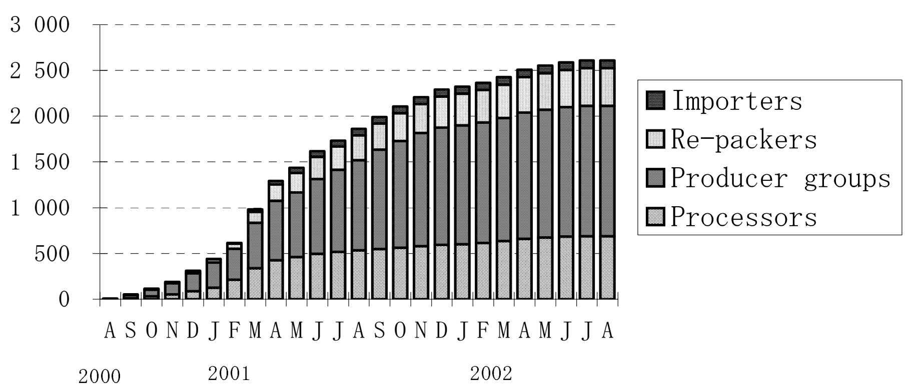


Figure 4. Change in the number of domestic accreditation groups



Promotion of "organic farming" meeting the demands of producers and consumers

While there is no specific "organic farming" policy in Japan, organic farming is encouraged as one of the forms of environmentally friendly agriculture (EFA).

Technical support

Whenever farmers consider adopting EFA, they come across a die-hard bottleneck: how to attain a reasonably high yield with considerably fewer or no chemical fertilisers and pesticides. MAFF has supported local governments with expenditure for technical support to local farmers' groups for the implementation plan of decreased practices of pesticides or chemical fertilisers, on-site testing of the cultivation under low use of pesticides or chemical fertilisers, and the technical training of high yielding organic farming. Research on machinery, integrated pest management, and fertilising is also on-going.

Figure 5. Number of foreign accreditation groups

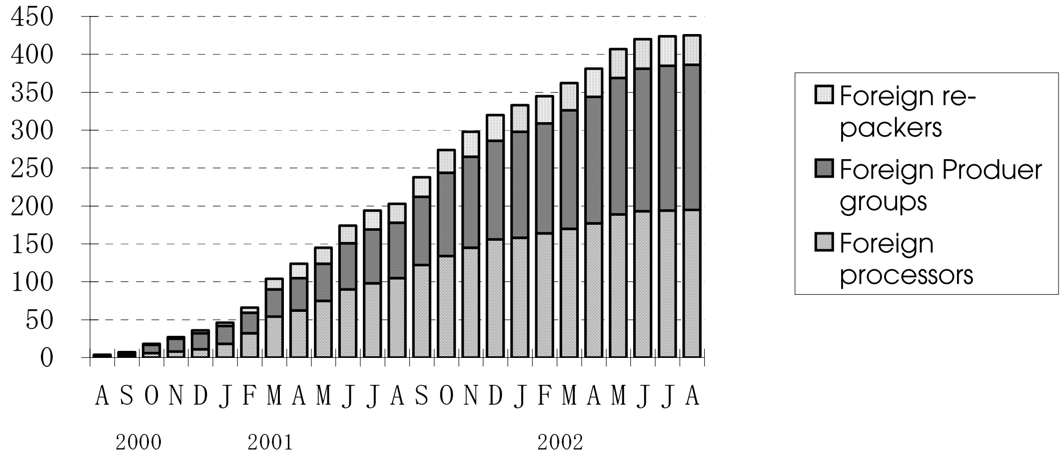
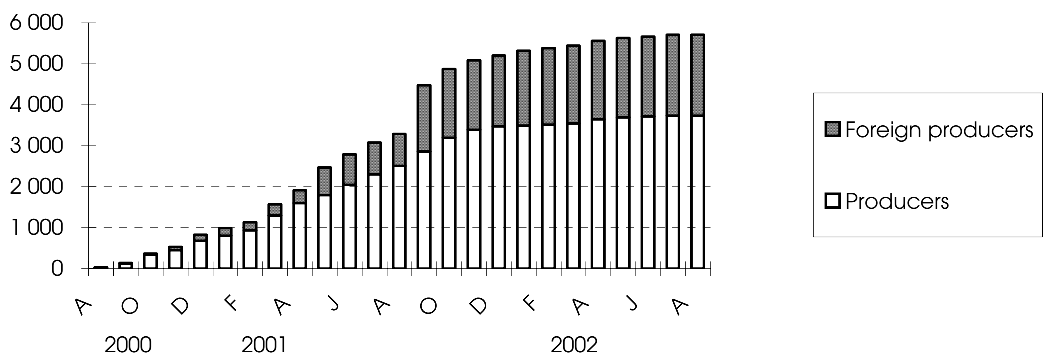


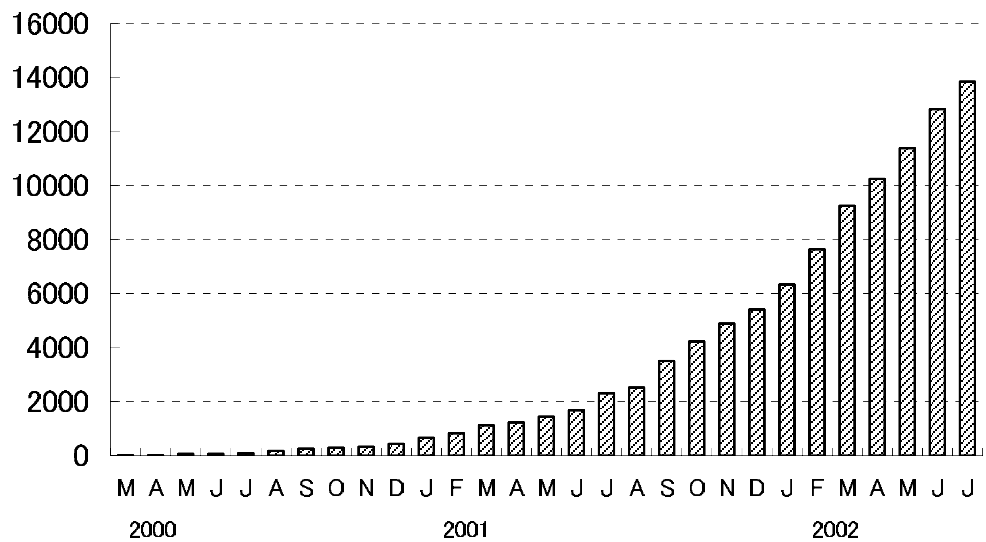
Figure 6. Number of domestic and foreign accredited producers



Administrative support by law enforcement

The law for promoting the introduction of sustainable agricultural production practices (referred to as "Sustainable Agriculture Law") came into effect in October 1999. The law is to promote EFA in terms of increased numbers of "eco-farmers". Provincial governments issue guidelines for the eco-farmers in their own province based on the Sustainable Agriculture Law; therefore, guidelines may be different from one province to another. Farmers who abide by the guidelines are accredited by the governor as eco-farmers and adopt environmentally friendly practices such as organic farming. Eco-farmers are eligible for benefits, *e.g.* entitled to have a larger loan and longer due term. Since April 2000, some 14 000 eco-farmers have been certified, which corresponds to only 0.5% of total Japanese farmers, but the number of certified farmers is on the increase.

Figure 7. Number of eco-farmers in Japan



Future perspectives

A rough estimation has been made of the number of so-called "organic" consumers. A total of 3 million or more people are enjoying "organic products" throughout Japan on a regular basis. Recently, BSE-infected cows have been successively identified in Japan and big food processing companies have been prosecuted for fraudulent labelling of dairy and beef products. There has also been some detection of excessive pesticide residues and prohibited pesticides. Under such circumstances, consumers have become more concerned about food safety and pay greater attention to the traceability of food. MAFF has taken the situation very seriously and is shifting agricultural policy to give high priority to consumers.

"JAS organic" accredited farm households represent less than 0.2% of total farm households in commercial farming, and an estimated 0.9% of planted areas. Some 22% of total farm households are adopting EFA practices. Currently, "JAS organic" accredited farmers represent only 0.7% of EFA farmers, but 6.5% of EFA farmers wish to obtain "JAS organic" accreditation. As previously described, there will be a sizeable number of "organic producers" if die-hard technical bottlenecks in the organic production are solved. Faced with high temperatures and high humidity, Japanese scientists are urgently requested to develop breakthrough technology and technological integration of the relevant component technologies to cope with the outbreak of pests, disease, weeds, and the like.

ORGANIC FARMING IN POLAND: PAST, PRESENT AND FUTURE PERSPECTIVES

Jozef Tyburski[1]

Abstract

In this paper the development of organic farming in Poland is presented from its original phase in the 1930s, through the period of abandonment i.e. the outbreak of the Second World War, up until the beginning of the 1980s, when the organic farming movement was reborn. A more detailed description is devoted to the period since 1990 — when for the first time inspection and certification took place. The development of formal structures is pointed out — the establishment of organic farming associations and the inspection bodies of the Department of Organic Farming in the Ministry of Agriculture and Rural Development; the creation of a supervising office in the form of the Office of Purchase and Processing of Agricultural Products; the parliamentary acceptance of the organic farming regulation; as well as the introduction of subsidies for organic farmers. The potential of organic farming is evaluated by comparing average yields of organic crops with intensive conventional farms. The main obstacles to the dynamic development of the organic sector are identified: 1) the insufficient number of well-qualified advisers, 2) the insufficient number of veterinary doctors trained in organic farming healing methods, 3) the scarcity of applied experiments which are much expected by farmers, 4) the scarcity of biological pesticides and mineral fertilisers approved of by the organic standards, 5) the limited demand for organic products in the country, and 6) hindrances in the development of export. In the final section, the friction caused by different development tendencies in Polish farming is discussed, namely the still worsening economic situation of agriculture, and the ageing of farming machinery and buildings on the majority of farms, but also the growth in the number of intensive conventional farms. In the plans made by the government and the President, growth of the organic sector is forecast to increase from 0.2% at present to 3-5% in 2010.

Introduction

The number of farms in Poland amounted to 1.88 million in 2000, utilising an area of 16.5 million ha, and with approximately 2 million ha fallow. The average acreage of a farm stood at 8 ha. Extensive methods of farming are still dominant in Polish agriculture. The use of industrial means of production is made only on a limited scale in comparison with EU countries. The average use of artificial fertilisers per hectare amounts to 48 kgN, 17 kgP_2O_5 and 21 kgK_2O. Chemical

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pesticides are applied in the average amount of 0.53 kg of active substance per hectare (Central Statistical Office, 2001). A striking, and from the point of organic farming advantageous, feature of Polish agriculture is the running of both crop and animal husbandry in the majority of farms. A decisively bad point of Polish agriculture, as far as a conversion to an organic method is concerned, is the improper structure of cropland use. Cereals are grown on 71% of arable land, with as little as 2.6% producing legumes and 1.1% pulses for grain.

Organic farming in the past (1930s-1990s)

The first farm in Poland which was run according to principles of organic farming was created in 1930. Count Stanislaus Karlowski on his 1 760-hectare farm in Szelejewo started a practical application of the oldest method of organic farming — the bio-dynamic method — achieving very good results. It began six years after the development of this production method by R. Steiner in 1924. Count Karlowski did not limit his activity in this field to cultivation in accordance with this method, but promoted actively bio-dynamic farming by organising one day courses in Szelejewo and by establishing an Association of Farmers and Growers. He also published instruction brochures. Thanks to his endeavours, in 1938 a Poznan-based Association of Promoting Principles of Life in Accordance with Nature was established. The Association's main outlet was a newspaper entitled *Biology and Life*. The outbreak of the Second World War annihilated these promising initiatives. Karlowski was killed by the Nazis, his farm was confiscated, and the movement fell into oblivion (Soltysiak, 1993).

The development of organic farming in Poland after the war was extremely difficult. Agriculture, which was traditionally based on family farms, was repressed for ideological and political reasons. The most difficult period was 1949-56, when the government chose the policy of forced collectivisation. Nobody thought about organic farming — peasants fought for survival (Gazinski, 1992). It was as late as 1960, when an engineer named Julian Osetek, animated by philosophical impulses, created in Nako, near Bydgoszcz, a 3-hectare bio-dynamic farm. For many years he worked alone, not finding any followers.

Since 1980, in connection with the political thaw, people started discussing and writing on organic methods of farming. Journalists soon discovered this example of a native organic farm. Following the ensuing publicity, Julian Osetek earned the reputation of a pioneer of bio-dynamic farming. At that time, together with his son, Jerzy, he began to promote strongly this method of farming and gave many lectures throughout Poland. In 1983 he began translating and publishing Maria Thun's bio-dynamic calendar. A few years later, in 1989, he published his own work entitled *Bio-dynamic Farming and Horticulture*.

At the turn of 1982-83, Professor Górny joined in the popularisation of bio-dynamic farming. Thanks to him, bio-dynamic farming became well-known and evoked wide public interest, resulting in the organisation of numerous courses by various institutions, such as the Association of Rustic Youth, branches of the Main Technical Organisation, the Polish Association of Allotment Owners, the Association of Dowsers and a large number of regional associations. Meanwhile, a lively polemic of followers and antagonists of bio-dynamic farming appeared in the press. In 1984, the Psychotronic Association published a book edited by Professor Górny entitled *Bio-dynamic growing of crops on allotments*. For the same audience — allotment owners — Dorota Metera wrote outstanding articles in a weekly publication, *A Housewife,* in the second half of the 1980s. Her collected texts were published as *A Bio-dynamic Garden by a House,* in 1989.

The origin of the movement which resulted in establishing an organisation of organic farmers began with a course with the participation of Dr von Wistinghausen in Warsaw in January

1984. Important courses took place throughout Poland: in Jachranka near Warsaw in February 1985; in Chelm Lubelski in February 1987; and in Przysiek near Torun in June 1988. During the last of these courses, the idea of establishing an association of organic farmers reached fruition (a few farms having adopted organic farming methods by this time). The organisation was created on 1 April 1989 in Torun, and registered as the Association of Organic Food Producers (EKOLAND) the following September.

Promotion and organisation were followed by practicalities. In the mid-1980s another farmer and long-time practitioner of organic farming, Remigiusz Jasieniecki, from Gostkowo near Torun came into the public eye. His 17-hectare farm, with its big cattle livestock density and prepared composts, was an excellent example of the application of organic methods for Polish enthusiasts.

A new group of farmers began converting their farms in the period 1986-87. Consequently, the EKOLAND Association was able to undertake its first inspection in 1990 and give certificates to 27 farms — for the first time in post-War Poland.

Present state (1990-2002)

The EKOLAND Association was the only association of its kind in Poland until 1993, when the Polish Association of Organic Farmers (PAOF) was established, with its headquarters in Lublin. Both associations (*i.e.* EKOLAND and PAOF) provided a forum for farmers to come together, as well as controlling their farms and issuing certificates. The inner structure of the two organisations kept production matters and controlling functions separate, *e.g.* in the EKOLAND Association there were different committees for inspections and for certification. Keeping the two above-mentioned committees in the framework of the same organisation was against international rules and, among others, against those of EC Council Regulation No. 2092/91 of 24 June 1991 *on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs*. Consequently, in 1996, on the basis of EKOLAND's committee of inspection and certification, a new association, Agro Bio Test, was created —the first Polish inspection body in organic agriculture. In 2001, three inspection bodies were in operation on the Polish market:

- The Polish Association of Organic Farmers;
- Agro Bio Test Ltd.;
- Bioexpert Ltd.

They operated in the framework set by the Minister of Agriculture and Development of Rural Areas.

The attitude of the Minister towards organic farming was changing with time. Shortly after the creation of EKOLAND in 1989, its board applied to the Minister with a request for a parliamentary regulation of organic agriculture. Each new board of the association met each new Minister of Agriculture and made the same request. Finally, the Parliamentary Regulation on Organic Farming was accepted by Seym on 16 March 2001 and came into force 6 months later. In accordance with the Polish legal system, the Regulation itself does not provide many details. These are found in the supplementary regulations, issued as appendices to the Regulation. Four supplementary regulations have been issued:

- on 12 April 2002 — concerning acceptable heavy metal concentration in soil;
- on 14 May 2002 — concerning detailed conditions of producing organic farming products;

- on 15 May 15 2002 — concerning a list of additional substances, other supporting ingredients and ingredients of agricultural origin made by methods other than organic and approved of for use in processing organic farming products;
- on 21 May 21 2002 — concerning conditions which should be fulfilled by inspection bodies and set by the Minister of Agriculture pertaining to controlling, certifying and de-certifying.

Finally, under the Polish legal system organic farming is considered equivalent with international regulations in force. The only significant difference constitutes the additional requirements relating to an acceptable concentration of heavy metals in soil (Table 1). Although the requirements are very strict, 97% of Polish soils meets them.

Table 1. Accepted level of heavy metals concentration in soils in the case of organic farming

Heavy metal (element)	Concentration of dry soil in given soils (mg/kg)		
	*Sandy soil**	*Loamy soil***	*Clayey soil****
Lead (Pb)	50	70	100
Cadmium (Cd)	0.75	1	1.5
Chromium (Cr)	50	80	100
Copper (Cu)	30	50	70
Nickel (Ni)	30	50	75
Mercury (Hg)	0.5	1	2
Zinc (Zn)	100	200	300

* Soil containing up to 20% silt and clay;
** Soil containing more than 20% to 35% silt and clay;
*** Soil containing more than 35% silt and clay.

Mere fulfilment of the legal requirements does not, however, permit direct access for Polish organic farmers to the international market, and especially to that of the European Union. The Polish Ministry of Agriculture is to undergo a procedure confirming the Polish system of organic farming as equivalent to that of the EU — a process which will take at least two years. Only then will Poland be added to the list of so-called “third” countries, thus enabling Polish farmers to supply products with Polish certificates on the EU market. Consequently, up until now Polish exports of organic farming products have been relatively small, and only possible after direct control, in Poland, by inspection bodies from the EU. EU certificates are, however, very expensive — a few times more expensive than domestic certificates. An additional commercial barrier is the necessity of receiving individual permits by importers. In 2001, Polish organic food exports amounted to some USD 3.5 million.

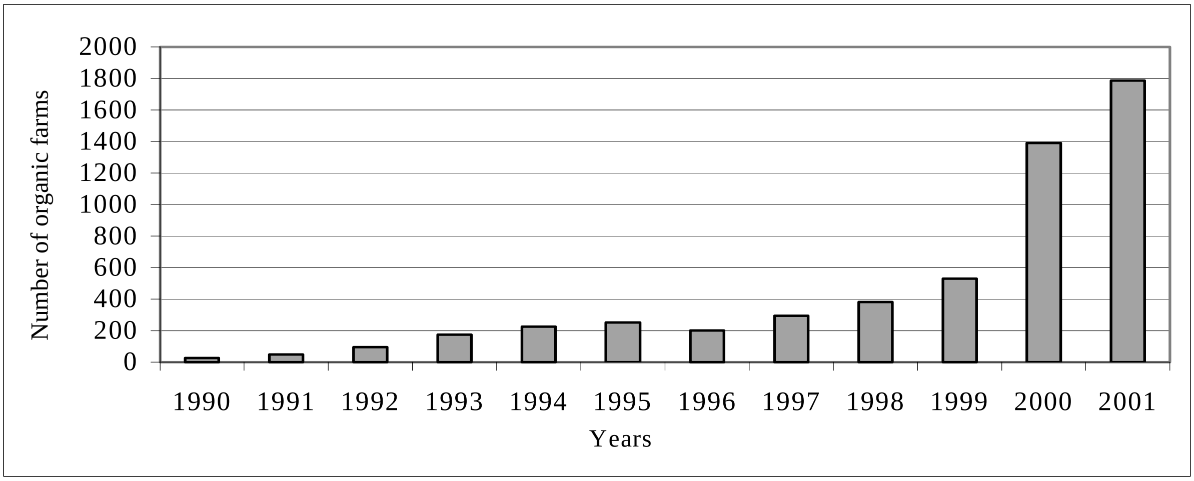
Before the legal system of organic farming in Poland was established in 2001, however, the Ministry of Agriculture had supported the development of this kind of agriculture. Subsidies for organic farmers appeared for the first time in 1998 to partly cover the costs of inspection. In 1999, additional support was provided for each hectare of organically grown crops. In the first year of conversion a farmer receives subsidies only for the costs of inspection. From the second year on, the farmer receives a subsidy for each hectare of organically grown crops. Furthermore, these subsidies for acreage of organically grown crops are higher in the second year of conversion than after receiving a certificate (the intention being to compensate farmers for their expenditures, and for a fall of yields when it is not yet possible to offer their products as “organic” and so obtain a premium price). These subsidies (and also those for the costs of control) are offered only to producers who have been positively verified by lawful inspection bodies. Subsidy rates are given in Table 2.

According to data from the Polish Inspection of Purchase and Processing of Agricultural Products office, which supervises the activities of organic agriculture, the number of organic farmers in 2001 amounted to 1 787 and their total acreage stood at 44 886 hectares, which was, respectively, 0.2% of agricultural land and 0.1% of total farms. As compared with the year 2000, this represents a 20% rise in the number of farms, and a 41% rise in acreage. In 2001, 15 certified factories ran the processing of organic products. Changes in the number of organic farms in Poland in the period 1990-2001 are shown in Figure 1.

Table 2. Subsidies offered to certified and in-conversion farms per ha of cropland

Type of crops	Second year of conversion		Certified farms	
	Zlotys	Euros	Zlotys	Euros
Field vegetables	500	123	400	99
Arable crops	200	49	150	37
Orchards	550	136	450	111
Plantations of berries	550	136	500	123
Meadows and pastures	80	20	50	12

Figure 1. Changes in the number of organic farms in Poland, 1990-2001



The geographical distribution of organic farms in Poland is very uneven. The largest number of organic farms lies in the Swietokrzyskie province (462), the Lubelskie province (288), the Mazovian province (233) and the Podkarpackie province (185): the largest acreage of farmland in this system of agriculture is in the Podkarpackie province (6 973 ha), the Mazovian province (5 377 ha), the Lubelskie province (4 989 ha) and the Zachodniopomorskie province (4 549 ha).

Organic farms in Poland have one particular feature — in comparison with the average Polish farm, they stand out by a higher mean acreage and different structure of sowing. The average size of a farm in Poland is 8 ha, but for an organic farm it is 25.1 ha. Within this average, farm size ranges from 1 ha (the lowest value at which to consider an agricultural unit as a farm), to 1 000 ha. In general, however, since the beginning of inspections and certifications in post-War Poland there has been a tendency towards organic production on bigger farms. This is not in accordance with the expectations of organic farming pioneers, who believed that the abandonment of industrial methods of production (chemical pesticides and artificial fertilisers) would be a factor in increasing employment in rural areas. It should be noted here that many organic farms, especially those with a large acreage of vegetables, employ numerous seasonal farmhands, which is, however, not shown by statistics.

As far as the structure of agricultural utilised area is concerned, it is distinguishable by the higher share of meadows and pastures as well as plantations of vegetables and berries (Table 3).

Table 3. The structure of land use in Poland and on organic farms

Cropland structure	Mean in Poland*	Organic farming**
Arable land	72.1%	53%
Meadows and pastures	24.8%	41%
Fields of vegetables	1.5%	3%
Plantations of berries	-	2%
Orchards	1.6%	1%

* Data according to Central Statistical Office.
** Data according to the Office of Purchase and Processing of Agricultural Products.

A high share of meadows and pastures takes place mainly in big farms and in marginal areas. A higher share of vegetables results from the possibilities of selling these products with a premium. In Poland, vegetarians are the largest consumers of organic food. Plant products sell better than animal products. Selling animal products involves processing, and big processing plants cannot process small amounts of raw materials, for economic reasons. Organic premiums for vegetables range from 5-40%, for cereals around 30% and for potatoes around 50%. At the moment about 50% of plant products are sold as organic: in the case of vegetables, 60%; cereals 50%; potato 80%; meat 5% and milk 10% (Babalski, 2002).

Future perspectives

Organic farming in Poland currently lies on the fringe of the mainstream (occupying 0.2% of agricultural land). As for the possible development of this system, representatives of scientists, members of the business community and politicians are not in agreement. In this argument it is appropriate to ask what would be the outcome of an increase in the share of organic farming from the point of view of the volume of production?

Research comparing agricultural systems has been done in Poland since the beginning of the 1980s. Some take the form of field experiments, where the comparisons pertain to experimental plots, while others examine existing farms. I will first present the results from the latter, prepared by J. Tyburski and T. Sadowski, which are currently in press. The authors adopted the method used by the USDA in its famous 1980 report for comparing the results of the best organic farms with conventional ones in order to determine the prospective of the system (USDA, 1980). From the research which has been carried out in the period 1992-2002 it is clear that yields of wheat in a well-run organic farm are 26% higher than the national average, but at the same time are 43% lower than those of intensive conventional farms (Table 4). Similarly, yields of potato are also higher than the national average — in this case by 8% — but they are 53% below the yields of intensive farms. It is worth noting that in Poland potatoes are traditionally grown on the poorest soils. This does not, however, apply to the intensive system, where potatoes are grown for processing with precisely determined demands (cultivar, shape and size of tubers) only on good soils and in very intensive technology. To give some examples: Polish farmers traditionally apply 1-2 treatments against potato blight, whereas intensive farmers use around 20; they traditionally apply about 40 kg N, whereas intensive growers apply around 200 kg N.

Table 4. Average yields of wheat and potatoes in Poland on the best organic farms and intensive conventional farms

Crop	Yield level in tonnes per hectare		
	Average for Poland*	**Best organic farms****	**Conventional intensive farms****
Wheat	3.44	4.63	8.1
Potato	18.4	21.0	44.7

* Averaged for 1998-2000, data according to the Central Statistical Office.
** Averaged for 1992-2002.
Source: (Tyburski J. and T. Sadowski).

In general, the conclusions from this comparison are as follows: yields in well-run organic farms are higher than the national average, thus the large-scale introduction of organic farming, on condition that a high quality extension service is provided and the yields of the best organic farms are obtained, does not threaten a breakdown of the balance of agricultural production in Poland. At the same time, the intensive system is almost twice as effective as the organic system in terms of the level of yields. In this context, at least two questions arise:

1. What would be the result of widely applying intensive farming methods considering the already existing over-production?
2. What environmental consequences could be expected?

So as not to be limited to the research presented above, data from other sources will be quoted. In this case they do not come from the comparison of the existing farms, but from strict field experiments. The data are presented in Table 5.

Table 5. Yields of wheat and potato obtained when applying organic methods of growing in field experiments by different authors

	Author	**Yields in tonnes per hectare**
Wheat:		
	Szymona, J., 2000	4.1
	Kuœ, J., 1995	5.03
	Stalenga, J., 2001	4.33
Potato:		
	Kuœ, J., Stalenga, J., 1999	24.5
	Krasowicz, S., 1996	19.8

It was clearly confirmed that when comparing average national yields, the proper use of organic methods gives not lower but even higher yields. Nevertheless, in practise there are organic farms of strongly differentiated levels of operation. Quite a number of them obtain yields lower than before conversion. The reasons for obtaining low yields by many organic farms include:

- lack of a sufficient number of well-qualified advisers;
- difficulties with purchasing mineral fertilisers approved of in organic farming standards; and
- difficulties in obtaining a supply of biological pesticides.

The most important of the above-mentioned problems is the first — the lack of well-qualified advisers. It happens quite often that a farmer who contacts an extension service centre meets an adviser with an unwilling attitude towards organic farming or with insufficient knowledge. It is not a rare occurrence that farmers, deprived of any advisers' help, are challenged with the problem of farm conversion. Consequently, they are forced into a method of trial and error which is costly. Often there are fiascos that lead to negative publicity.

The difficulties of buying means of production lie in the fact that organic farming in Poland is not widespread, so that traders are not interested in supplying the needs of organic farmers. As biological means of production are far more expensive than conventional ones, no conventional farmer is willing to buy them. For example, the price of biological pesticides to control the Colorado potato beetle is more than ten times higher than the chemical one. In the case of biological pesticides there also arises the problem of registration in Poland. The costs of this registration are very high and Polish law requires three-year investigations before registering. Since the potential biological pesticides market in Poland is limited, most firms are slow to invest in the Polish market.

Concluding remarks

At the moment one can perceive several different tendencies in the development of Polish agriculture. Some farms are being closed down, no longer able to compete in the gradually worsening economic conditions of agriculture. Some agricultural land, mainly low-quality, lies fallow (approximately 2 million ha — 11% of total farmland). Some farms are still operational, but investment in their development is insufficient. However, a small but growing number of farms have abundant financial resources, and invest in more land and new machinery — these are the farms with good soils at their disposal, which are not numerous, as the majority of soils in Poland are sandy (around 60%). These developing farms usually cover 50-200 ha and introduce very intensive chemical methods of production. This technology is effective in financial terms. It should be emphasised that applying such methods on sandy soil is unthinkable.

In this context organic farming can be viewed as an alternative form of development for a considerable group of farms. It could be a particularly attractive form for farms situated on marginal soil, lying within the borders of nature reserves, landscape parks and natural parks as well as those farms in the vicinity of big cities, representing potential purchasing markets. In the wider context, organic farming products may be perceived as one of Poland's export successes in the future. With the heavy surplus of conventional farm products in Europe and the US, there is no demand for more conventional products. Polish farmers may prove more competitive in producing organic food.

The current view of decision makers in Poland regarding the development of organic farming is favourable, with the government aiming to increase the share of organic farms to 3-5% of all farms by 2010. Considering the case of Italy, where the number of organic farms has increased from 1 300 in 1990 to 51 120 in 2001, the plans seem to be feasible.

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Chapter 8.

Conversion and Support Payments

FROM CONVERSION PAYMENTS TO INTEGRATED ACTION PLANS IN THE EUROPEAN UNION

Nicolas Lampkin[1]

Abstract

Organic farming is an approach to agriculture that emphasises environmental protection, animal welfare, sustainable resource use and social justice objectives, utilising the market to help support those objectives and compensate for the internalisation of externalities. Although organic farming as a concept has existed for over 80 years, only since the mid-1980s has it become the focus of significant attention from policy-makers, consumers, environmentalists and farmers in Europe. In 1991, the EU introduced legislation to define organic crop production (EC Reg. 2092/91) followed by livestock production in 1999 (EC Reg. 1804/1999). Consumer demand for organic food has risen sharply, leading to the active involvement of multiple retailers and substantially higher prices at the farm gate than those received in the conventional sector. A more widespread application of policies for supporting conversion to nd continued organic farming came into effect in 1992 when support to organic farming was included as one measure in the agri-environment programme (EC Reg. 2078/92), an accompanying measure of CAP reform. This has been continued under the Agenda 2000 rural development programme (EC Reg. 1257/1999). As a result, policy support for organic farming is now widely available across Europe, in recognition of its contribution to surplus reduction, environmental and rural development policy objectives. These factors have contributed to substantial growth in supply, helping market development by increasing availability of products and raw materials, but in some cases also leading to oversupply problems and downward price pressures. As a consequence, more emphasis is now being placed on the development of action plans at local, national and EU levels, integrating supply-push and demand-pull policy measures. This paper documents the development of the organic sector, reviews the support policies in the various EU countries prior to and after the reforms of the CAP in 1992 and 2000, and discusses likely future directions in policy development. [2]

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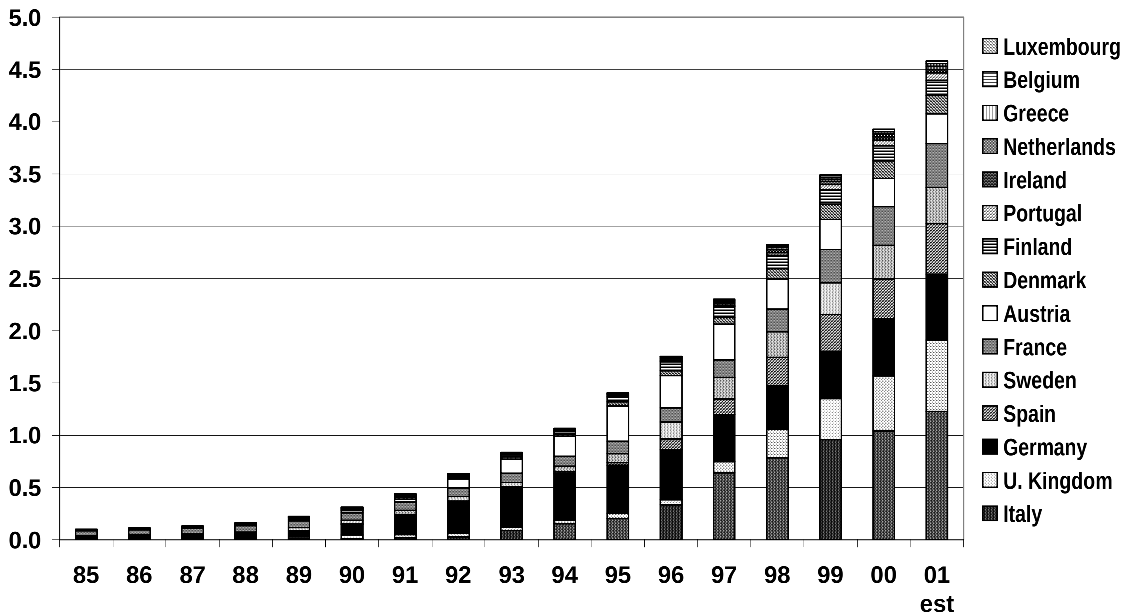
1. Institute of Rural Studies, University of Wales, Aberystwyth, United Kingdom.

2. This is a modified and updated version of a paper previously published as Lampkin *et al.* (2000). Part of the research reported in this paper was carried out with financial support from the Commission of the European Communities’ Agriculture and Fisheries (FAIR) specific RTD programme, Fair3-CT96-1794, Effects of the CAP Reform and possible further development on organic farming in the EU. It does not necessarily reflect the Commission’s views and in no way anticipates the Commission’s future policy in this area.

Methodology and data sources

The paper is based on work carried out as part of a wider research project on organic farming and the Common Agricultural Policy (CAP) of the European Union (EU). The overall objective of the project was to provide an assessment of the impact of the 1992 CAP Reform and possible future policy developments on organic farming, as well as the contribution that organic farming can make to EU agricultural and environmental policy goals (Lampkin *et al.*, 1999; Foster and Lampkin, 2001). Data collection was based on standardised questionnaires and national experts in each EU country utilising various published and unpublished data sources, and where appropriate consultations with key individuals in specific fields. Where possible the data were confirmed from other sources (Lampkin, 1996; Willer, 1998; Deblitz and Plankl, 1997; various EU Commission documents). A provisional updating for 2001 has been undertaken, but this will be subject to revision as part of a new EU research programme on the development of organic farming policy in the EU and CEE candidate countries starting in autumn 2002.[3]

Figure 1. Organic and in-conversion land area in the EU, 1985-2001
(million ha)



Source: Own data; see: www.organic.aber.ac.uk/stats.shtml.

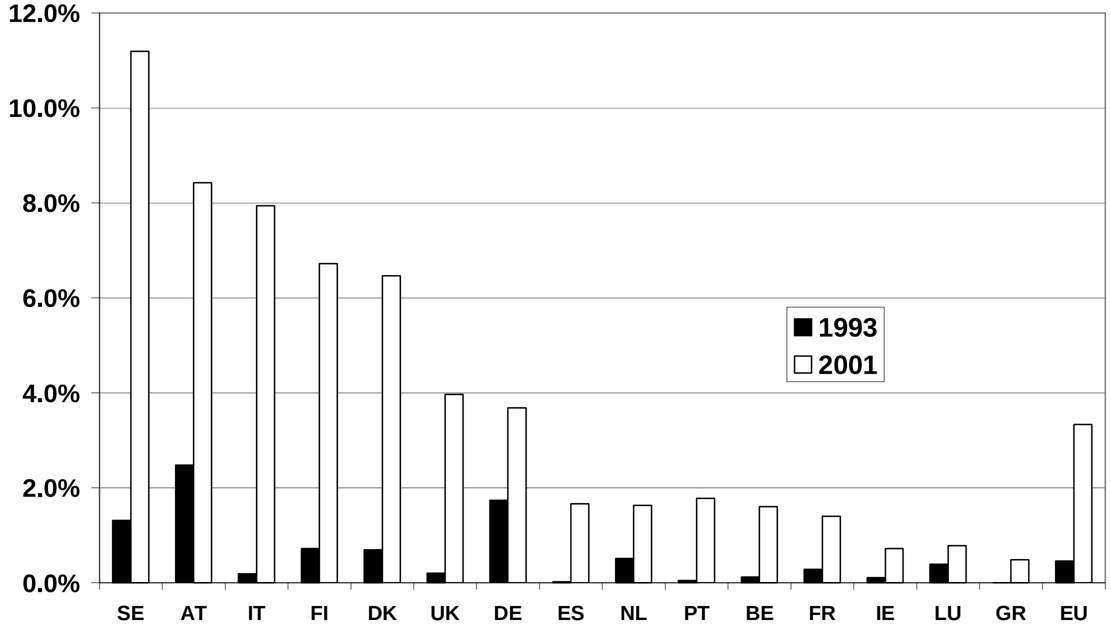
The growth of organic farming in Europe

Recent years have seen very rapid growth in organic farming. In 1985, certified and policy-supported organic production accounted for just 103 000 ha in the EU, or less than 0.1% of the total agricultural area. By the end of 2001, this had increased to almost 4.5 million ha, or 3.25% of the total agricultural area (Figure 1). In the same period, the number of organic holdings has increased from 6 000 to 156 000. These figures hide great variability within and between countries. Several countries

3. "Further development of organic farming policy in Europe, with particular emphasis on EU enlargement", QLRT-2001-00917 EU-CEEOFP.

have now achieved 6-12% of their agricultural area managed organically, and in some cases more than 30% on a regional basis (Figure 2).

Figure 2. Organic and in-conversion land area as a proportion of total utilisable agricultural area in the European Union (by member State)



Source: Own data; see: www.organic.aber.ac.uk/stats.shtml.

Alongside the increase in the supply base, the market for organic produce has also grown significantly, but statistics on the overall size of the market for organic produce in Europe are still very limited (Hamm *et al.*, 2002). Some recent estimates have suggested that the retail sales value of the European market for organic food was of the order of EUR 8-10 billion in 2000 (ITC, 2001).

Major growth of the sector (90% of the expansion in the land area) has taken place in the last decade since the implementation in 1993 of EC Regulation 2092/91 defining organic crop production, and the widespread application of policies to support conversion to and continued organic farming as part of the agri-environment programme (EC Reg. 2078/92).

Although growth trends in individual countries have varied considerably, with periods of rapid expansion followed by periods of consolidation and occasionally decline (*e.g.* Austria), overall growth in Europe has been around 25% per year during the 1990s. Although relative growth rates in the last two years have fallen, absolute growth rates are continuing at a similar pace (ca. 15 000 holdings, 0.5 million ha per year). Projecting these growth rates forward suggests that 10-20% of EU agriculture could be managed organically by 2010 (10% of EU agriculture represents nearly 14 million ha and 700 000 farms). This level of growth has significant implications for the provision of training, advice and other information to farmers, as well as for the development of inspection and certification procedures. It also has major implications for the development of the market for organic food, as it progresses from niche to mainstream status, with a possible retail sales value in 2010 of EUR 20-30 billion.

Policy support for organic production

Policy makers have been interested in supporting organic agriculture for two main reasons (Dabbert *et al.* in MFAF, 2001). Firstly, as a public good, where organic farming is recognised as delivering environmental, social and other benefits to society that are not, or only partly, paid for through the normal price of food. Secondly, as an infant industry, support for which can be justified in terms of expanding consumer choice and allowing the industry to develop to a point at which it is able to be independent and compete in established markets and make a positive contribution to rural development. Although both justifications can be seen to be utilised in most countries, the first is more typical of some Scandinavian and Central European countries (*e.g.* Sweden, Finland, Austria) while the second approach is reflected in the Dutch focus on supply chain initiatives (MLNV, 2000) and the UK's unwillingness historically to support farms beyond the initial conversion phase (Lampkin *et al.*, 1999).

These main justifications for supporting organic farming can be seen to be linked to the general issue of market failure, although unlike other agri-environmental policy measures, organic farming has developed a strong reliance on markets and consumer willingness to pay in support of its broader objectives. In recent years, it can be argued that this strategy has been so successful that there may be significant risks associated with the market for organic products becoming an end in itself, rather than a means to achieve broader goals of benefit to society as a whole. The challenge for policy makers has become the development a mix of policies that can make effective use of the market, while at the same time allowing organic agriculture to remain true to its original aims, thus maximising the broader benefits to society.

Support initiatives prior to 1992 CAP reform

The positive perceptions of the potential of organic farming led to the introduction of support programmes in various European countries starting in the late 1980s (Lampkin *et al.*, 1999). The pioneering Danish scheme, introduced in 1987, covered financial assistance to producers during the conversion period as well as the development of a market and extension and information support. Germany was the first country to introduce in 1989 support for conversion to organic farming in the context of the EU's extensification policy (EC Reg. 4115/88). France and Luxembourg introduced smaller programmes under the same regulation in 1992. Austria, Sweden and Finland had national conversion support programmes prior to their accession to the EU in 1995. The Swedish and Finnish programmes included support for a state advisory service for organic producers and Sweden was unique at that time in providing support for continuation of organic production.

Support initiatives under the 1992 agri-environment programme

Under the agri-environment regulation (EC Reg. 2078/92), introduced as part of the 1992 CAP reform, aid was available for farmers who (among other options) introduce or continue with organic farming methods, subject to positive effects on the environment. The majority of organic farming schemes under this regulation were implemented in 1994 (with some regional variations in Italy and Germany). Austria, Finland and Sweden followed in 1995 on accession to the EU. Greece and Spain did not start until 1996 and Luxembourg only implemented its organic farming scheme under 2078/92 in 1998. Most countries have a uniform national policy, but several (Finland, France, Germany, Italy, Spain, Sweden and the United Kingdom) have significant regional variations in rates of payment and requirements.

Table 1. Uptake, public expenditure and average payments for organic farming schemes under EC Reg. 2078/92 compared to all agri-environment options (1997 data)

Country	Land area (ha)	Farms x 1 000	Public expenditure (MECU)	Lowest conversion payment	Highest conversion payment	Average (conversion and continuing)
	(% of total 2078/92 area)	*(% of all 2078/92 agreements)*	*(% of total 2078/92)*	*(ECU/ha)*	*(ECU/ha)*	*(ECU/ha)*
AT	246 000 *(7.7%)*	18.5 *(4.2%)*	65.03 *(13.0%)*	217 (forage)	723 (hortic.)	264
BE	3 401 *(17.9%)*	0.15 *(8.0%)*	0.88 *(23.7%)*	180 (cereals)	838 (fruit)	259
DE	229 486 *(4.17%)*	8.42 *(1.5%)*	23.27 *(6.0%)*	127 (cereals)	713 (fruit)	101[a]
DK	50 281 *(46.9%)*	1.45 *(18.2%)*	9.44 *(58.2%)*	87 (forage)	140 (high N)	188[b]
ES	50 000 *(6.05%)*[c]	1.5 *(5.0%)*	2.91 *(3.9%)*	90 (forage)	362 (fruit)	58[c]
FI	89 403 *(4.5%)*	4.16 *(4.7%)*	21.07 *(7.6%)*	280 (cereals)	1 056 (fruit)	236[d]
FR	41 976 *(0.6%)*	1.55 *(0.9%)*	4.02 *(1.4%)*	106 (forage)	711 (fruit)	96[a]
GB	29 127 *(2.1%)*	0.3 *(1.3%)*	0.82 *(1%)*	20 (LFA)	101 (lowland)	28
GR	42 600 *(12.2%)*	0.89 *(37.6%)*	4.25 *(31.7%)*	182 (cereals)	1 217 (fruit)	100
IE	nd	nd	nd	337 (cereals)	398 (hortic.)	nd
IT	308 367 *(19.1%)*	17.12 *(14.1%)*	102.90 *(25.6%)*	185 (cereals)	1 235 (fruit)	334
LU	n/a	n/a	n/a	173 (all)	(from 1998)	0
NL	4 640 *(14.2%)*	0.27 *(3.6%)*	0.34 *(0.85%)*	226 (cereals)	837 (hortic.)	73[a]
PT	9 938 *(1.8%)*	0.23 *(0.2%)*	1.18 *(1.93%)*	217 (cereals)	723 (fruit)	119
SE	205 185 *(11.7%)*	10.87 *(14.5%)*	25.13 *(17.1%)*	104 (crops)	254 (livestock)	123
EU-15	1 272 064 *(5.1%)*	65.40 *(3.9%)*	261.24 *(10.7%)*	181 (cereals)	1 208 (fruit)	205

nd = no data; n/a = not applicable.

a. Lower payments for continuing organic farming.
b. Includes other forms of support.
c. Estimated.
d. Excludes payment for main agri-environment protection scheme.

Source: European Commission and national agricultural administrations summarised in Lampkin *et al.*, 1999.

Nearly all countries (except France and the United Kingdom) supported not just the conversion period, but also continuing organic production, often with lower payments, recognising the particular costs of conversion. However, Austria, Greece, Sweden and most regions of Italy did not offer higher payments for conversion. Austria adopted this policy so as not to encourage entrants who were solely interested in the available subsidies (Posch, 1997).

Average rates of support for in-conversion and organic land in 1997 are presented in Table 1. Payment rates varied widely between countries and within countries where regional variations existed. By October 1997, more than 65 000 holdings and nearly 1.3 million ha were covered by organic farming support measures at an annual cost of more than ECU 260 million. Organic farming's share of the total agri-environment programme amounted to 3.9% of agreements, 5.0% of land area and nearly 11% of expenditure, the differing shares reflecting in part the widespread uptake of baseline programmes in France, Austria, Germany and Finland.

There are reports from several countries that the types of farms converting were skewed towards moderate to low intensity livestock farms, particularly milk production in marginal areas, and farms with mixed cropping (Schneeberger *et al.*, 1997; Schulze Pals *et al*., 1994). Specialist cropping farms (arable and horticulture) as well as intensive pig and poultry producers, seemed to be less attracted by the available payment rates. To address this problem, Denmark introduced in 1997 a supplement of 230-266 ECU/ha/year for three years for arable farms without milk quota and pig farms.

Requirements and eligibility conditions

Most schemes (except for Germany and Ireland) allowed staged conversions during which experiences can be gained and the risk of financially and environmentally damaging mistakes thus minimised. All schemes required organic management of crops to be maintained for at least five years. In nearly all cases (except Sweden and some regions in Germany and Italy) organic crop production had to be controlled according to EC Reg. 2092/91. The intention in Sweden was to maintain a clear distinction between certified organic production for the market, and organic farming supported for agri-environmental policy reasons. Livestock production requirements were more complex because the EC Reg. 2092/91 had not yet been extended to cover this aspect.

In a few countries (*e.g.* Greece, Portugal, Spain and parts of Italy), the payments were restricted to specific crops and, more commonly, permanent grassland and/or set-aside was excluded from the schemes. Some countries (Austria, Denmark, Finland, Germany, Ireland and Italy) introduced additional environmental requirements. In Ireland and Finland, participation in the main agri-environment programme was compulsory, for which additional payments were made (included in the payment levels shown in Table 1). In the United Kingdom, additional environmental restrictions were incorporated into national organic production standards.

Other restrictions in the eligibility conditions were related to the principle of avoiding double payments for the achievement of the same objective under different agri-environment and mainstream measures, resulting in considerable variation between the schemes.

Effects of the 1992 CAP reform commodity measures

The impact of the reformed commodity measures on organic farming is a topic that has received relatively little attention from policy makers, despite the potential for conflict between these measures and the agri-environmental measures. In many cases, the assumption is made that there is no difference between organic and conventional producers in terms of eligibility, and that therefore any impacts are likely to be negligible. Very few studies have attempted to quantify any possible impacts, so that the following analysis is unavoidably qualitative in nature.

In most countries, the mainstream commodity measures of the CAP reform were seen as beneficial for the organic sector. Even though organic farmers don't contribute as much to surplus production, set-aside has the potential to support the fertility-building phase of organic rotations during conversion and on arable farms with little or no livestock. This is confirmed by the higher use of set aside on organic than on conventional farms in some countries. However, in most countries farm size is such that organic producers could qualify for the simplified scheme for arable area payments without the need to set land aside.

Only in a few cases have significant adverse impacts of other mainstream measures on organic farmers been identified and in some cases, special provisions have been made to reduce these. The implications are different for existing organic producers as compared to producers in conversion and effects vary according to farm types.

Implication for existing organic producers

Existing organic crop producers typically gained, because aid for crops was no longer linked to output, but to the areas of different types of crops grown. Previously, price support and selling into intervention were of little relevance to producers operating in an under-supplied premium market. Area aid calculated on the basis of regional average yields represented a bonus to many organic producers, particularly given that organic crop prices did not fall as much as conventional prices as a consequence of the reforms. The higher level of support payments for protein crops such as beans and peas was also of benefit to organic producers, given the contribution which these crops can make to the nitrogen and livestock feed requirements of the farm system.

However, in some cases the benefits gained may have been at the cost of setting land aside which might otherwise have been producing cash crops that were in demand, given that on most organic farms the fertility building phase of the rotation is utilised by livestock. In addition, dairy and horticultural producers, who represent a relatively high proportion of organic production in most countries, saw few benefits from the CAP reform measures, as their crops, grassland and dairy cows were not eligible for support. To the extent that CAP support under the mainstream measures has been incorporated into land and rental values, the impacts may even have been negative.

For many producers operating rotational systems that included periods of fertility-building leys lasting longer than five years, the definition of eligible arable area according to land not in permanent grass (*i.e.* >5 years old) at the end of 1991 meant that some of the rotational land would not qualify for support payments when it came back into production. In some countries (*e.g.* United Kingdom, Ireland), this issue appears to have been resolved by allowing producers to rotate eligible area around the farm or higher flexibility about the permanent/temporary nature of fodder area (Belgium) so that farmers could choose the optimum basis for the support regime.

Existing organic livestock producers, who had reduced livestock numbers before 1992, in many cases received lower livestock quota allocations than would have been the case had they remained under more intensive, conventional management, with a potentially adverse impact on asset values. At the same time, they benefited (as other producers, but to a lesser extent given lower stocking rates) from the increases in headage support payments. The adverse impacts relating to lower stocking rates might have been less significant if support for livestock producers were also allocated on an area basis. However, organic producers would not have been as severely affected by the reductions in eligible stocking rates in the early years of the reforms. Indeed, many organic producers benefited from the higher beef extensification payments for stocking rates less than 1.4 LU/forage ha.

There is no indication that the environmental cross compliance measures that had been implemented as part of CAP reform in a few countries had any special impact on organic producers. Similarly, the overall impact of capping mechanisms on the organic sector has been limited, even though some examples of an effect have been reported (*e.g.* forage maize in the United Kingdom).

Impacts on farmers converting to organic production

Negative effects might have occurred for farmers converting to organic farming because arable area payments differentiated by crop types and livestock aid eligibility quotas tend to freeze current production patterns and levels of intensity. This does not go well with the enterprise restructuring which conversion to organic farming entails.

In their aim to diversify the rotation, arable farmers converting could lose eligibility for some arable area payments, without compensation, but only get access to some livestock premiums through quota purchase. In some areas, even quota purchase may not be possible because of the regional basis of quota allocations.

Livestock farmers converting were likely to receive livestock payments on fewer animals, yet will not be entitled to arable area payments for any new arable land introduced, although this may be offset by quota sales. There is therefore an active disincentive to producing cereals for livestock feed on the holding itself, in line with organic principles, when crops that have received support can be purchased relatively cheaply from elsewhere. On the other hand, the ability to trade quotas has facilitated the restructuring process during conversion and for many producers the ability to lease out quotas during conversion has proved to be an important means of financing the conversion.

These blockages were seen as more of a problem in countries and regions with larger farm sizes, as the farms were too big to qualify for the simplified scheme, but in many cases creative use of the support measures could reduce the extent of the impacts significantly.

Special provisions for organic producers

In order to mitigate negative impacts of CAP reform on organic producers, several countries made special provisions for organic producers or used investment aids and national/regional measures to provide additional assistance. Measures included:

- less restrictive requirements compared with conventional producers, *e.g.* later cutting or cultivation dates (*e.g.* the United Kingdom), exceeding of the maximum allowance of legume content for set-aside mixtures (Sweden, the UK, although in most other EU countries no restriction on the use of legumes in set aside mixtures apply);
- priority in allocation or free access to quota from the national reserve, *e.g.* suckler-cow and sheep annual premium quota from the national reserve (United Kingdom), and flexibility in choosing the reference time for milk quota (Sweden) and additional allocation of milk quota for organic and in conversion producers (Denmark);
- supplementary payments per LU or per ha for producers receiving aid under the organic option under 2078/92 to less favoured area (LFA) payments under EC Reg. 950/97 (one region in Italy since 1998).

- rotation of eligible arable area land around the farm, if the total area of eligible arable land on the farm remains the same (United Kingdom, Ireland) or higher flexibility about the permanent / temporary nature of fodder area (Belgium).
- priority status with respect to farm investment grants and loans (two regions in Italy).

In the Netherlands, special provisions existed with respect to the manure law that imply that, if organic farms had trouble meeting the standards for NH_4 emissions, especially in poultry and pig-keeping, they would not have to farm within these norms. This exemption was related to the fact that certain animal housing systems in organic farming (with advantages concerning animal health and well-being), may lead to higher NH_4 emissions than in conventional systems.

Other support measures

Support for organic farming under the 1992 CAP Reform was not solely restricted to direct financial support under the agri-environmental and commodity measures. Support for market and rural development initiatives, and support for information initiatives (research, training and extension) also played an important role and can be seen as important balancing components determining the success or otherwise of direct financial support measures in individual countries. They are only reviewed briefly here, as they are beyond the scope of this paper, but further details can be found in Lampkin *et al.*, 1999.

Production standards and regulations

One of the most important initiatives has been the introduction of EU-wide legislation covering organic crop production (EC Reg. 2092/91) and organic livestock production (EC Reg. 1804/1999). Production standards for organic agriculture promote consumer confidence and prevent the undermining of the market through fraudulent trading, but in situations where several competing initiatives exist, this may not be achieved. The introduction of legislation defining organic agriculture was seen as a means to avoid confusion among consumers, protect the producer and hence assist the development of the market for organic food. However, even after the implementation of the EU regulations, there has been wide differences between countries in the implementation of these initiatives, including the role of the state compared to private organisations, the number of agencies involved (which if too high can undermine both consumer and producer confidence), and the use or otherwise of generic national or EU logos to support consumer recognition of organic products.

Marketing and processing

The development of the marketing structure and establishment of new retail outlets is of key importance if the sector is to be able to deal with the supply-led expansion and if premium prices are to be maintained (Hamm and Michelsen, 1996). Policy support for marketing and processing in organic farming varies considerably. A number of countries have legislation, grants and/or support programmes available on a national level through which organic enterprises can and have received funding, for example Austria. Germany and Denmark have national programmes that specifically target organic farming. On an EU level, one of the established priorities for the application of EC Regulation 866/90 on improving the processing and marketing conditions for agricultural products and subsequent regulations through to the Rural Development regulation 1257/1999 has been investments relating to organic farming products.

Regional development and structural policy

Organic farming can help to meet many of the goals of regional development programmes, combining a sustainable model of agriculture with the encouragement of local production, processing and consumption patterns and local marketing networks, leading to an increase in the 'economic value' of a region (Vogtmann, 1996). Organic farming projects received support under Objectives 5b and 1 of the EU Structural Funds up to 1999 and this support has continued under Agenda 2000. These projects cover a variety of activities, including direct marketing, promotion of regional products, research, technical advice and training. Some regional development schemes include support for marketing and processing activities in the organic sector, mainly aimed at small-scale projects. Such schemes have been particularly successful in Germany in helping develop regional marketing networks, overcoming the problems of a small organic sector and encouraging the entry of new operators. The impact of grant aid on the organic sector and consequently the development of the region can be significant as evaluations of the Irish Objective 1 programme have shown (Fitzpatrick, 1997).

Information support

The provision of information and advice about organic farming is very important, as in organic farming, similar to other low input systems, inputs are replaced through management (Lockeretz, 1991). Only with access to suitable information can farmers who are considering conversion make an informed choice about the implications for their particular circumstances. Organic producers and their organisations are an important source of information to those interested in organic production, and in seven countries the producer organisations receive public support in recognition of this role. Regional groups of producer organisations operating in ten countries facilitate the sharing of experience among organic farmers, act as a focal point for regional market development and give social support to the producers. Support has also been given to information and advisory services and demonstration farm networks under national advisory support systems, mainly with the aim to increase the uptake of conversion support. Specific conversion information programmes in Sweden (under EC Reg. 2078/92) and the United Kingdom (national programme) have proved very popular. In addition, indirect support to the information provision has been given through training and research programmes including the second, third and fourth framework programmes from the European Union.

Trade and WTO implications of support policies

The development of the market for organic products relies significantly on international trade, and therefore it is to be expected that policies to support organic farming will come under the scrutiny of the World Trade Organization. Organic farming standards and regulations are generally acceptable within the WTO framework, as in principle at least they are governed by Codex Alimentarius agreement on organic food standards, but bilateral issues remain, not least between the US and EU. Potentially more contentious is the availability of financial incentives to encourage conversion to organic production and to stimulate demand for locally produced food, both in Europe and North America. Direct support of this type currently comes within the WTO's Green Box, which is justifiable given the environmental and other public good benefits of organic farming. The current US/EU agreement to leave Green Box measures intact would suggest that these support payments are secure for the foreseeable future, but the increasing emphasis on the market for organic products as an end in itself, rather than a means to support the environmental objectives, could undermine this, particularly if some countries feel their producers are being discriminated against. The answer may lie in quantifying the broad range of public good outputs of organic farming and developing holistic measures of total environmental costs, but higher transaction costs would inevitably be involved.

Developments under Agenda 2000

Support for organic farming under Agenda 2000 has yet to be analysed in depth, but will be the focus a new EU-funded research programme co-ordinated by the author starting in autumn 2002. The Rural Development regulation (1257/1999) provides the means for the continuation of direct support to organic producers through the articles relating to agri-environmental measures. Examples of current payment rates are shown in Table 2. A more comprehensive analysis is to be conducted by the author in 2003.

Table 2. Comparison of organic farming support payments for arable crops in selected countries, 1997 and 2002

Status	**Conversion**		**Organic**	
Year	***1997***	***2002***	***1997***	***2002***
Austria	327	327	327	327
Germany*	150	285	100	160
Belgium	180	180	112	112
England	80	290	0	50~

* Lower Saxony; ~ proposed.
Source: Lampkin *et al.* (1999) and own data (2002).

In addition, the Rural Development regulation integrates several other relevant measures, including support for marketing and processing, training, farming in less-favoured areas, animal welfare initiatives and young farmers. This integrated approach to rural development forms the second pillar of the CAP and, in theory at least, provides member States with the opportunity to support fully integrated rural development plans suited to their specific needs. (In practice, many of the measures reflect previously existing regulations and have continued to be implemented independently because of the different agencies responsible.) Perhaps of greater significance for the development of the organic sector is the potential the Rural Development regulation offers to support integrated action plans that achieve a better balance between supply-push and demand-pull policies.

Agenda 2000 did not introduce fundamental changes to the main commodity regimes, reinforcing rather than substantially progressing the reforms started in 1992. To the extent that these measures were advantageous to organic producers previously, they have remained so subsequently. One area of movement, however, has been that of exemptions from compulsory set-aside requirements for organic producers. As indicated above, it can be argued that organic farmers should be exempted from compulsory set-aside, because the market is under-supplied and production is in any case reduced as a result of the farming system applied, but the option of voluntary set-aside should be retained as it can be used to support the fertility-building phase of the rotation in the absence of livestock. In 2001, the EU Commission introduced a special exemption to allow organic producers to utilise set-aside land for the feeding of livestock, but a complete exemption remains an issue for the mid-term review of Agenda 2000. There is a need for this process to be continued, and for other production constraints, such as quotas, to be re-examined on similar grounds.

The European Commission has put forward proposals for the mid-term review of Agenda 2000 (EC, 2002), which are currently the focus of intensive debate between member States. In essence, the proposals aim to complete faster than originally envisaged the process of reforming market support mechanisms, decoupling direct payments from production, introducing compulsory modulation and increasing support for the second pillar rural development measures, including agri-environment, animal welfare, food quality and organic farming schemes.

Viewed in their totality, there are many elements of these proposals that are likely to be beneficial to organic producers, in particular the decoupling and modulation proposals, which favour smaller, more labour-intensive producers and remove the penalties that producers converting to organic production previously faced when altering enterprise mix and reducing stocking rates and production intensity. However, organic farming does not receive detailed explicit attention in the proposals, and some of the earlier proposals from the Commission to exempt organic producers from compulsory set-aside do not yet appear to be reflected in the reform plans.

Action plans

A key problem facing policy-makers is the balancing of supply (push) and demand (pull) initiatives to achieve sustainable development of organic agriculture in support of environmental and rural development goals. Some countries (*e.g.* Denmark, England, Finland, France, Germany, the Netherlands, Norway, Sweden and Wales) have developed integrated action plans to achieve a better policy mix (Lampkin *et al.*, 1999). The range of approaches adopted, however, illustrates the problems, and the political pressures, inherent in achieving this.

The organic farming action plans normally include targets for adoption (typically 5-10% by 2000/2005 or 10-20% by 2010) and a combination of specific measures including: direct support through the agri-environment/rural development programmes; marketing and processing support; producer information initiatives; consumer education and infrastructure support. The more detailed plans contain evaluations of the current situation and specific recommendations to address issues identified, including measures to ameliorate conflicts between different policy measures.

Denmark has the longest history of policy support for organic farming, with the first measures introduced in 1987. The first Danish Action Plan of 1995 covered the period until 1999. Its 7% by 2000 target was almost achieved, with 6% of agricultural land in Denmark certified in 2000. Action Plan II (MFAF, 1999) aims for an increase of 150 000 ha, to ca. 12% of agricultural land, by 2003. The plan was drawn up by the Danish Council for Organic Agriculture, a partnership between government, organic producer organisations, conventional farming groups, trade unions, consumer and environmental groups. It is characterised by an in-depth analysis of the situation in Denmark and represents the best-developed example of the action plan approach, containing 85 recommendations targeting demand and supply, consumption and sales, primary production, quality and health, export opportunities as well as institutional and commercial catering. The plan has a specific focus on public goods and policy issues, with recommendations aimed at further improving the performance of organic agriculture with respect to environmental and animal health and welfare goals, including research and development initiatives, administrative streamlining and policy development.

The situation in Germany has a more overtly political basis. The fall-out from the BSE crisis in Germany in 2000 led to a goal of 20% organic farming by 2010 being set. This was heavily criticised by farming unions and agricultural economists, in part because of the absence of specific measures to achieve the goal. However, the payment rates for the federal German organic farming scheme were increased and a unified symbol for organic products introduced (following the failure of private sector initiatives to achieve a similar goal). Marketing and processing support initiatives continue through the rural development plan. The German "Federal Programme for Organic Agriculture" (BMVEL, 2001) is not strictly an action plan as it does not aim to integrate or modify policy measures that are already in place, but seeks instead to create a new information programme targeting all elements of the supply chain, from the input suppliers through producers, distributors, processors and retailers to consumers. Substantial funding (EUR 70 million in 2002/2003) is directed at the key elements, including web-based information resources, research, training and demonstration activities, with the major share of funding targeted at consumer information campaigns.

In contrast to the mixed approach in Denmark with an emphasis on both market development and the delivery of public goods and the dominant information focus of the German action plan, the most recent action plan in the Netherlands (MLNV, 2000) "*An organic market to conquer*" reflects the very strong demand/supply chain focus of Dutch policy, which targets 10% by 2010. The plan aims to improve the functioning and efficiency of the supply chain, to reach new, less ideological consumers, and to retain consumer confidence through effective certification procedures, but it also recognises the need for continuing research and information dissemination initiatives. In contrast to other countries, the policy includes the phasing out of supply measures including direct payments, with support for conversion available for the last time in 2002.

In the United Kingdom, action plans have been produced in Wales and in England. The Welsh action plan (WAFP, 1999), published in 1999, aims for 10% of Welsh agriculture to be organic by 2005 and for organic farming to play a key role in agricultural/environmental policies as well as exploiting market opportunities at home and abroad. This is to be achieved by increasing the supply of organic products from Wales, developing markets for Welsh organic products, and addressing specific bottlenecks that might occur. An integrated approach combining three main types of activities was envisaged: effective utilisation of existing measures and development of new policy initiatives; marketing measures (including market analysis and development, marketing and processing/RDP grants, and related training and business advice; and information measures, involving a co-ordinated information strategy and the establishment of an organic centre for excellence. The recently-published English action plan (DEFRA, 2002) does not include targets, but does for the first time introduce the concept of maintenance payments for organic producers (as available elsewhere in Europe). It also includes a series of supply chain initiatives, including reform of the certification system and improved statistical and bench-marking data, as well as increased funding for research, the establishment of an institute to support the accreditation and information needs of advisors, and a range of other training and extension initiatives linked to existing programmes for conventional producers.

At the European level, a strategic focus for policy support for organic agriculture is needed, given its potential significance in coming years. Although the implementation of measures to support organic farming is primarily a matter for member States, it is important that the enabling regulatory framework is adequate to provide the right policy mix, including the minimisation of conflicts between individual initiatives. As organic farming grows, the size of the sector will begin to impact on the overall supply and market situations for agricultural products in the EU, and this will need to form part of the considerations for ongoing reform of the main commodity measures. Therefore, while the EU may hold back from setting a global target for organic production, some consensus on the longer-term potential of the sector is still desirable. In addition, there is a need for certain actions at an EU-wide level, for example a common, non-discriminatory identification symbol (also applicable to non EU-products). The development of a European action plan for organic farming is now the subject of study by the EU Commission, a process initiated by the European conference on organic farming held in Copenhagen in May 2001 (MFAF, 2001), and subsequently supported by the Council of Agricultural Ministers in June 2001. A draft action plan is expected to be presented to the Council by the end of 2002.

Conclusions

Organic farming has developed rapidly in Europe since 1993, against the background of significant policy support, mainly in the form of direct payments under agri-environmental support and indirectly through support for marketing and processing activities, certification, and information-related activities. The prospects are for continued growth, which may lead to 10-20% of EU agriculture managed organically by 2010. The Agenda 2000 mid-term review proposals for continued reform of the CAP from 2004 look likely to provide the basis for further support to this process, allowing organic farming to move from "niche markets" to become a mainstream part of the agricultural sector. However, in order to achieve this, integrated policy support in three key areas (production support, support for regional and market development, and support for knowledge networks) is essential. Longer term, the Agenda 2000 package will be replaced by further new policy measures from 2007, reflecting the substantial enlargement of the European Union from 15 to 27 countries and the outcomes of the current WTO round. The EU action plan for organic food and farming and the new policy research programme will have a key role to play in this process.

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THE INFLUENCE OF THE EU COMMON AGRICULTURAL POLICY ON THE COMPETITIVENESS OF ORGANIC FARMING

Frank Offermann[1]

Abstract

The Common Agricultural Policy (CAP) strongly influences the economic framework of agriculture in the European Union (EU), contributing to a significant share of farm receipts. Organic farms tend to receive higher total payments than comparable conventional farms due to support from agri-environmental programmes. However, due to differences in production structures, they receive fewer payments from the general schemes like arable area payments and livestock headage premia, which were introduced as part of the 1992 CAP reform. As yields in organic farming are lower, organic farms are also likely to gain less from the still widespread use of price support measures. Still, the CAP reforms have significantly increased the competitiveness of organic farming relative to conventional farming. While the introduction of direct support to organic farming in all EU member States was probably the single most important change, modifications of the general support schemes also play a decisive role in this development. The replacement of price support by partly decoupled payments favours extensive farming systems. The introduction of premiums for set-aside has especially benefited organic arable farms. Initial calculations indicate that further decoupling as envisaged in the current discussion of future reforms of the CAP, such as grassland premiums or general uniform area payments, will considerably increase the financial attractiveness of organic farming in the EU.

Introduction

The CAP has been influencing the economic and regulatory framework for agriculture in the European Union in numerous ways for decades. The OECD calculates the Producer Support Estimate (PSE) to be 40% of gross farm receipts for the period 1998-2000 (OECD, 2001). Market price support policies and area and headage payments are still the main policy instruments, but payments based on input constraints have been gaining in relevance. The objective of this paper is to identify and quantify CAP support for organic farms in comparison to conventional farms, and to assess the impact implemented and planned reforms of the CAP have had or could have on the relative competitiveness of organic farming.

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Importance of the CAP for organic farms

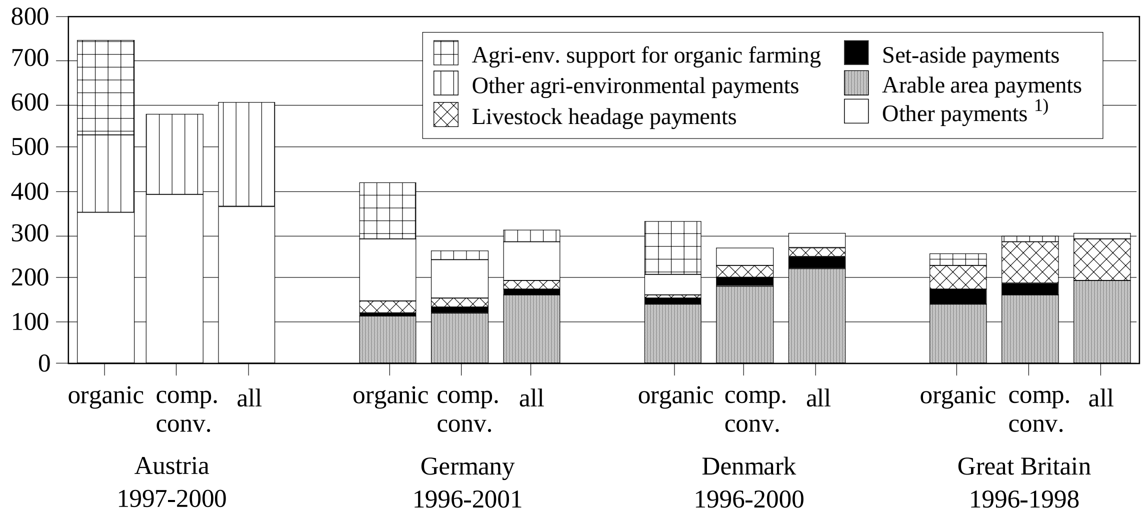
Direct payments

In the EU, direct payments generally account for a significant share of income in agriculture. The most important payments are made on the basis of

- the area planted with specific crops (arable area payments);
- the number of animals held or slaughtered (headage payments); and
- the participation in agri-environmental programmes.

Payment levels often vary regionally, and eligibility is subject to a number of constraints and requirements (*e.g.* set-aside, stocking rates, minimum and maximum levels, budget constraints, etc). Actual farm receipts can therefore only be determined on the basis of farm level data. Suitable data were available for four countries (Austria, Denmark, Germany and the United Kingdom) from national farm accounting data networks.[2] Farm samples include between 30 and more than 120 organic farms each, and all figures represent the average of at least three years of observations to eliminate the influence of any annual fluctuations that might occur.

Figure 1. Importance of the CAP: direct payments to farms



1) Austria: incl. CAP compensatory payments.

OF_2002-08-20

comp. conv. = comparable conventional farms

all = sample representing all farms in the country

Source: Own calculations based on BMLF, BMVEL, DIAFE, Fowler et al.

An overview of total direct payments per ha in organic, comparable conventional[3] and all farms in the countries analysed is given in Figure 1. In three of the four countries, organic farms

2. In the United Kingdom, supplemented by data collected on organic farms.

3. The comparable conventional farms are of similar size as the organic farms. For a detailed description of the concept of comparable conventional farms, see the paper by Nieberg and Offermann, “The Profitability of Organic Farming in Europe”, in Part I, Chapter 3.

receive higher total payments than conventionally managed farms, due mainly to the support for organic farming practises within the agri-environmental programmes. The notable exception is the United Kingdom, where organic farming has been supported only for a conversion period, and the payments therefore have little importance in the sample analysed.[4]

Payments made within all the other categories are often higher for conventionally managed farms, especially with respect to the payments introduced as part of the CAP reform of 1992:

- Arable area payments are made for certain crops only (so-called "*Grandes Cultures*", *i.e.* cereals including maize for silage, oilseeds and pulses), of which organic farms often grow less due to the need for a broader crop rotation and the use of leys for fertility building.
- Most livestock payments are linked to the number of animals held, and, even though some schemes exist that reward low stocking rates, this leads to livestock payments being significantly lower on organic farms.
- Set-aside payments do not differ significantly. While the obligatory set-aside area is somewhat lower on organic farms, voluntary participation in set-aside schemes is higher as this land can be used for fertility building.

Price support

Price support measures are still the most important instruments of agricultural protection in the EU (OECD, 2001). The influence on individual farm receipts depends on the products covered and quantities produced. Both aspects make these instruments much more beneficial to conventional than organic farming systems. In the EU, yields are generally higher under conventional management (Offermann and Nieberg, 2000), and many of the products with the highest price support[5] (*e.g.* barley, sugar, beef) are more often produced on conventionally than on organically managed farms.

Impact of the CAP reforms on the relative competitiveness of organic farming

The 1992 CAP reform was characterised by a reduction in price support coupled with compensatory payments and obligatory set-aside, and the introduction of agri-environmental programmes. All three elements had an impact on the relative competitiveness of organic farming.

Agri-environmental payments

The CAP reform of 1992 introduced the large-scale promotion of environmental objectives with voluntary participation in agri-environmental programmes (EC Reg. 2078/92).[6] Within this framework, all EU member States now offer support for organic farming, and even though the support to other extensive farming systems is often competitive, these payments are probably the single most important change that the CAP reform of 1992 made for organic farming. A detailed discussion of the

4. Note that in 2002 the United Kingdom announced it would begin paying direct payments to organic farmers after the conversion period.

5. Measured by the producer Nominal Protection Coefficient (NPC).

6. With the implementation of Agenda 2000, agri-environmental measures are financed within the framework of the Rural Development Regulation (EC 1257/99).

role of conversion and support payments is given in the paper by Lampkin (Part III, Chapter 8). This paper will therefore only concentrate on the impact of the general measures of the reform.

Compensatory payments for reduced price support

While the analysis presented in Figure 1 demonstrates that organic farms receive less direct payments per hectare from the general CAP schemes introduced as part of the 1992 CAP reform, it would be rash to denounce the reform as having disadvantaged organic farming systems. Actually, the 1992 CAP reform (as well the subsequent reform, Agenda 2000) has generally reduced the discrimination against extensive farming systems by lowering the level of price support for a number of products, compensating farms for losses of revenue via direct payments. For arable area crops, payments are made depending on the area cropped, with the per hectare level of the compensatory payments based on regional historical average yields. This has generally favoured extensive farming systems, since farms with lower yields were less affected by price reductions but get the same level of compensatory payments.

However, since organic produce is generally sold at premium prices, the impact of the shift in the support system on organic farms is more difficult to assess and depends on the effects of the change in the EU market price support mechanisms on the prices for organic products. Looking at a few stylised relationships between organic and conventional farm gate prices provides an insight in the general mechanisms:

Case a) Organic and conventional prices are independent from each other

In this case, the fall in conventional prices does not affect organic producers, and the compensatory payments will directly increase the returns to organic farms.

Case b) The premium paid for organic products is constant in absolute terms

Then, the absolute price decrease for the organic product is similar to the price decrease for the conventional product, but revenue reductions will generally be lower in organic than in conventional farming due to the yield difference. Decoupled compensatory payments will increase the relative competitiveness of organic farming. This is also the case if an organically produced product is sold conventionally.

Case c) Organic products receive a constant premium relative to conventional products

If the relative price decrease for the organic product is similar to the relative price decrease for the conventional product, then revenue reductions may be either higher or lower than in conventional farms, depending on the revenue in the base situation: If base revenues per ha are lower under organic than under conventional management, then this change in policy regime will increase the relative competitiveness of organic farming, and *vice versa*.[7]

Little information exists on the exact relationship between organic and conventional farm gate prices, but impressive empirical evidence of the positive impact of the decoupling of agricultural support is provided by the development of organic farming in the Scandinavian countries following

7. Using typical figures for cereals, with yields in organic farms lower by 40% and prices higher by 100%, revenues per ha are higher by 20% in organic farming. In this case, if prices of organic cereals are defined relative to conventional prices, relative competitiveness of organic farms would decrease.

the EU accession in 1995. In Finland, for example, conventional producer prices fell by up to 40% "overnight" with the adoption of EU agricultural policy, which significantly increased the relative competitiveness of organic farming systems, and in turn, was one of the main reasons for the doubling of the organically managed area within a single year (Koikkalanen and Vehksalo, 1997).

Price support was also reduced for livestock products (mainly beef and sheepmeat), but as compensatory payments are paid per head, the benefit to extensive systems (which differ from intensive systems mainly by lower stocking rates and longer fattening periods) was small, if any. In addition, at least in the 1990s, often a significant share of organically produced livestock products had to be sold conventionally, and thus the decreased price level did directly affect organic farms as well.

Set-aside schemes

To limit the excess production of certain arable crops, the CAP reform has introduced the instrument of the obligatory set-aside, with set-aside land being eligible for a payment. Organic farms are subject to the same obligatory set-aside rate as conventional farms, even though they already contribute to a reduction of surplus products through reduced yields and a different cropping pattern. Still, the impact of the set-aside schemes on organic farming is generally assessed to have been neutral or positive, as organic farms can often use the set-aside for fertility building by including legumes in set-aside-mixtures. In particular, arable farms with little or no livestock and farms in countries that allow a cumulation of set-aside payments and payments for organic farming have benefited from the set-aside schemes.

Overall impact

The overall impact of the CAP reforms on the economic situation of organic farms can be illustrated using the example of Germany. There, organic farms were eligible for specific support before 1992 and therefore the effects of the CAP reforms were not influenced by the introduction of support to organic farming within the new agri-environmental programme. A survey of 150 organic farmers found that the impact of the CAP reform on the economic situation was positive, especially for organic arable farms (Table 1).

Outlook: the impact of possible future developments

The latest reform of the CAP, Agenda 2000, is continuing the gradual shift from price support to direct payments. Especially price protection for livestock products will decrease in the future. However, since payments will continue to be paid per head (or, in the case of milk, will possibly even be directly coupled to production), the impact on the relative competitiveness of organic farming will be marginal.

Table 1. Impact of the general measures of the CAP reform on the economic situation of organic farms in Germany

	Former federal states			New federal states
Economic situation	**All farms**	**Arable farms**	**Grazing livestock farms**	**All farms**
Worse than before	11%	3%	17%	2%
Slightly worse	15%	13%	18%	0%
No change	37%	37%	37%	28%

Slightly better	22%	32%	15%	60%
Better	15%	16%	13%	9%

Note: Survey of 107 organic farms in the former federal states and 43 organic farms in the new federal states in Germany in 1995. Farmers were asked how the CAP reform had affected the economic situation of their farms. Farms have been eligible for organic support schemes before the CAP reform, and thus the introduction of EC Reg. 2078/92 was not taken into account.
Source: Nieberg (1998).

In contrast, other options discussed as part of the mid-term review of the Agenda 2000, *e.g.* a uniform payment for all land, or a transformation of headage payments to grassland payments, may considerably alter the competitiveness of organic and conventional farming systems. Initial calculations for Germany indicate that a transformation of all milk and headage payments to a uniform grassland premium would increase the income of organic farms by approximately 15% (EUR 60/ha) compared to comparable conventional farms (Offermann and Nieberg, 2001), highlighting the importance the general policy framework has for the relative competitiveness of organic farming.

Conclusions

When evaluating the policy and regulatory framework for organic farming, the emphasis is often on specific regulations and support programmes for organic farming. However, in the EU the general framework of the CAP is one of the main determinants of the relative competitiveness of organic farming. In this respect, recent reforms have, in general, been positive for organic farming systems. Future developments which aim at a further decoupling of agricultural support and expanding payments for the provision of environmental goods could continue this trend.

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NORWEGIAN EXPERIENCE WITH CONVERSION AND SUPPORT PAYMENTS FOR ORGANIC FARMING

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Abstract

The development of organic farming is an integral part of Norwegian agricultural policy. Governmental conversion and support payments to organic farmers have been, and still are, important tools to reach the political goals established for organic farming in Norway. Norwegian experiences with conversion and support payments directed towards organic producers will be the main focus of this paper. The paper describes how the subsidy system in Norway has emerged and the impact support payments have had on the development of organic farming. The subsidies are especially effective in increasing acreage demanding productions, but are not effective in enhancing acreage-intensive productions. Conversion and support payments can be effective tools to steer the development in the right direction but they are not effective if used as the only development tools.

Organic farming as a part of Norwegian agricultural policy

Objectives of Norwegian agricultural policy

Norwegian agricultural policy has several objectives, the most important being to:

- secure farmers an income and living standard corresponding to the remainder of the population;
- secure the production of high-quality, safe food;
- secure agriculture's contribution to the production of public goods like food security, settlement in rural areas and cultural landscapes (agriculture's multifunctional role).

As a consequence of the latter objective, it is a goal to maintain farming activities throughout the entire country. In addition, it is an overall goal that agricultural production, as far as possible, should develop in an environmentally friendly and sustainable direction.

The development of organic farming has been an increasingly important part of agricultural policy in Norway since 1990. In 2000, the Norwegian Parliament debated a White Paper regarding agriculture and food production. A large majority supported the further development of organic farming, aiming for an increase in the agricultural area under organic cultivation to 10% by 2010,

1. Ministry of Agriculture, Norway.

provided there is a functioning market for organic food products. The development of organic agriculture is regarded as an important part of agricultural policy because it can contribute to several of the objectives mentioned above, for example:

- Organic farming is environmentally friendly, *e.g.* in terms of effective resource utilisation, and no use of synthetic pesticides or chemical fertilisers. Research, and especially the development of new technologies, done in connection with organic farming can also be used in conventional farming. Thus organic farming can contribute to a more sustainable Norwegian agricultural production as a whole.
- It is a political goal to increase the variation in the food-sector and the consumer's possibility to choose between different food qualities. Organic production contributes to this goal.
- Surveys show that the consumers are interested in organically produced food and that they are willing to pay more for these products. To secure domestic agricultural production, it is important to meet the demand for organically produced food with Norwegian production as far as possible.

Agricultural policy instruments

In order to achieve the objectives of Norwegian agricultural policy, a number of measures have been employed, including economic instruments as well as laws and regulations. The main economic instruments in Norwegian agricultural policy are: *a)* border protection and market price support; *b)* target prices; *c)* market regulations; *d)* direct support and *e)* fees and excise taxes.

In this connection, the direct support system is of main interest. The direct support system consists of several support measures that can be divided into:

- direct support (product-specific support and non-product-specific support);
- investment support;
- indirect support via research, education and extension services.

The direct support subsidies are partially differentiated according to production, geographical region and farm size. Development of, and support to organic farming is an integrated part of the direct support system.

In Norway, the two farmers' associations[2] have the right to negotiate with the Government on prices and other measures in the annual agricultural negotiations, resulting in The Agricultural Agreement.[3] The total annual support given through the Agricultural Agreement over the last few years has been about NOK 12 billion (USD 1 607 billion). In 2002, NOK 125 million (USD 16.7 million) was set aside to enhance the development of organic agriculture. About 50% of this sum represents direct conversion and support payments to organic farmers. The other 50% are used for measures through the whole food chain, including advisory services, research, market development actions and information activities.

2. The Norwegian Farmers' Union and the Norwegian Farmers' Smallholders' Union.

3. The Agricultural Agreement, which is ratified by the Norwegian Parliament, covers a large number of items including subsidy programmes via the national budget and changes in market prices (target prices).

Experience with conversion and support payments directed to organic primary producers will be the main focus of this paper. Because of the complexity of the Norwegian support system, it is difficult to describe and isolate one integrated part of the system. An attempt will be made, however, to show how the subsidy system for organic farming has emerged, and the influence the conversion and support payments have had on the development of organic farming in Norway.

Subsidies to organic farmers

Organic farmers have been granted subsidies from the Norwegian government since 1990. The subsidies are given as an extra payment on top of the general support system, and the subsidy levels are established on an annual basis, through the Agricultural Agreement. In 1990, two types of subsidies were introduced: a one-time conversion subsidy and a yearly acreage subsidy. Because the subsidies are debated on a yearly basis, both the level and shape of the subsidies have changed several times since 1990, reflecting developments in the organic sector as a whole and public opinion. Table 1 shows the support system as it will be from 1 January 2003.

Table 1. Norwegian support system for organic farmers from 2003

Product grown/ Animal	**Conversion payment** (USD per hectare, one-time subsidy)	**Acreage payment** (USD per hectare per year)	**Payments for organic animal production**** (USD per animal per year): Eastern and Southern Norway	**Payments for organic animal production**** (USD per animal per year): Western and Northern Norway and mountain areas
Grain, potatoes, vegetables, fruit and berries	1 000	333		
Green fertilising*	1 000	733		
Pasture and other organic areas	1 000	74		
Dairy cows			84	117
Other cattle			25	37
Goats and sheep			9	12

* Maximum 50% of area used for grain, potatoes, vegetables, fruit and berries.
** New subsidy in 2001.

There are three main goals for granting subsidies to organic farmers:

- Stimulate more farmers to convert to organic farming;
- Give partial compensation for the extra expenditures connected with organic production;
- Encourage farmers to maintain organic production after the conversion period.

At the same time, it is an important principle that higher prices in the market should cover some of the extra expenditures connected with organic production. In other words, consumers must be willing to pay some of the extra costs of supplying the market with organic products.

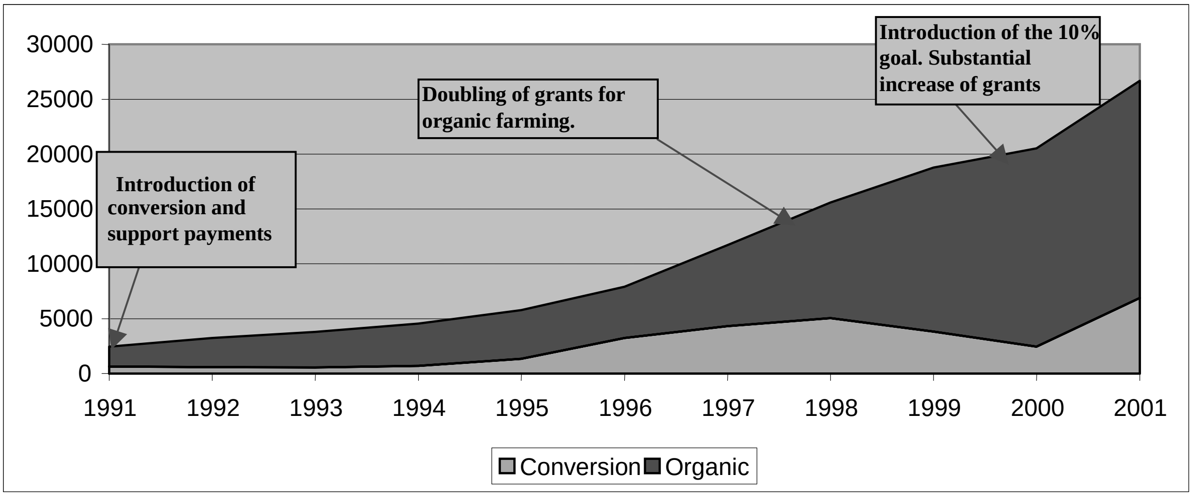
The "stimulation part" is to a great extent put on the conversion subsidy, which is set at a relatively high level compared to the actual extra expenditures occurring during the conversion period.[4] This is practical because the conversion support is a one-time subsidy, and consequently a high subsidy level will have limited influence on market prices. On the other hand, the acreage subsidies, which are granted on an annual basis, are set at a more sober level aiming for a partial coverage of the higher production costs of organic farming.

Setting subsidies at a level greater than the extra costs in order to stimulate a wanted action has been successfully used to reach other political goals in Norwegian agriculture, *e.g.* more environmentally friendly farming. In general, such subsidies are held at a high level until farmer attitudes towards the wanted action have positively changed, then the subsidy is stabilised at a lower level. Subsidies to organic farming will probably also be stabilised at a lower level once the 10% goal has been reached.

Development after the introduction of conversion and support payments

As Figure 1 shows, there has been a steady growth in the area under organic cultivation since the introduction of support payments in 1990. Most of the organic area converted in this period has been pasture, while the development in acreage-intensive productions, like vegetable or fruit production, has almost stood still since 1989. The lack of development of organic horticulture production is unfortunate as surveys show that consumers' willingness to pay is highest for organic vegetables and fruit. That subsidies have had a low impact on encouraging this type of production is, however, not surprising, as the subsidies are acreage-based thereby favouring acreage demanding productions. Actions to enhance the development of acreage-intensive organic production therefore need to be found outside the direct support payment system. More research, good advisory services and developing "farm-to-fork" projects will probably be among the most important measures.

Figure 1. Development of organic area and area under conversion from 1991-2001
(in hectares)



4. Farmers receiving a conversion subsidy are committed to organic farming for a minimum of five years after the conversion period is over.

Steering the development

The yearly review of the subsidy system through the Agricultural Agreement makes it possible to steer subsidies in different directions based on how the organic sector is developing and the sectors reaction to the support system. The development of organic grain production may serve as a good example.

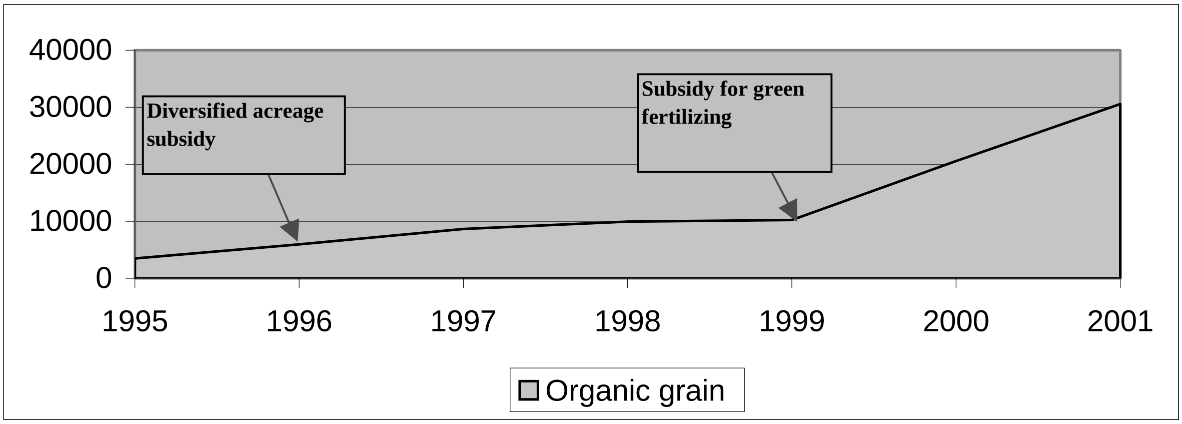
Increasing organic grain production

The introduction of conversion and subsidy payments clearly had a positive influence on the development of organic production. However, it soon became obvious that very few grain producers were converting to organic farming.

This can be explained by the general agricultural policy in Norway, locating animal production in the western and northern parts, and grain production in the eastern parts of the country. As a consequence, there is little animal manure available in the grain producing areas, which makes it especially challenging and costly to produce organic grain in Norway compared to grass production. Consequently, the subsidy levels were too low to give a proper incentive for grain producers to convert.

Work on developing an EU regulation on organic animal husbandry began around 1996, and it soon became clear that one probable result of this regulation would be a claim that fodder used in organic animal husbandry should be 100% organic by 2005. This made it pressing to rapidly increase organic grain production, and so in the 1997 Agricultural Agreement the acreage subsidies were diversified, granting a higher subsidy for arable crops.

Figure 2. Development of area used for organic grain production from 1995–2001
(in hectares)



Even though the number of grain producers converting to organic farming increased after this, the development was far too slow to meet the future need for organic grain, so during the next few years the subsidies for arable crops were increased several times.

As knowledge about organic grain production in areas with no animals improved, it showed that the costs of having to use green fertilising was high because it reduced the production area by about one-third. In 1999, a new subsidy especially directed towards grain producers with few or no animals was introduced, aiming to compensate for the extra expenditures of having to set aside area for green fertilising. This led to substantial growth in the organic grain area. Figure 2 shows the development of organic grain area form 1996 to 2001. Both evaluations and several surveys show that most organic grain producers emphasise the changes in support policies as especially important for their decision to convert.

The importance of other measures

Even though subsidies for organic farmers have a positive influence on the conversion rate it is clear that subsidies alone are not enough to improve development.

Words are never enough — but they are important!

Converting to organic farming is an important and long-term decision, both economically and personally. Farmers, therefore, need to know that signals from politicians and the government are serious and predictable. Experiences from the development of the organic sector in Norway clearly show how important this is. The many changes in the organic subsidy system from 1998 to 2000 created uncertainty about the system. Consequently, many farmers did not take the risk of converting, resulting in a low conversion rate (Figure 1).

In 2000, the Norwegian Parliament set a goal that 10% of the total agricultural area should be under organic cultivation by 2010. This was followed by a substantially higher allocation of money for organic farming, mainly increasing efforts directed towards market development and projects activity. Direct support payments to farmers have to a great extent been held at the same level since 2000, but it was strongly emphasised that they will remain stable throughout the 10-year period. While the 10% goal did not result in any marketable economic consequences for the farmers, there has been a substantial growth in the number of farmers converting to organic production (Figure 1). The setting of the political goal has also had a positive influence on retailer’s and the food-processing industry’s attitude towards organic agriculture.

Throughout the food chain

While there has been a very positive development of organic farming in Norway since 1990, production volumes are still low and the Norwegian market for organic products is at a very early stage of development. The support payments give organic farmers an important economic base. But as they also need to cover some of the extra costs connected with organic farming through the market, development of the market for organic products is just as important. Further, support payments are not effective to enhance development of all types of production, like acreage-intensive productions.

Conversion and support payments are therefore not effective if used as the only tools for development. Efforts need to be made throughout the whole food chain from “farm-to-fork” including market development, advisory services, research and information. And the measures must work simultaneously to secure highest efficiency and a balanced development.

Conclusions

It is clear that development and changes in other parts of the Norwegian agricultural policy are of at least the same importance for the development of organic farming as the organic support system. Even so, the special conversion and subsidy payments have made a substantial contribution to the positive development of organic farming, the conclusion being that:

1. Governmental conversion and support payments to organic farmers have been, and still are, important tools to reach the political goals for organic farming in Norway.

2. Acreage-based subsidy payments are especially effective to increase acreage-demanding production, but not effective to enhance acreage-intensive production as, for example, vegetable production.

3. Support payments can effectively be used as a tool to steer the development in the right direction.

4. Conversion and support payments are not effective if used as the only development tools:

   – Words are not enough, but they are important! Clear and binding political goals and long-term focus are central factors for success.

   – Work needs to be done throughout the whole food chain from "farm-to-fork". Measures directed towards production, research, advisory services, information and development of the market need to proceed simultaneously.

DO SUPPORT PAYMENTS FOR ORGANIC FARMING ACHIEVE ENVIRONMENTAL GOALS EFFICIENTLY?

Lars-Bo Jacobsen[1]

Abstract

Concerns about the impact of modern agriculture on the environment have in the past few decades resulted in strict legislation concerning the leaching of nitrogen from Danish farms and their use of pesticides. An often-heard argument in recent years is that conversion to organic farming is a solution to many environmental problems. Hence, in the late 1990s several initiatives to support the development of organic farming have been taken, including permanent direct support for producing organically. This was made possible by the 1992 reform of the common European Agricultural Policy (CAP) that allowed for specific subsidies for environmentally friendly production. This paper discusses the cost efficiency of two alternative policy measures for obtaining an overall reduction in the use of nitrogen and pesticides in Danish agriculture. The first policy measure is a subsidy for producers who produce organically and thus reduces the use of nitrogen and abandons the use of pesticides. The other policy measure is the use of taxes levied on fertilisers and pesticides. Using an Applied General Equilibrium (AGE) model the two policies measures are compared. The paper concludes that an overall reduction in the use of pesticides and fertilisers is most efficiently obtained by taxing those agents using these inputs. The size of the organic sectors should be determined by consumers' willingness to pay for organic products.

Introduction

Concerns about the impact of modern agriculture on the environment have in the past few decades resulted in strict legislation concerning the leaching of nitrogen from Danish farms and their use of pesticides. An often-heard argument in recent years is that conversion to organic farming is a solution to many environmental problems. Hence, in the late 1990s several initiatives to support the development of organic farming have been taken.

Until the mid-1990s, organic farmland was held at a stable level of around 1% of the total cultivated area. From 1994/95, increased demand for organic products and favourable support for organic production led to a significant growth in organic farmland. Today, organic farmland accounts for 5% of the total agricultural area, and 6.6% if land under conversion is included. Organic milk is the most important product accounting for around 80% of the total value of production. The rapid increase in organic production has, however, not been followed by a similar increase in demand. After a significant preference shift towards organic products in the mid-1990s consumer tastes have only

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changed slowly in the most recent years. This has resulted in a situation where approximately 60% of current organic milk production is used for non-organic purposes.

Frandsen and Jacobsen (1999*a*) show that the cost to society of a complete transformation of Danish agriculture into organic production would be around 2-3% of real GDP, whereas the cost of a complete or partial ban on pesticides would amount to 0.82% and 0.35% of real GDP respectively (Frandsen and Jacobsen, 1999*b*).[2]

While the above-mentioned analyses focused on pesticides and organics separately, this paper addresses both issues simultaneously and also addresses the use of fertilisers in the agricultural sector. Moreover, the scenarios in this paper are less radical. Scenarios resulting in the same reduction in the use of pesticides and nitrogen are compared, by using two different policy instruments, namely subsidies to organic farmers in the first case, and taxes on fertiliser and pesticides in the other.

In all scenarios, positive environmental effects from organic farming are measured by changes in the use of pesticides and nitrogen. An obvious critique is to argue that organic farming generates many other positive benefits to society, and that it would be wrong to merely choose between two alternative scenarios based on this measure of success alone. Yet it is important to keep in mind the overall goal of a policy. In the case of Denmark, for example, it would be fair to conclude that there is a general concern about the effects of the use of pesticides and the effects of nitrogen leaching. Observing the policy initiatives taken within the past two decades reveals these concerns.[3] Other concerns have also been voiced: animal welfare, biodiversity, healthy and safe food etc. Clearly, less or no use of pesticides is good for the environment to the extent the environment is being harmed by present practices, and since pesticides are not used in organic farming at all, it is clear that organic farmers do not harm the environment by this one indicator.

It is not entirely clear, however, that organic farmers do better on animal welfare (Kristensen and Thamsborg, 2000). Nor has it been proved that organic food is healthier than conventional food (Jensen *et al.*, 2001). There also lacks a discussion on whether in fact there is a biodiversity problem in relation to organic and conventional farming and, furthermore, it is not clear-cut that organic farmers do better on this front either. Comparing conventional and organic farming shows an increase in the number of earthworms and springtails but also a decrease in the number of skylarks (Langer *et al.*, 2002).

It is clear that organic farming changes the biodiversity on the arable land, but it is not clear from practical policy work that this is necessarily a change for the better from the point of view of society at large, or that organic farming is the best way to achieve a certain amount of biodiversity. In fact the Wilhjelm Committee[4] (2001) concluded:

> *Denmark is one of the European countries with the fewest natural areas in relation to total land area.*

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2. A governmental committee commissioned to analyse pesticide use in Denmark used both reports. (The Bichel Committee, 1999).

3. The Danish Aquatic Programme 1 and 2 implemented in 1987 and 1998 (see Jacobsen, 2002). Taxes on pesticides (13-27%) were introduced in 1996 and increased by approximately 100% in 1998.

4. The Danish government in March 2000 appointed the Wilhjelm Committee. The task of the Committee was to prepare a report as a basis for a government action plan on biodiversity and nature conservation.

Furthermore,

> *The quality of Denmark's nature and biodiversity has never been so poor. This is due to the fact that natural habitats are too constricted, contain too many nutrients and too little water, and that natural areas are fragmented and overgrown. Furthermore, the poor quality is also caused by the inability of nature and natural habitats to cope with both contemporary intensive farming, and the widespread decline of extensive farming.*

Consequently, the Wilhjelm Committee suggested the following measures: enhancement of nature management, securing natural forest, consideration of nature in grant schemes, establishment of buffer zones around vulnerable nature, establishment of national natural areas, more nature around watercourses, and nature monitoring and quality planning. That is, the Wilhjelm Committee suggest that improved biodiversity is mostly achieved through increases in and protection of existing natural areas. In this light the relation between conventional and organic farming on arable land play a minor role although the Committee also notes that the committee supports the continuation of initiatives to promote organic farming within the market framework.

The scenario is calculated using Danish Research Institute of Food Economics' Agricultural Applied General Equilibrium model (AAGE) of the Danish economy. The advantage of using the AAGE approach is that this modelling framework covers the interdependencies between the individual industries, interaction between industries and consumers and between domestic and foreign agents. The model thus covers the whole Danish economy and is characterised by a requirement that there should be equilibrium in all markets. The model therefore calculates long run results of a given policy scenario.

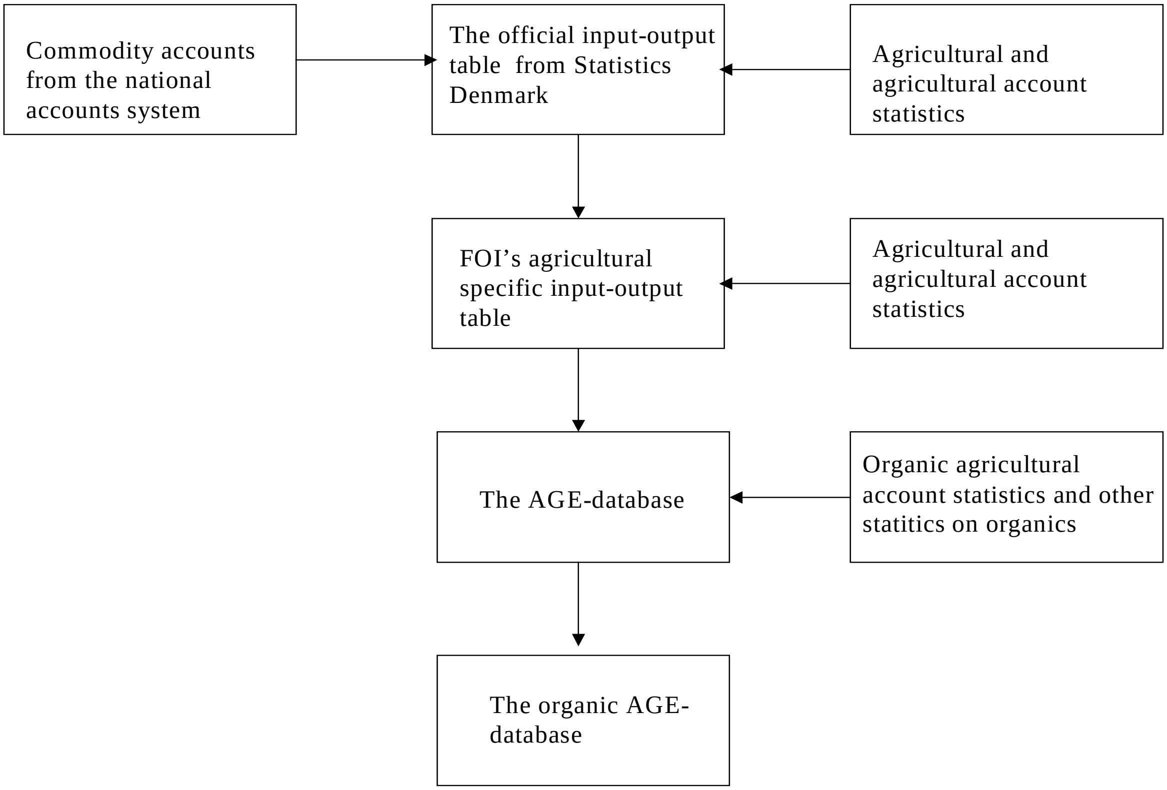
The next section describes the construction of the database that is used in the AAGE-model and is followed by a description of the AAGE-model. The scenarios are then described and the results analysed. The paper finishes with some conclusions.

Construction of the input-output data

Analysing organic farming in an AAGE modelling framework requires a database that explicitly describes the production structures of each organic sector as well as the distribution of organic products for intermediate and final use. The Danish Research Institute of Food Economics has produced agricultural specific input-output tables for the Danish economy for many years. In order to analyse the development of organic farming extensions of this work have been undertaken, resulting in a detailed description of organic farming as well as the processing of the primary products. The process of expanding the original database is illustrated in Figure 1.

Starting from the top, the first two levels illustrate the construction of the standard AAGE-database without the specific description of organic production. Initially the agricultural specific input-output table of the Danish economy is constructed. Disaggregating those commodity accounts that are used by Statistics Denmark for constructing the agricultural sector in their official input-output table basically does this. This disaggregation is done by extensive use of various agricultural statistics and sector specific farm accounts. The second level illustrates how the agricultural specific input-output table together with agricultural and sector specific farm accounts comprises the basis for construction of the AAGE-database. This work involves the disaggregation of farm income into components related to the rental of capital, the return to land and the farmer's own labour input. Moreover, some additional adjustments and aggregations to the sector specification of the AAGE-model are performed.

Figure 1. Constructing the organic AAGE-database



The third level in Figure 1 shows that the organic AAGE-database is constructed from the existing database. A main part of this work is the calculation of organic mark-ups that represent as percentage changes the change in input use of producing one unit of organic production compared to one unit of conventional production. The continued expansion of the organic production and improvement in the collection of primary statistics to cover organic production (the commodity accounts) will determine whether these calculations will move up to the top level of this data construction process.

The general AAGE-database describes the Danish economy using an industry and commodity aggregation with 50 industries and 56 commodities of which 10 industries and 12 commodities related to the primary agriculture. In the organic version, the database is expanded with similar organic sectors and commodities (excluding fur farming) thus leading to 19 primary industries and 23 commodities. Moreover, a number of processing industries are also disaggregated into organic and conventional sectors, resulting in a total of 18 organic industries and 20 organic commodities. The final database thus covers 68 industries and 76 commodities.

The organic mark-ups used in the third level for selected industries shown in Table 1. In the vegetable sectors, for example, production takes place without the use of chemical, fertiliser or pesticides (-100%). Instead these sectors generally use more of other inputs compared to conventional production (positive percentage changes). For organic cereal production, for example, demand contract operations is 2.5 times higher than for conventional production, potato production demands twice as much, while the production of roughage requires just 32% more contract operations compared to conventional production.

The table also reveals large variation in the demand for land. Organic cereal production needs 61% more land to produce one unit compared to conventional production while the production of organic roughage needs 25% more land than its conventional counterpart.

The last two columns in Table 1 show the changes in demand for inputs in the organic cattle and pig sectors. Generally, the organic pig sector needs more inputs compared to conventional pig production, although the input of electricity and other energy is 45% lower in organic production. Compared to organic pig production, the organic cattle producers generally show moderate percentage changes in their input demand per unit produced compared to conventional cattle production.

Table 1. Organic mark-ups for selected industries
(%)

	Cereal	Potatoes	Roughage	Cattle	Pigs
Seeds for sowing/Roughage	115.0	311.0	15.0	6.1	
Concentrates				-13.0	56.0
Manure	8.5	120.0	-16.4		
Chemicals and fertiliser	-100.0	-100.0	-100.0		
Pesticides	-100.0	-100.0	-100.0		
Intermediates	165.0	351.0	55.0	11.0	71.0
Contracts operations	242.0	215.0	32.0	-3.0	72.0
Fuel	57.0	145.0	-9.0	4.0	58.0
Electricity and other energy	120.0	153.0	41.0	14.0	-45.0
Equipment	84.0	126.0	18.0	19.0	62.0
Automobile cost	223.0	343.0	73.0	42.0	135.0
Construction	116.0	150.0	60.0	40.0	211.1
Service	108.5	261.1	37.5	9.6	66.7
Capital	78.7	165.2	24.5	9.2	10.2
Labour	84.0	152.0	-11.0	2.0	93.0
Land	60.5	81.8	25.4		
Unit cost	68.3	132.6	3.8	9.4	63.0

At the bottom of the table all the percentage changes are weighted together yielding the percentage change in unit cost. This reveals that the cost of producing one unit of organic cereal is 68% higher than cost of producing one unit of the conventional product. In potato production the unit cost is 133% higher, while the two tightly connected roughage and cattle sectors show moderate increases in unit costs compared to their conventional counterparts. In other words organic production is generally more resource demanding than conventional production, and thereby leading to relatively higher output prices.

The AAGE-model

There are five types of agents in the AAGE-model: industries, capital creators, households, governments, and foreigners. The current database of the model identifies 68 industries producing 76 commodities (Appendix 1). For each industry there is an associated capital creator, each producing capital specific to the associated industry. There is a single representative household and a single government sector. Finally, there are foreigners, whose behaviour is summarised by export demand curves for Danish products, and by supply curves for imports.

The nature of markets and prices

AAGE determines supplies and demands of commodities through optimising behaviour of agents in competitive markets. Optimising behaviour also determines industry demands for labour and capital. The assumption of competitive markets implies equality between the producer's price and the marginal cost in each industry. Demand is assumed to equal supply in all markets other than the labour market (where excess supply conditions can hold). The government intervenes in markets by imposing sales taxes on commodities. This places wedges between the prices paid by purchasers and prices received by the producers. The model recognises margin commodities (*e.g.* retail trade and freight) that are required for each market transaction (the movement of a commodity from the producer to the purchaser). The costs of the margins are included in purchasers' prices.

Demands for inputs to be used in the production of commodities

AAGE recognises two broad categories of inputs: intermediate inputs and primary factors. Firms in each industry are assumed to choose the mix of inputs, which minimises the costs of production for their level of output. They are constrained in their choice of inputs by nested production technologies (Appendix 2). For the land-using industries (Appendix 1), AAGE specifies nested substitutions between: capital, labour, energy and herbicides (CLEH); land, fertiliser and insecticides (LFI); CLEH and LFI (CLEHLFI); and CLEHLFI and an aggregate of remaining intermediate inputs. For non-land using industries substitution is allowed between capital, labour and energy (CLE) and between CLE and aggregate non-energy intermediate inputs.

Household demands

The representative household buys bundles of goods to maximise a utility function subject to a household expenditure constraint. The bundles are combinations of imported and domestic goods.

Demands for inputs to capital creation and the determination of investment

Capital creators for each industry combine inputs to form units of capital. In choosing these inputs, they cost minimise subject to technologies similar to that used for current production; the only difference being that they do not use primary factors. The use of primary factors in capital creation is recognised through inputs of the construction commodity.

Government's demands for commodities

The government demands commodities. In AAGE, there are several ways of handling these demands, including: a) endogenously, by a rule such as moving government expenditures with household consumption expenditure or with domestic absorption; b) endogenously, as an instrument which varies to accommodate an exogenously determined target such as a required level of government deficit; and c) exogenously. In the computation in this paper government demand changes follow household consumption expenditures.

Foreign demand (international exports)

Two categories of exports are defined: traditional, which are the main exported commodities, and non-traditional. Traditional export commodities face individual downward-sloping foreign demand schedules. The commodity composition of aggregate non-traditional exports is treated as a Leontief aggregate. Total demand is related to the average price via a single downward-sloping foreign demand schedule. Contrary to many conventional agricultural products all organic products are assumed to be traditional export commodities.

Demand for foreign imports

For all industries, AAGE includes the standard Armington specification for imported and domestically produced inputs. This assumes that users of a given commodity regard the domestic and the imported varieties of this commodity as imperfect substitutes. The Armington assumption is also used in input demands for industry investment and in household demands for consumption.

Computing solutions for AAGE

AAGE is a system of non-linear equations. It is solved using GEMPACK, a suite of programs for implementing and solving economic models. A linear, differential version of the AAGE equation system is specified in syntax similar to ordinary algebra. GEMPACK then solves the system of non-linear equations as an Initial Value problem, using a standard method, such as Euler or midpoint. For details of the algorithms available in GEMPACK, see Harrison and Pearson (1996).

Scenarios

A baseline is constructed to introduce all ongoing policy developments and known shocks to the economy so as to ensure that the policy shocks are undertaken in an economy where all known developments and shocks are accounted for.

We introduce four alternative scenarios. First, the preference scenario is introduced, where domestic and foreign consumers of Danish products change their preferences in favour of organic products. The preference scenario is then compared with three policy scenarios in the absence of the assumed consumer preference change.

The first two policy experiments (Sub-A and Sub-B) use subsidies to agricultural land in the organic sectors to induce a movement of land into organic production to achieve a positive environmental effect. The first policy experiment (Sub-A) is designed so as to achieve the same share of organic land as obtained in the preference scenario. This does not automatically result in the same reduction in the use of harmful inputs. Therefore, the second policy experiment (Sub-B) uses such subsidies to achieve the same effects on the environmental indicators as obtained in the preference scenario.

The third policy experiment (tax) imposes environmental taxes on fertiliser and pesticide use to achieve the same effects on the environmental indicators as in the preference scenario and Sub-B. The idea is to compare two different policy instruments, namely subsidies to land and input taxes that achieve the same effect on the use of environmentally harmful inputs (fertilisers and pesticides). The policy implication would be to choose the policy that achieves the same goal at the lowest cost to society.

Expected results from the analysis

The introduced subsidies lower the cost of using land in the organic sectors (the purchasers' price of land is reduced), thereby yielding pure profit in the organic sector and hence stimulating entry to organic production. This leads to an increase in the demand for land, with an upward pressure on the basic price of land as a result. The subsidy also changes the relative price of land thus leading to a substitution effect resulting in an extensification of organic production. In other words, more land and less capital and labour is used per produced unit. Subsidies are thus expected to increase the production of organic products but are also expected to lead to an extensification of organic production. The exact extent of these two effects depends on how demand for organic products is affected.

The environmental taxes imposed on the use of fertilisers and pesticides increases the unit cost of production. Substituting taxed inputs with other inputs can moderate this increase in unit cost. The substitution elasticity controls the extent to which this can be done. A higher unit cost requires a higher product price if profits are to remain unchanged. Yet a higher product price tends to lower demand. A decline in production releases resources to be used in other sectors of the economy and tends to lower the prices and required rental of these resources because of the increase in supply. Since the taxes are levied on conventional land- using sectors and land is only used in the agricultural sectors (whereas labour, capital and other inputs are also used in the rest of the economy), land is expected to bear the greatest burden of the levied taxes in the form of lower returns to land. Relative lower returns to land will also results in a substitution effect where the land-using sectors will substitute other inputs, especially capital and labour, for land.

Results

This section presents selected results of the calculated scenarios, including the effects on production, exports, consumption, land and labour use and the environmental indicators and concludes by presenting the macroeconomic impacts. The presentation focuses on the results for the primary agricultural and associated processing sectors. Since the main issue addressed is the comparison of the results from applying the two different policy instruments this will be the focus of the analysis.[5]

Production and organic land

In the baseline aggregate organic production in the primary agricultural sector increases annually by an average of 5%. This results in 5% of total land being used for organic production (Figure 2) and almost 6% of the total production volume arising from organic production.

Figure 2 also shows that the assumed changes in preference scenario have significant effects on both the organic share of land (8.7%) and its share of the total agricultural production volume (10.7%). Aggregate organic production increases by 84.4% whereas conventional production falls by 4.7% (Appendix 3). The last three scenarios are to be compared with the preference scenario: since scenario Sub-A results in the same share of land allocated to organic production whereas scenarios Sub-B and tax result in the same reduction in the use of nitrogen and pesticides.

The land subsidies lower the purchaser’s price of land, thereby lowering the unit price of organic products and stimulating demand. Lower land prices also stimulate a substitution of all other inputs in favour of land thus leading to an extensification of organic production. Comparing with the preference scenario it is clear that it is the land substitution effect that dominates in Sub-A and Sub-B. In scenarios Sub-A and Sub-B, the share of land is higher than or equal to the land shares in the preference scenario, whereas the increase in production is much smaller [organic production increases

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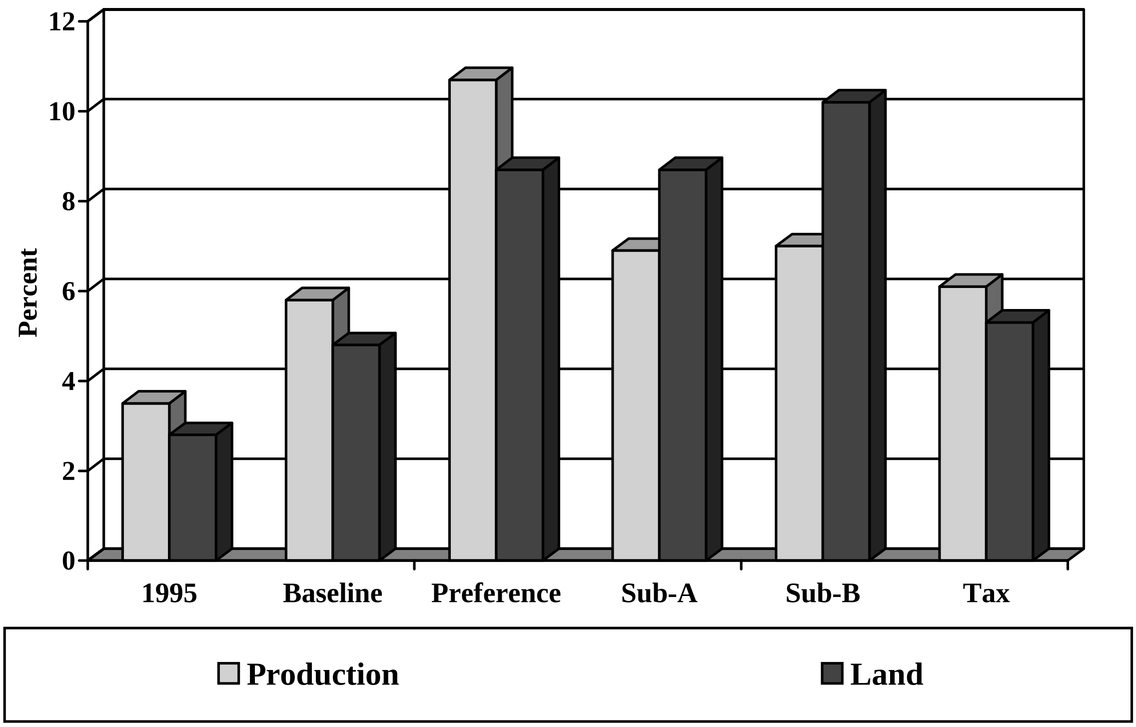
5. A more thorough presentation of the *baseline* and the *preference* scenario can be found in Jacobsen (2001).

by 17% (Sub-A) and 18% (Sub-B) compared to 84 in the preference scenario, see Table A3.2 in Appendix 3].

In the last scenario (tax), environmental taxes are imposed on inputs used only in the conventional sector in a magnitude that insures the same aggregate effect on the input of nitrogen and pesticides as in the preference scenario and Sub-B (Figures 5 and 6).

Figure 2. The organic sector's share of the total agricultural production volume and land usage



Note: Details can be found in Table A3.1 in Appendix 3.

In the preference scenario it is the movement of land into organic production that achieves the aggregate reduction in the use of nitrogen and pesticides. In fact, conventional farmers use these chemicals more intensively in this scenario due to a substitution effect generated by a slight increase in land prices. The taxes achieve the same effects on the environmental indicators without the same increase in organic sector's share of total land and production. The reason is straightforward: the environmental taxes generate a substitution effect in the conventional agricultural sector. Since conventional farming is still the largest sector only small changes in the behaviour of conventional farmers are required to achieve the same overall reduction in the environmental indicators that was the result of the preference scenario.

Organic consumption and exports

The representative household determines its composition of total consumption to maximise a given utility function. In the top nest, the consumer system determines the composition of a number of aggregate goods by a Stone-Geary linear expenditure system. The expenditure system identifies four broad food commodities; Bread and flour, Meat, Dairy and Other.[6] Beneath this nest, a CES function determines the composition of organic and conventional products using econometrically estimated elasticities.[7] At the bottom of the nesting structure, a CES function controls the domestic and foreign composition of all commodities. In the CES nest between conventional and organic products a "twist" variable is built in to allow for cost-neutral changes in the composition of organic and conventional consumption.

Consumption decisions are influenced by changes in income and relative prices, but in both the baseline and the preference scenario, the exogenous twist variable also plays an important role. It is this variable that is shocked and the results show that most of the changes in organic consumption directly reflect the shock to the twist variable.

Changed relative prices also affect the consumption decision of the consumer, but the resulting consumption shares of organic products are in both the baseline and in the preference scenario mostly explained by the assumed changes in preferences, *i.e.* the exogenous shock to the twist variable explained above. In the preference scenario, the consumption of organic dairy products amounts to 27% of total consumption in this category while for the other three categories, organic consumption amounts to around 15%. At the aggregate level, organic food consumption amounts to 17% of the total in this preference scenario (Table A3.3 in Appendix 3).

When compared to the baseline results (Figure 3), it is apparent that the consumption decisions are not markedly influenced by the introduction of the subsidies and taxes in the last three scenarios. As explained earlier, changes in consumption are explained primarily by income changes and consumers' responsiveness to changes in relative prices. In the last three scenarios only moderate effects are seen compared with the baseline results even though all three experiments change the price structure in favour of organic products and higher elasticities in the demand for organic products.[8] The reason is that the large price effect is seen most directly on the primary product. When the products have been processed, the price effect is smaller due to the fact that the primary product only accounts for a fraction of total costs in the processing industries.

In the baseline, the share of organic exports is calculated to increase from practically zero in the initial situation to somewhere around 1-6% (Figure 4). In the preference scenario there is an assumed change in foreigners' demand curves in favour of organic products at the given prices. Meat exports declines even though the demand curve is shifted. This is a result of the increased domestic demand pressuring prices upwards, thereby resulting in lower export demand. In other words, the price effect dominates the shift in the export demand schedule. As with the domestic consumption, only moderate effects are seen in the last three scenarios and for the same reasons. For dairy products, stronger effects are seen due to an assumed higher elasticity in the export demand function.

Results for both domestic consumption and exports show that both land subsidies and the environmental taxes affect demand. Yet, keeping in mind that either land use or the effect on the environmental indicators is the same as in the preference scenario (depending on which scenario we are examining), it is evident that these policy instruments can affect land use and input choices, but they do relatively little to overall demand and production.

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6. Mostly vegetables.

7. Wier and Smed (2000).

8. The cross-price elasticity between conventional and organic products varies between 1.5 and 2.2 in the four consumption groups.

Figure 3. Organic consumption shares, volume index

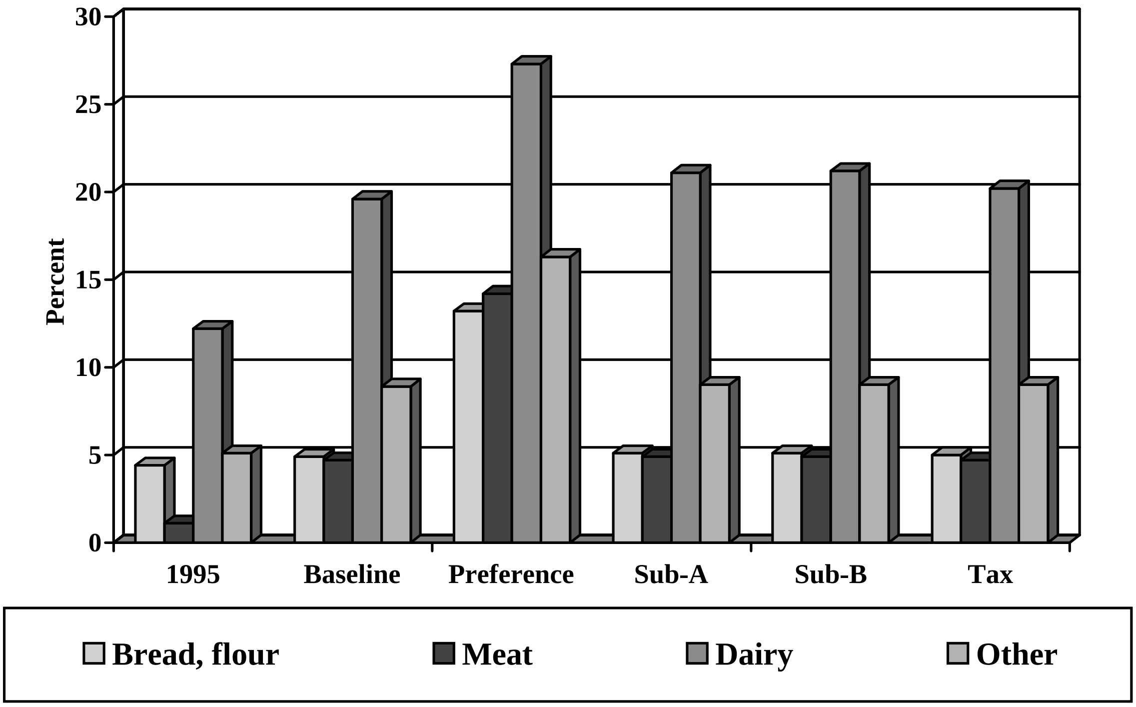
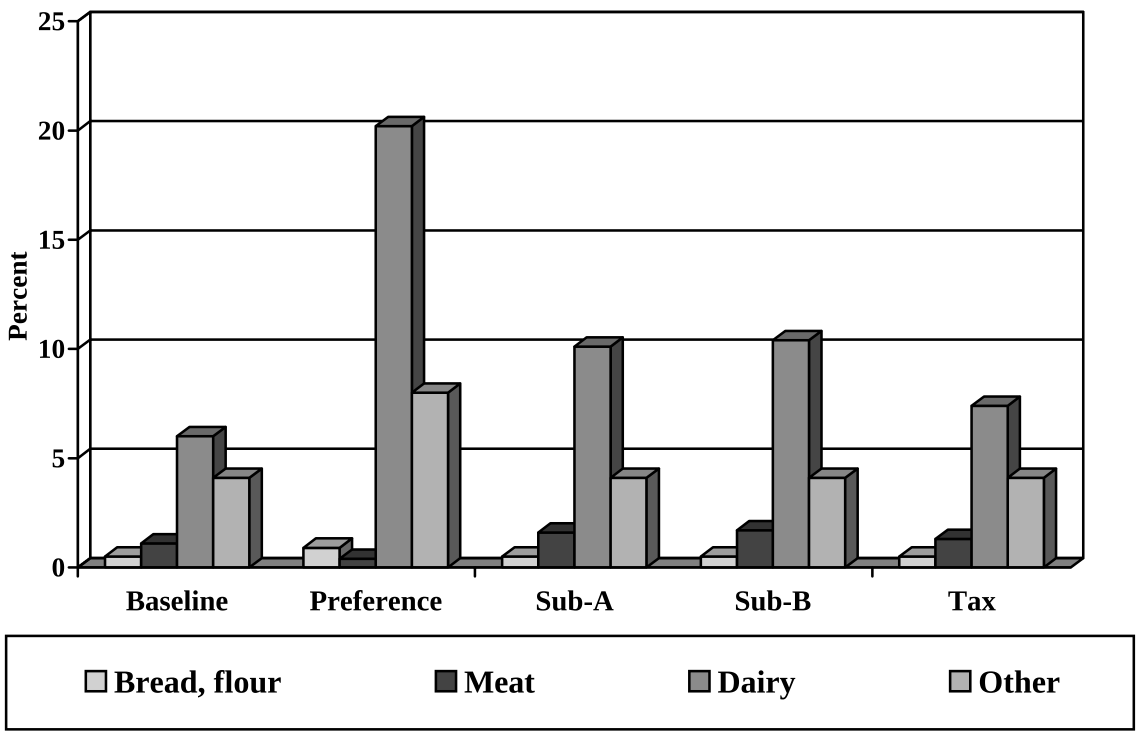


Figure 4. Organic export shares, volume index



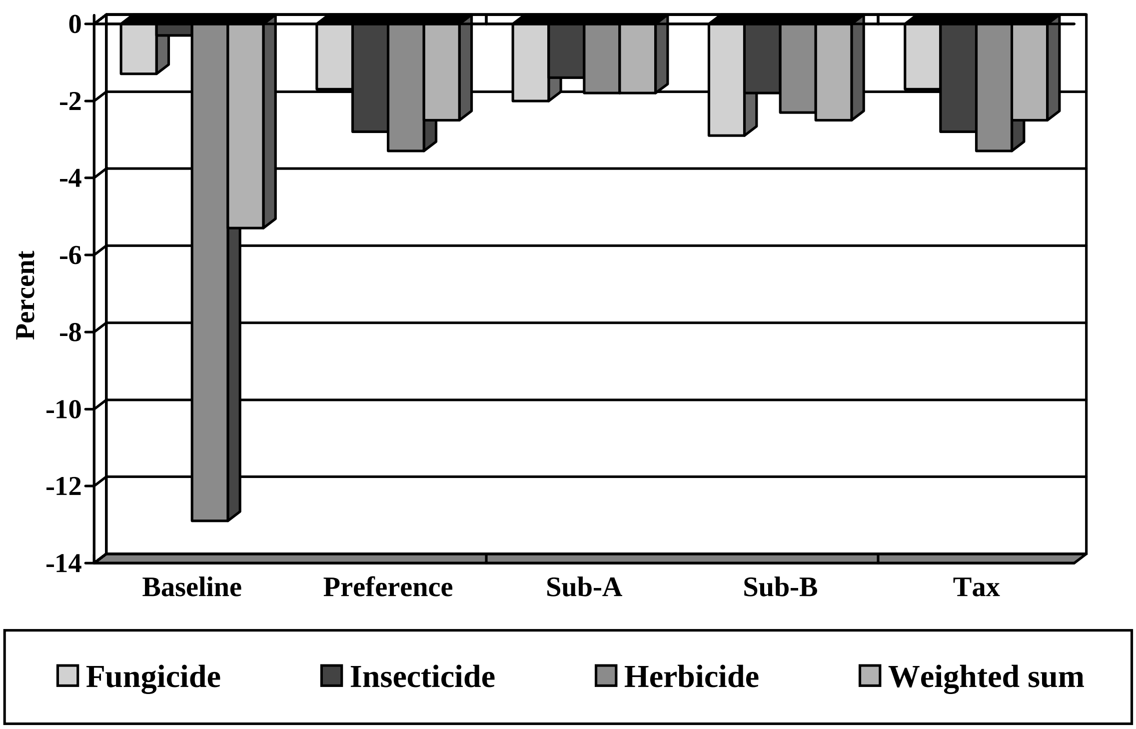
Note: Bread, flour is an aggregate of 8 commodities: meat and other is an aggregate of 6 and 3 commodities.

Environmental indicators

The baseline shows a decrease in the use of pesticides (Figure 5) because of an increase in the taxes on pesticides during the base case period. The use of nitrogen, on the other hand, increases during the baseline. This is mainly due to increased production of manure (pig production increases by more than 30%). In the preference scenario, the movement of land into organic production results in decreases in the use of both pesticides and nitrogen.

Introducing subsidies to organic land that ensure the same organic area as in the preference scenario is not enough to achieve the same reduction in the use of pesticides (Sub-A). As Figure 5 shows, the decrease is less than 2% measured by the weighted sum. The reason is that the use of land in conventional production changes to a more pesticide intensive allocation than was the case in the preference scenario. In scenario Sub-B these subsidies to organic land are increased to attract more land, thereby resulting in the same reduction in the weighted sum of pesticides as in the preference scenario.[9] In the tax scenario, taxes are introduced to exactly match the reduction in the preference scenario. Total pesticide use falls by 2.5% in this scenario.

Figure 5. Changes in the use of pesticides

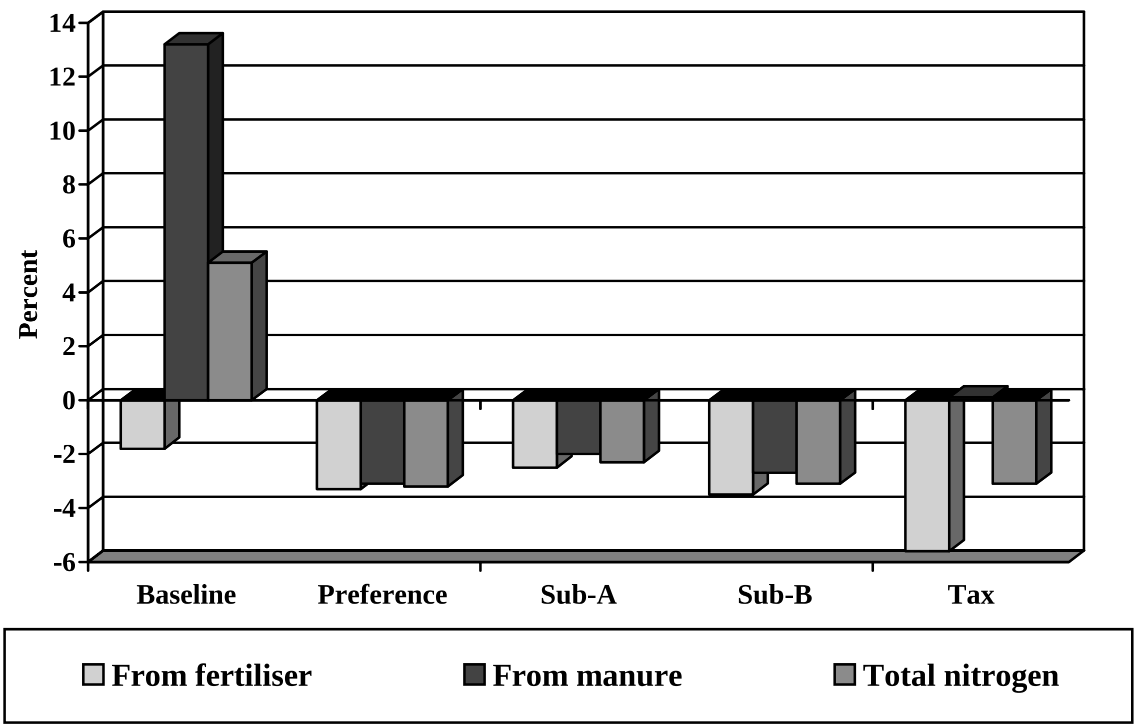


As with pesticides, introducing subsidies to organic land (Sub-A) that insure the same organic area as in the preference scenario, is not enough to achieve the same reduction in the use of nitrogen. The decrease is slightly more than 2% (Figure 6). The reason is that the allocation of land in conventional production changes to a situation where more fertiliser is used than was the case in the preference scenario. In scenario Sub-B, these subsidies to organic land are increased to attract more

9. The weighted sum is used since there is only one policy variable to alter (the subsidy to land).

land, thereby resulting in the same reduction in the use of nitrogen. In the tax scenario environmental taxes are introduced that result in the same reduction in the total use of nitrogen whereas the composition is quite different. In the tax scenario the total change is a result of a decrease in the use of fertilisers. In fact, there is a small increase in the use of manure due to a slight increase in the animal production.[10]

Figure 6. Changes in the use of nitrogen



Employment

In the baseline, the total number of full time workers in primary agriculture falls by almost 13 000 persons (Table 2). This is mainly due to structural development and increases in labour productivity. In the preference scenario, the demand shift from conventional to organic commodities is also reflected in the employment result. The total number employed in the conventional sectors thus falls by 3 211 persons while employment in the organic sectors increases by 3 100 full-time employees. Thus net employment in the primary agricultural sectors falls by just 111 persons.

Both subsidy scenarios work in the same way, with the strongest effects being in Sub-B. Employment in the conventional sectors falls by almost 1 200 persons in this scenario while 600 more persons are employed in the primary organic sectors. In the tax scenario, the effects are more moderate, with 163 persons leaving the conventional sectors and 179 entering the primary organic sectors.

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10. The reason is that there is an increased demand from slaughterhouses (pigs) due to a fall in their unit cost. The scenario results in lower returns to capital and labour and this fall dominates the increase in pig price.

In the two subsidy scenarios it is mainly the movement of land that explains the results. Land moves out of conventional production resulting in less production and less use of labour. The released land moves into organic production, but since demand does not follow the inflow of land, this results in an extensification effect in organic production: all other inputs are to some extent substituted by land in the organic production.

In the tax scenario, the taxes result in both lower conventional production and thereby also less demand for inputs of land, labour and capital, but also in a substitution effect where taxed inputs are substituted with other inputs (especially labour). The result is a more labour-intensive conventional production. For organic producers, the tax scenario first of all results in lower land prices, pressuring the unit prices to decline and thus stimulating demand and production. Yet the lower land prices also result in a minor substitution effect between land and other inputs. As can be seen from Table 2, the tax scenario results in a minor net increase in the use of labour in the primary agricultural sector.

Table 2. Employment, number of full-time persons

			Deviation from Baseline			
	1995	**Baseline**	**Preference**	**Sub-A**	**Sub-B**	**Tax**
Primary, conventional	84 978	71 521	-3 211	-961	-1 198	-163
Primary, organic	2 837	3 608	3 100	547	600	179
Total primary agriculture	*87 815*	*75 130*	*-111*	*-414*	*-599*	*16*
Processing, conventional	33 197	25 815	-1 281	-640	-865	-12
Processing, organic	582	819	803	171	186	59
Total	121 594	101 764	-589	-883	-1 278	63

Macroeconomic consequences

The macroeconomic consequences of all four preference and policy scenarios are small (Table 3). The effect on real GDP varies between a fall of 0.01% and 0.08%, *i.e.* the consequences for the economy as a whole are small. But the magnitude of change in the different scenarios does reveal that there are differences in the relative cost to society.

In the preference scenario, real GDP and consumption fall by 0.07% and 0.14% respectively, but these declines cannot be interpreted as a situation in which society is worse off since they are a result of changed consumer preferences. If consumers change their preferences in favour of a product that is produced at a higher cost, (thus lowering the total real consumption potential) it must be because they are better off by this choice. In other words, the new consumption bundle yields a higher utility to the consumer.

At first sight, it seems somewhat contradictory that the aggregate capital stock decreases (0.04%) while aggregate investments increases (0.04%). This is nevertheless an effect of assumed fixed investment/capital ratios in each industry and the fact that a decline capital stocks in industries with relatively low investment/capital rates weigh more in the total result than increasing capital stocks in industries with relatively large investment/capital ratios.

The three other scenarios, on the other hand, are a result of policy intervention, and the results must be interpreted as costs to society. If these scenarios result in the same effects on the policy objective, these figures may also guide us to the most cost-effective policy of those analysed. Finally, a policy instrument should only be used if the benefit to society is higher than the cost. In this context it should be noted that all potential benefits are not a part of this analysis.

Comparing the two subsidy scenarios (Sub-A and Sub-B), it is clear that the cost in terms of real GDP is higher the more land is shifted into organic production. The reason for this is of course that more land is being used in a less productive sector, thus lowering the total production possibility of the economy. Lower productivity results in lower returns to capital and labour and thus also lower income and lower consumption possibilities. For the agricultural sector as a whole though, the subsidies increase the returns to land resulting in increase land price of (9.6% and 14.1%).

The tax scenario results in exactly the same reduction in the total use of pesticides and nitrogen as subsidy scenario B (Sub-B) but at a lower cost. In terms of GDP, the cost of the tax scenario amounts to 0.01% of GDP. Achieving the same reduction in nitrogen and pesticide use by using subsidies (Sub-B) costs almost seven times more.

Table 3. Macroeconomic consequences

	1995-Level	Preference		Sub-A		Sub-B		Tax	
	Billion DKK	Million DKK	Percent	Million DKK	Percent	Million DKK	Percent	Million DKK	Percent
Real GDP	1037.7	-728	-0.07	-617	-0.06	-859	-0.08	-128	-0.01
Real private consumption	511.1	-740	-0.14	-392	-0.08	-557	-0.11	40	0.01
Real public consumption	260.3	-360	-0.14	-190	-0.08	-271	-0.11	19	0.01
Real investments	189.3	82	0.04	-190	-0.10	-272	-0.15	-17	-0.01
Real stocks	39.3	0	0.00	0	0.00	0	0.00	0	0.00
Real exports	296.0	320	0.11	171	0.06	194	0.06	-159	-0.05
Real imports	258.3	-22	-0.01	-7	0.00	-96	-0.04	45	0.02
Real capital stock			-0.04		-0.09		-0.13		-0.01
GDP deflator			-0.13		-0.14		-0.18		-0.03
Consumer price index			-0.08		-0.09		-0.13		-0.01
Price of investment goods			-0.12		-0.16		-0.22		-0.05
Terms of Trade			-0.06		0.01		0.01		0.02
Nominal wage rate			-0.25		-0.33		-0.44		-0.11
Price of agricultural land			0.34		9.55		14.07		-17.75

The reason for this difference is that in the tax scenario the majority of farmers (namely the conventional) face the imposed environmental tax and they only reduce their use of the taxed input by approximately 3%. These first units of input are relatively easily substituted with other inputs, and total production is only affected slightly. Society can thus achieve the same overall reduction in the use of pesticides and nitrogen by using two different policy instruments. Imposing environmental taxes that affect the majority of farmers turns out to be the most cost-effective instrument.

There is a small increase in real consumption in the tax scenario. This is not a generic result of taxing pesticides and fertilisers. Real consumption increases because the income loss in this scenario is so small that the falling consumer prices allow for this small increase in real consumption. If the scenario was specified with higher taxes or taxes that applied to a larger part of the economy, the income loss would dominate and result in a fall in real consumption. Real public spending also increases. This is a result of the model closure where the percentage change in real public spending is set equal to the change real private consumption.

Concluding remarks

This paper analyses the economy wide implication of two different policy instruments targeted at reducing the overall use of pesticides and fertiliser. The analysis shows that in absence of consumer preference changes, subsidies (Sub-A and B) can be used effectively to change the relative profitability between organic and conventional production, thereby resulting in a shift of land into organic production of the same magnitude as that resulting from changed consumer preferences. Although the aggregate land use is the same, the increase in production is almost five times higher in the preference scenario compared with the Sub-B scenario. The results also show that subsidising the organic sectors leads to a situation in which the conventional sectors use pesticides and fertilisers more intensively.

The implications for land prices are also different in the two scenarios. While the land subsidies result in land price increases and thus higher returns to landowners, the tax scenario results in lower prices of land.

Even though the macroeconomic consequences of the analysed scenarios are small, the relative magnitudes are clear. In terms of real GDP, the cost of reducing the aggregate use of fertilisers and pesticides is seven times higher when using subsidies to organic farming compared to taxing the use of these inputs. If society is concerned about the overall use of environmentally harmful inputs these inputs should be taxed or regulated in a similar way. The size of the organic sector should be determined by the consumers' willingness to pay.

Cost analysis such as the one presented could be compared with expected economy-wide benefits of the introduced policies. These benefits have not been a part of this analysis and only if the benefits are calculated or assumed to exceed the cost should such policies be introduced.

Naturally, the results found should be evaluated in light of the assumptions applied. Compared with other more partial economic analysis the present analyses takes into account the economic linkages between the individual agricultural sectors and between the agricultural sectors and the industrial sectors, consumer preference or willingness to pay. Furthermore, the analysis has taken into account the derived cost and price effects and the implications of explicitly representing the overall macroeconomic budgetary restrictions. The simulations have also been undertaken with a national AAGE-model assuming unilateral Danish policy initiatives.

Appendix 1.

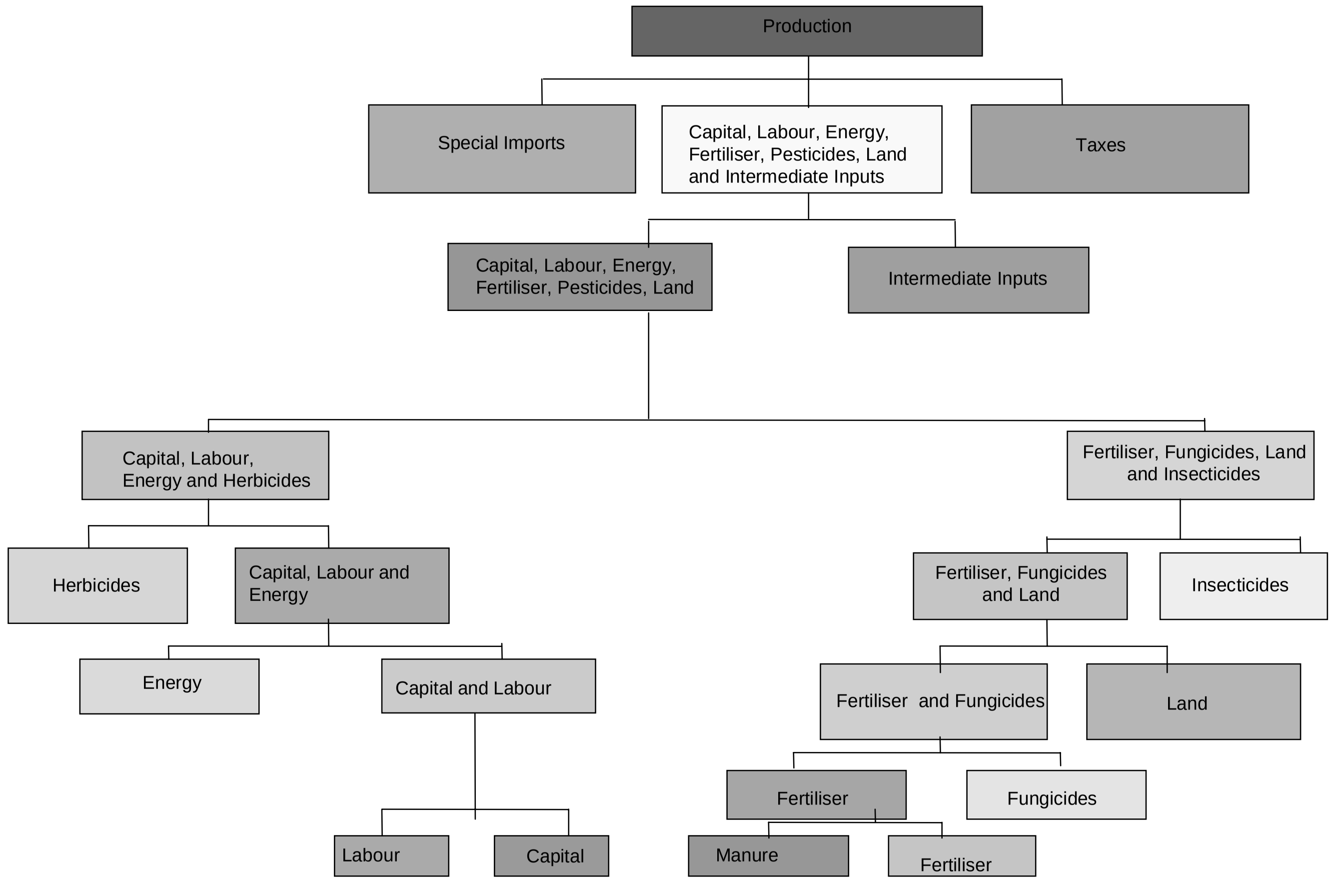
Table A1. Industries and commodities in organic-AAGE

		Industries			Commodities
*#	1-2	Cereal	*	1-2	Cereal
*#	3-4	Oil seeds	*	3-4	Oil seeds
*#	5-6	Potatoes	*	5-6	Potatoes
*#	7-8	Sugarbeet	*	7-8	Sugarbeet
*#	9-10	Roughage	*	9-10	Roughage
*	11-12	Meat cattle and milk producers	*	11-12	Meat cattle
*	13-14	Pigs	*	13-14	Milk
*	15-16	Poultry	*	15-16	Pigs
	17	Hunting and fur farming, etc.	*	17-18	Poultry
*#	18-19	Horticulture		19	Hunting and fur farming, etc.
	20	Agricultural services, etc.	*	20-21	Horticulture
	21	Forestry		22	Agricultural services, etc.
	22	Fishing		23	Forestry
	23	Extraction of coal, oil and gas		24	Fishing
*	24-25	Cattle-meat products		25	Extraction of coal, oil and gas
*	26-27	Pig-meat products	*	26-27	Cattle-meat products
*	28-29	Poultry-meat products	*	28-29	Pig-meat products
	30	Fish products	*	30-31	Poultry-meat products
*	31-32	Processed fruit and vegetables		32	Fish products
	33	Processed oils and fats	*	23-34	Processed fruit and vegetables
*	34-35	Dairy products		35	Processed oils and fats
*	36-37	Starch, chocolate products, etc.	*	36-37	Dairy products
*	38-39	Bread, grain mill and cakes	*	38-39	Starch, chocolate products, etc.
*	40-41	Bakery shops	*	40-41	Bread, grain mill and cakes
*	42-43	Sugar factories and refineries	*	42-43	Bakery shops
	44	Beverage production	*	44-45	Sugar factories and refineries
	45	Tobacco manufacture	*	46-47	Beverage production
	46	Textile, wearing apparel and leather		48	Tobacco manufacture
	47	Manufactured wood and glass products		49	Textile, wearing apparel and leather
	48	Paper products and publishing		50	Manufactured wood and glass products
	49	Oil refinery products		51	Paper products and publishing
	50	Basic chemicals		52	Oil refinery products
	51	Fertiliser		53	Basic chemicals
	52	Agricultural chemicals nec		54	Fertiliser
	53	Non-metallic building material		55	Agricultural chemicals nec
	54	Metal products		56	Non-metallic building material
	55	Machinery and non-transport equipment		57	Metal products
	56	Transport equipment		58	Machinery and non-transport equipment
	57	Electricity		59	Transport equipment
	58	Gas		60	Electricity
	59	Steam and hot water		61	Gas
	60	Construction		62	Steam and hot water
	61	Motor vehicles service		63	Construction
	62	Wholesale trade		64	Motor vehicles service
	63	Retail trade		65	Wholesale trade
	64	Freight transport		66	Retail trade
	65	Financial and property services		67	Freight transport
	66	Transport and communication services		68	Financial and property services
	67	Public services		69	Transport and communication services
	68	Dwelling ownership		70	Public services
				71	Dwelling ownership
				72	Coal imports
				73	Manure
				74	Fungicide
				75	Insecticides
				76	Herbicide

* Both conventional and organic product/production. # Land using industries.

Appendix 2.

Nesting structure



Appendix 3.

Detailed results tables

Table A3.1. Organic share of land and value of production

	1995	Baseline	Preference	Sub-A	Sub-B	Tax
Production value	3.5	5.0	9.5	5.5	5.6	5.0
Production volumes	3.5	5.8	10.7	6.9	7.0	6.1
Agricultural land	2.8	4.8	8.7	8.7	10.2	5.3

Table A3.2. Changes in production, percentage changes

	Baseline	% per annum	Preferences	Sub-A	Sub-B	Tax
Conventional production	20.6	1.3	-4.7	-2.3	-3.0	-0.4
Organic production	107.1	5.0	84.4	17.1	18.4	5.9
Total	23.6	1.4	-0.2	-1.3	-1.9	-0.1

Table A3.3. Organic consumption shares

	1995	Baseline	Preference	Sub-A	Sub-B	Tax
Bread, flour	4.4	4.9	13.2	5.1	5.1	5.0
Meat	1.1	4.7	14.2	4.9	4.9	4.7
Dairy	12.2	19.6	27.3	21.1	21.2	20.2
Other*	5.1	8.9	16.3	9.0	90	9.0
Total	5.1	8.8	17.0	9.2	9.2	8.9

* Other is mainly vegetables.

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Chapter 9.

Research, Information and Communication

THE ROLE OF RESEARCH, INFORMATION AND COMMUNICATION

Johannes Michelsen[1]

Abstract

Organic agriculture is distinguishes itself from other production systems by values that oppose certain mainstream agricultural practices. These values are in tune with policy instruments that attempt to change citizens' behaviour via communication, i.e. involving citizens' attitudes and social norms. Communication in support of organic agriculture s takes place in the domains of agriculture policy, the farming community and the food market as well as within institutional settings that co-ordinate activities across domains. Available evidence from initial comparative studies in Europe suggest that the distinction between organic and mainstream agriculture institutions is weak within the farming community, but strong within agricultural policy. Public policies based on certification and financial support seem to have had limited impact on organic agriculture development. Finally, it seems that differences in organic agriculture development among European countries are positively related to institutional changes and continuing interrelations across domains and between organic and mainstream agricultural institutions.[2]

Introduction

This paper seeks to outline the scope and need for including research, information and similar communicative measures in public policies that attempt to promote organic farming. It is a prerequisite of the analysis that the promotion of organic farming involves decisions by farmer-owners on the basis of individual viewpoints and the calculation of costs and benefits in terms of money or otherwise. Hence, the general theme is the potential for influencing farmers' decision making by means of policy. This may be analysed from a purely economic point of view where farmers are mainly seen as optimisers of individual preferences and production functions, and where different types of solutions are analysed for their potential impact on displacements of either of these. Wyn Grant, in his analysis of the EU Common Agricultural Policy (CAP), made it clear, however, that agriculture cannot be analysed as an exclusively economic sector (Grant, 1997). Economists fail to understand that agriculture is also a social order that requires sociological understanding and a set of institutional structures that can be approached through the insights of political science.

Grant's assessment is especially true when considering the intersections of organic agriculture as a production system with other agriculture systems, whether characterised as

1. Department of Political Science and Public Management, University of Southern Denmark.

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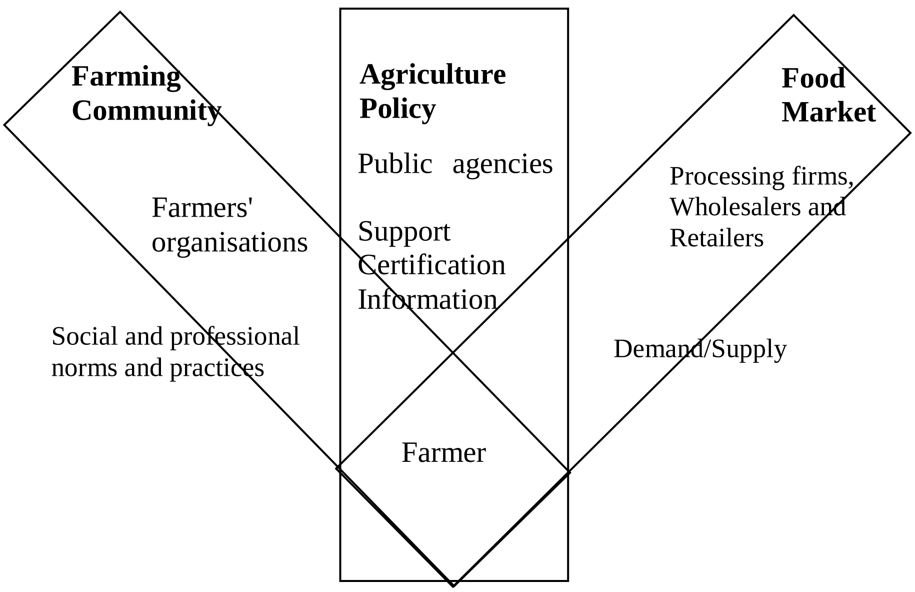
"conventional" (as the organic agriculture movement has obtained as one of its major successes), "integrated" or otherwise. For instance, it emerges from analyses of changes in farmers' propensity to convert to organic agriculture in different national settings, that responses to changes in economic conditions (whether positive or negative) are at best indirect (Michelsen and Soegaard, 2001). It also appears paramount for the understanding and promotion of organic agriculture development to recognise that it has developed as a social movement based on explicit values that counter and criticise some of the main understandings of agriculture (Michelsen, 2001a).

The argument put forward here is that the promotion of organic agriculture requires policy instruments in addition to those based on legal regulation and economic incentives. Other social mechanisms have to be considered and they may involve several types of communication between public administration, farmers and organisations and firms within the field of agriculture and food production/consumption.

Figure 1 is a translation of the broad understanding of organic farming into a model for external influences on farmers. Within the model, farmers' decisions are made within a social context constituted of three domains. The first is the food market composed of different types of firms with which the farmer interrelates on the basis of demand and supply. The second domain is agriculture policy composed of public agencies that regulate farmers' activities either directly or through interplays with organisations. The third domain is the farming community, which includes local as well as professional communities and organisations with which the farmers interrelate in order to obtain knowledge and identity (Michelsen, 2001*a*; Michelsen *et al.*, 2001).

Figure 1. The social context of organic agriculture development



The three domains correspond basically to a model of society constituted of three sectors: the market, the state and civil society. Each sector is based on a distinct type of rationality and may provide the individual farmer with different types of inputs for his/her deliberations regarding the farm; for instance, the option of converting to organic agriculture or developing existing organic production.

The emphasis in this paper is on agriculture policy while taking into account how features of the other two domains could influence the impact of any policy on farmers' decisions and activities

(Figure 1). We will begin with a general discussion of the importance of organic agriculture distinctiveness relative to communication policy instruments that promote organic farming. Secondly, a summary of empirical findings relating to the theoretical considerations on policy instruments is provided. Finally, we conclude with an analysis of how communication instruments may be used to promote organic agriculture development in practice.

Organic agriculture distinctiveness

Organic agriculture is a well-defined agriculture production system. It is constituted of usually detailed production standards. The use of standards is similar to other systems such as integrated agriculture. However, whereas other types of agriculture production methods and systems originate within the agriculture sector itself, notably in research, organic agriculture has strong ties outside the agriculture sector. It has been largely developed "from below" as part of a social movement bringing together people from within and without the agriculture sector and with only marginal interrelations to agriculture research (Michelsen 2001a).

The social movement' origin has major consequences for the use of policy instruments to promote organic farming. The main implication is that organic agriculture standards are developed on the basis of a system of overarching values and ideas about the proper principles for sustainable agriculture. They are included in statements of principles expressed by most organic agriculture movements — and certainly by the IFOAM. The best way to understand the value statements is to realise that they are a reaction to and a critique of certain practices of mainstream agriculture. The critique includes claims about the negative consequences for the environment, animal welfare, human health, etc., of "conventional" practices. Hence, the explicit value orientation makes a very clear distinction between organic and "conventional" agriculture. The values are in turn institutionalised into the detailed production standards and certification systems as well as into organisations that serve the purpose of specifying organic agriculture distinctiveness. The social movement origin thus implies that the institutions of organic agriculture attempt to realise the values of organic agriculture in a world that from the outset was dominated by those values and institutions and organisations, which organic agriculture is meant to oppose. Hence, organic farming may need to address all three domains of the social context to meet the challenges of mainstream agriculture.

One way of illustrating the importance of the value basis for organic agriculture development is to compare it with integrated agriculture. Integrated agriculture has no basis in a social movement but in a scientific concept of environmentally friendly production focusing on savings rather than bans of external substances used in mainstream agriculture. Hence, although integrated agriculture institutions may be needed to manage the three domains of the social context, it seems from the outset possible to meet the challenges on the basis of co-operation with existing agriculture institutions rather than competition.

There are no analyses available that can clarify whether the distinction between organisations of integrated and organic agriculture made here are found empirically. A Danish study suggests, however, that there are clear differences in the level of farmers' compliance to the complex set of rules included in both systems. Both systems are inspected in similar ways by the same public agency. In the case of organic farming, between 0.0 and 0.2% of certified farms were deprived of certification every year between 1995 and 1999, while it was between 5.8 and 24.9% of certified farms in the case of integrated farming for the years 1996 to 1999 (Michelsen, 2001b). These data are combined with an analysis showing that the attitudes of Danish organic farmers are consistent with organic agriculture standards. Similar data are not available for integrated farmers, but a certificate of integrated farming is an obligatory prerequisite if a farmer is to supply distinct markets demanding uniform quality and large quantities. Hence, there were clear instrumental reasons for entering integrated farming, and apparently low exit costs. Part of the case is that neither public authorities nor market actors accepted the claim that products of integrated agriculture were distinguished from ordinary products on the basis of environmental friendliness.

The initial comparison of the two agriculture production systems thus illustrates the relevance of including compatibility of values between farmers and regulation when analysing the working of organic agriculture regulation. As this affects the promotion of organic agriculture as a high value orientation this may imply high barriers to both entrance and exit of farmers to organic agriculture. Finally, the Danish case illustrates that the distinction of a production system from mainstream production needs to be substantial if it is to be accepted within the various domains of the social context.

Communicative policy instruments and organic agriculture promotion

It is common to make an analytical distinction between three main types of policy instruments (Peters and Nispen, 1998). There are broad agreements as to the content of *legal instruments* (regulation) and *financial instruments*. Legal instruments operate through political power/authority and legitimate legal sanctions in the form of licences or prohibitions. Financial instruments operate through economic incentives whether positive in the form of support or negative in the form of taxes and duties. Both types of instruments are well known within the politics of organic agriculture promotion as public definitions or certification of organic agriculture or as financial support paid to farmers during and after conversion periods.

The third category of policy instruments is meant to include more flexible instruments, such as research, information and communication and has no clear labelling. Vedung (1997) suggests "information" indicating a one-way flow of messages from the public agencies to citizens while Dabbert (1997) suggests "moral suasion" and hence opens some space for citizens to consider the personal preferences related to the messages. In their critical assessment of instruments, de Bruijn and Hufen (1998) label the third category "communication instruments", leaving space for a two-way interrelationship between regulator and regulated citizens. It is clear that, irrespective of the label, the effect of these instruments does not rest on clear positive or negative sanctions, but on the persuasiveness of arguments and their compatibility with views and attitudes held by the regulated citizens, and through the working of social norms among members of the community in question.

Historically, organic agriculture developed on the basis of self-regulation through privately agreed standards. This kind of regulation may be included among communication policy instruments. One reason for including this kind of private initiatives in a concept of public policy is that abstention from the enforcement of public policy may be a deliberate political decision. In addition, the working of self-regulation is based on the same rationality of civil society as the above-mentioned communication instruments: social norms, ethics and trust mediated through personal interrelationships. In some cases, social norms (such as a threat of exclusion from a social group like farmers) may have much stronger impacts on citizens' behaviour than the punitive forces associated with either public regulation or failure in the market place.

To sum up, communication policy instruments include instruments that attempt to influence citizens' behaviour on the basis of communication between regulator and regulated citizen. The content of the communication must in some way be oriented towards communicating on the basis of attitudes and social norms that guide action within civil society.

When designing communicative policy instruments it may be worth considering that various levels of value orientation may be susceptible to change to a different extent. For instance, Sabatier (1993) distinguishes between three levels of value orientations among policy élites: a normative core akin to religious conviction and thus very difficult to change; a near policy core, which includes fundamental positions that may be subject to change if positions appear untenable by very clear experience; and secondary aspects that concern implementation of policy core which may be subject to change on the basis of reasoning and discussion. From this may be derived communication policy instruments addressing organic agriculture promotion that should primarily address groups within the farming community with core values that are not too far from those of organic farming and focus on influencing secondary aspects of their views by means of premises, facts and reasoning.

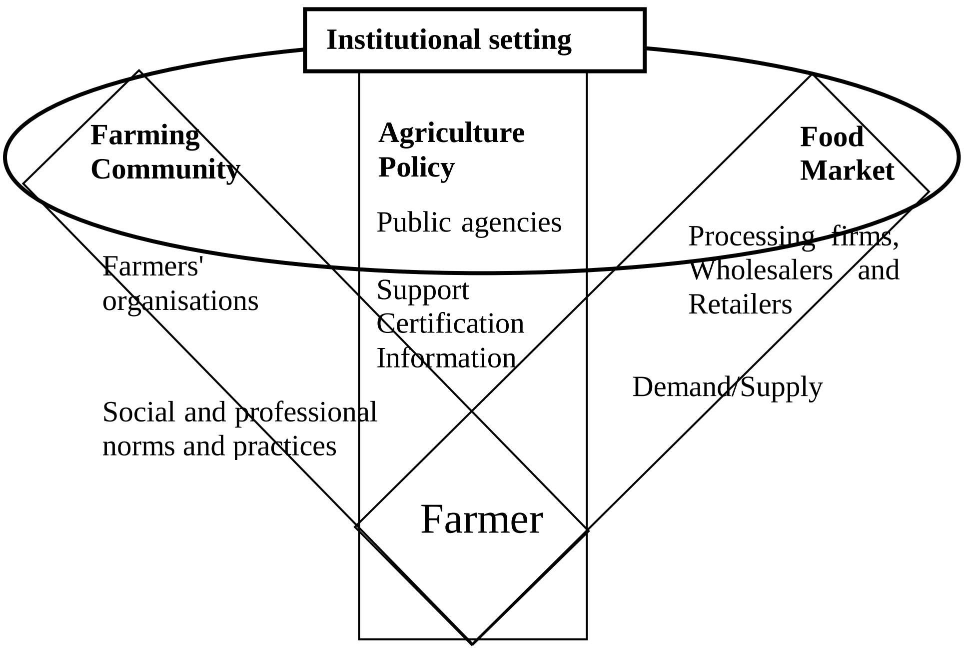
It appeared from the discussion of organic agriculture distinctiveness that organic farming is based on distinct values and that it is fair to emphasise compatibility of values between organic farmers and organic agriculture regulation. Further, the value orientation against mainstream agriculture represents a rather high barrier to farmers' entrance to organic agriculture, *i.e.* it seems a rather big decision to convert to organic farming. Thus, if public policy is to promote organic agriculture by means of communication instruments, it may be an objective to lower the entry barrier. This may be done by taking further steps than those derived from the discussion of levels of values above. These steps may include the reaching out for groups of farmers whose values might not be fully compatible with organic agriculture and adapt part of the organic farming practices to their attitudes and norms. This involves the risk of watering down the distinctiveness and hence the identity of organic agriculture. Thus, irrespective of the intention to either keep or water down organic agriculture distinctiveness, it appears an important policy element to learn about the essential features of organic agriculture, not least on the basis of research in different ways to implement the basic values into production standards.

Additional policy recommendations may be derived from Figure 1 as it indicates that agriculture policy is not the only channel available to influence farmers' decisions. It may even pay to exert some influence on and co-ordinate agriculture policy actions with activities of the farming community and the food market. In this way a fourth domain may be constituted within the social context, that of the institutional setting across domains. This is illustrated in Figure 2.

Combining organic agriculture distinctiveness with the characteristics of communication policy instruments lead to a definition of needs for producing and distributing premises, facts and reasoning within four domains of the social context and in such a way that the values of organic agriculture and their specification in production standards are treated seriously but not uncritically. In relation to the farming community objectives on communicative policy instruments may include: *a)* production of knowledge of organic farming practices, their relation to values and their potential for further development as well as more practical knowledge about the types of farms and productions that may be best fit for organic agriculture; and *b)* the development of systems to distribute information about existing and potential farmers. In relation to agriculture policy, the need is for knowledge about effects of different policy instruments on farming practices in general as well as on organic farming practices to be produced, distributed and implemented when public agencies address existing and potential organic farmers. In relation to the food market, knowledge about the actual interplay between buyers and sellers in the food market in general as compared to the markets for organic agriculture products may form the basis for attempts to establish enduring interrelationships with major actors in the food market to the benefit of actual and potential organic farmers (Michelsen *et al.*, 1999). Finally, but not least importantly, the production and distribution of knowledge in relation to the institutional setting should cover the interplay between different types of action in all domains when taken for themselves and when combined across domains.

Hence, if communication policy instruments are to be instrumental to promoting organic agriculture, one focus should be on production and distribution of knowledge about pragmatic issues of implementation of main organic agriculture values characterised as secondary aspects above. This implies a focus on collecting and analysing experiences with organic farming practices, regulatory instruments and market interrelationships. Likewise, distribution of knowledge should emphasise pragmatism in order to address groups whose core beliefs are not in overt opposition to organic agriculture. Another type of interest — with interest to the whole of agriculture community — should be on the content of the normative core and its practical relevance.

Figure 2. Institutional co-operation within the social context



So much for theoretical speculation. The following section will compare experiences from a number of European countries in the use of policy instruments. There is major variation as to the size of organic farming sectors, although most countries have based activities in support of organic agriculture on the same EU regulations.

European experience with policies promoting organic agriculture

There are only few and rudimentary analyses of policy impacts on the development of organic agriculture, and not one attempts to specify the contributions from communication policy instruments relative to those of other types. Hence, the objective of this section is to use a comparison of policy impacts on organic agriculture growth in European countries (primarily EU member States) as a basis for qualifying the theoretical considerations made above. The first issue is whether organic agriculture has appeared distinctive within the agriculture policy domain, the second issue is the general impact of policy on organic agriculture growth, and the third and final issue is the broad social and institutional context of organic agriculture development within six European countries.

Organic agriculture began as a Europe-wide policy issue in 1991-92, when the EU passed two regulations that defined organic agriculture (ECC Reg. 2092/91) and introduced support for organic agriculture as a type of environmentally-friendly production system (ECC Reg. 2078/92). In EU member States, these regulations were implemented in the following years while non-member States developed similar regulations. This forms the basis for the comparisons of the impact of policy on organic agriculture development presented below.

The first issue to be highlighted is the interplay between different actors involved in the introduction of policies in support of organic agriculture. The main question is whether different types of interplay has paved the way for different levels of acceptance of organic agriculture distinctiveness and of communication between organic and mainstream agriculture institutions to develop. Michelsen (2002) includes results from a survey on the situation in 1997-98 answered by national informants in 17 European countries. They should be taken only as a first and rough attempt to address the issue.

The findings show a broad variation with regard to the way in which actors representing interests of organic agriculture, general agriculture, and potential supporters of organic agriculture (such as environmental organisations) interact in different countries. In general, there is no clear division between organic and mainstream agriculture organisations, either on the level of individual farmers or on the organisational level. Furthermore, organic agriculture organisations' relationships with environmental organisations are not so strong and friendly as one might have expected. Alliances active within organic agriculture policy have a heavy load on organic agriculture organisations and public agencies while general agriculture organisations perform rather little activity. These findings suggest that organic agriculture policy may be developing as a policy sub-system separate from, rather than in dialogue with, mainstream agriculture policy. This is supported by the fact that political conflicts are perceived higher regarding administrative matters than substantive matters such as acceptance of support paid to organic farmers. The development of an organic farming policy sub-system also seems to be confirmed by the presence of rather specific fora for conflict resolution, with a low priority attached to fora for discussion between organic and general agriculture institutions. Finally, different types of interrelationships between organic and general agriculture institutions appeared to have no clear impacts on the size and growth of organic agriculture across countries. Hence, organic agriculture distinctiveness is not clear within the domain of the farming community — whether on the level of farmers or their organisations — whereas a rather strong separation appears within the agriculture policy domain.

The second issue is about the impact of policy instruments on the size and growth of national organic agriculture sectors. Available data made only crude qualitative assessments possible of the rather simplistic assumption that there is a direct link between the introduction of a distinct policy instrument and growth in the number of organic farms (Michelsen and Soegaard, 2001). Regarding legal instruments in support of organic certification, a qualitative analysis of 18 European countries suggested that the introduction of formal definitions of organic agriculture had some positive impacts on the rate of farmers' conversion to organic farming. In cases where a uniform national certification system was introduced, only positive correlations with organic farming growth in the following year(s) appeared. In cases of competition between national production standards, negative impacts on growth were found, with Germany as the main example. A supplementary quantitative analysis indicated an even stronger conclusion by suggesting a statistically significantly positive impact of introducing the common EU standards in the first half of the 1990s.

Regarding financial instruments, the analysis included only public support paid to organic farmers. Here, the qualitative analysis points towards a positive impact on the growth of organic farms in absolute terms when economic support was introduced for the first time. Subsequent changes seem, however, only to have accelerated the growth process leaving the final number of organic farms unchanged. Examples are the introduction of EU support in Austria in 1995 followed by acceleration, and the introduction of permanent support in Denmark 1993 followed by stagnation. The general finding was not contradicted by a crude quantitative analysis. Hence, the rather provocative conclusion (which calls for further empirical assessment) is that public support paid to farmers may have a clearly positive initial impact, while subsequent changes seems only to accelerate organic farming growth while the long-term number of organic farmers remains unchanged. The analysis of the interplay between legal and financial instruments indicated that certification is a necessary precondition for both developing organic farming and introducing financial support, and that the introduction of EU certification had an absolute impact on growth, whereas the impact of EU support was mainly to accelerate the development.

In sum, the rather rough and tentative analysis of growth patterns in 18 European countries suggests that legal and financial policy instruments have influenced the development of organic farming, but mainly by initiating a development. Furthermore, the growth of organic farming seems to depend more on the introduction of common production standards than on support paid to farmers. This finding goes well in hand with the theoretical emphasis put above on the importance of organic farming identity. Finally, the total and long-term impact of the policy instruments mentioned seems rather limited.

In addition to the general comparative analysis of organic agriculture growth, Michelsen and Soegaard (2001) considered the importance of individual factors for growth patterns in each country. Among important factors, working in at least the United Kingdom and Switzerland, is the economic position of organic farmers relative to non-organic farmers. In periods of general agriculture recession, farmers seem more inclined to look for support for organic farming than under prosperity. Another factor that might help to explain why organic farming uptake is relatively high in German-speaking and Nordic countries is moral suasion among farmers who may see conversion to organic farming as an individual reaction to politicisation of agri-environmental issues in these countries. A third factor found in several countries is the development of contacts with supermarkets in the food market and other institutional networks.

The implication of the findings of Michelsen's and Soegaard's (2001) study for the discussion of communicative policy instruments is first that the impact of the other two main types of instruments on organic agriculture development does not seem decisive. Hence, it is relevant to consider the use of communicative instruments. Secondly, the analysis emphasises the relevance of analysing the four domains of the social context mentioned in Figure 2 simultaneously. In the discussion that follows, an attempt is made to sketch findings relevant to both of these objectives. The basis for the analysis is six in-depth country studies performed by Michelsen *et al.* (2001) using qualitative methodologies. The countries included were Austria, Belgium, Denmark, Greece, Italy (notably the provinces of Marche and Sicily) and the United Kingdom. They represent much variation in development patterns. Austria, Denmark and (partly) Italy have large organic agriculture sectors and all countries, except Italy and Greece, have experienced periods of stagnation in the period 1985-1997.

Each of the six countries has its specific history of organic agriculture development related to the specific climatic, technical and social conditions of agriculture production (ranging from intensive agriculture production in northern Europe to extensive production in the south). Each country had developed specific types of communicative instruments to implement the legal and financial instruments included in the EU regulations. The main content of the communication was distribution of information on support and of advisory services available either for farmers in general or exclusively to farmers with a specific interest in organic farming. Production of knowledge in terms of collection of relevant information and of research and development was scarce in all cases — although with distinct differences in emphasis between the six countries (for an overview of this kind of initiatives see Lampkin *et al.*, 1999). The main difference between the six countries, which came out as an important explanation for differences in the size of the organic agriculture sector, however, not one single policy instrument, but the dynamics of the (communicative) interrelationships between organic and general agriculture institutions across domains.

In the first place, it appeared important for organic agriculture growth that dynamics in terms of changes to the organisations involved were taking place. They could include co-operation between hitherto competing organisations, major changes in the scope of existing organisations, the establishment of new organisations, etc. A high number of organisational changes indicate a higher level of adaptation to the social environment and to sectoral dynamics than a low number of changes. Furthermore, the scope of change in terms of the number of domains involved appeared important. If, for instance, changes within the agriculture policy domain were not accompanied by changes either within the domains of the food market, the farming community or the institutional setting then the impact on the size of the organic agriculture sector appeared less than if changes within all domains were combined.

In the second place, the character of interrelationships between organic and mainstream agriculture organisations appears to have a major impact on organic agriculture growth. Promotion of organic agriculture seems much less successful if the relationship is based on harsh competition or hostility between clearly demarcated sectors than if relations are based on some kind of co-operation. Strongly co-operative interrelationships may help promoting organic farming to reach a certain level rather quickly (as demonstrated in Austria and Greece). The major problem of co-operation is that less attention to the distinctiveness of organic agriculture may become visible when other options appear economically attractive to farmers. Then farmers may be less prepared to stick to organic agriculture than under conditions of less co-operation where the organic farming identity is more distinct. This reasoning may help to explain the stagnation since 1995 of Austrian organic agriculture.

Within the perspective of competition *versus* co-operation, more sustainable organic agriculture growth may be reached under conditions of what Michelsen *et al.* (2001) define as "creative conflict". It implies an on-going conflict but at the same time the identity of organic agriculture is accepted by mainstream agriculture organisations within all domains. Hence, organic agriculture is neither threatened from being silenced out (as under strong co-operation) nor overtly suppressed (as under strong competition). Under conditions of creative conflict organic agriculture positions within all domains have to be established and consolidated by means of trial-and-error processes that involve continuous adaptation to the conditions of the social context. At the time of the investigation, creative conflict was primarily detected in Denmark, where it permeated all domains.

Finally, it appeared that the most important domains for successful organic farming growth were the institutional setting and the farming community. The institutional setting helps promote organic agriculture by combining efforts directed at different domains. Among the six countries studied, the clearest examples of successful institutional settings were found in Austria and Denmark, as they were the two countries with the largest organic agriculture sectors. Belgium also has an important institutional setting, but when compared to the other two countries, Belgium is characterised by involving only organic agriculture organisations, and this seems to have contributed to hardening rather than softening the boundaries between organic and mainstream farmers, thus hampering recruitment of farmers to organic agriculture.

Conclusions

Policy matters in relation to the promotion of organic agriculture. When comparing the organic agriculture development in Europe, however, available data suggest that usual and well-known legal and financial instruments only matter to a certain extent, *i.e.* substantive growth appeared when support for organic agriculture was introduced, while later changes only accelerate growth to a given level. In addition, there is no empirical basis for evaluating the impact on organic agriculture development of communicative instruments in the narrow sense, *i.e.* research, development and information. Against this background, it is suggested here that communication policy instruments should be understood in a broader sense including all instruments that involve communication on the basis of attitudes and social norms within (segments of) the farming community. Some support for this understanding was derived from qualitative attempts to explain variation in national organic agriculture development that came out with promising results.

Within the broad context, communication involves the production and distribution of knowledge within and across the four domains that constitute the basis for institutional co-operation within the social context of organic agriculture development. It seems important that communication involve both organic and mainstream agriculture institutions on the basis of some kind of mutual respect and co-operation. The type of knowledge mentioned should include premises, facts and reasoning based on research of the distinct normative basis for organic agriculture as well as systematically collected experiences with practices in relation to organic agriculture development within the farming community, agriculture policy and the food market. Finally, it seems important to keep a certain level of dynamics in terms of activities within each domain and, not least, in terms of activities that combine efforts of various domains.

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NEW ZEALAND'S ORGANIC AGRICULTURE: THE GOVERNMENT'S ROLE

Peter Kettle[1]

Abstract

The New Zealand government views organic agriculture as one of the paths towards sustainable production systems. It does not subsidise any form of agriculture but is assisting the organic sector through initiatives aimed at developing a national organic standard, a strategy for the sector and a scheme that will enable small-scale organic producers to have their produce certified as organic in a cost-effective manner. The New Zealand government is supportive of the organic agriculture sector, but is committed to encouraging all forms of sustainable farming.

Introduction

Consumers in New Zealand are currently enthusiastic about organic products and the market has increased about four-fold in the past five years, but from a very small base. The value of organic exports for 2000/01 was about NZD 70 million and represented less than 1% of the total value of exports of agricultural and horticultural products. However, the true value is the premium paid for the organic products above the price for the conventional products displaced minus any additional production costs associated with organics. The main New Zealand organic exports are apples and kiwifruit, and they have been attracting good premiums on some markets at some times. There are currently about 47 000 ha in certified organic production (12 000 ha in 1994). This equals less than 0.5% of our agricultural and horticultural land.

There is a close alignment between the organic movement and "green" politics in New Zealand, as is the case in many countries, and the past two general elections have seen genetic modification and organics as important issues for the electorate to consider. In this debate perhaps the strongest unifying force bonding the organic sector has been, and remains, antipathy towards genetic modification technology. It should be noted that there has been no approved release of a genetically modified crop to the New Zealand environment and most of the organic proponents are determined that New Zealand should retain its "GE (genetically engineered)-free" status.

For many years succeeding governments have recognised organic farming as offering one of the routes towards more sustainable agricultural production systems. Amongst the key policies of the recently elected government is to *help the development of the organic sector and publish a new standard for organic products*. This policy is designed to provide added impetus to the sector and follows on from a number of recent actions by the government.

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The government does not support subsidies for any form of farming, organic farming included, but recognises the social, environmental and economic contributions it can make. It is particularly interested in encouraging land development initiatives for Māori, the tangata whenua, or original people, of New Zealand and the Māori organic initiative is viewed in this light.

Primary Production Committee report on organic agriculture

During 2000 and 2001 the Primary Production Committee, comprised of members of the New Zealand parliament, undertook an extensive inquiry into organic agriculture and published its report "Organics – New Opportunities for the Future" in April 2001. The recommendations made by the Committee were then considered by the government and to a large extent accepted.

The Organics Working Group

The Organics Working Group was established by the government in July 2000 in response to an initiative taken by the Organic Federation of New Zealand. It is comprised of representatives of the organics sector, organic certifying agencies, conventional farming, Māori and government departments. The Organics Working Group works in parallel with the Primary Production Committee. The Organics Working Group established its goal as: *to facilitate the efficient and sustainable development and growth of the New Zealand organic sector.*

Māori, on their own initiative, responded to the Organic Working Group process by establishing a national group, Te Waka Kai Ora. This network will encourage the development of organics among Māori and is going from strength to strength.

Current government initiatives

There are currently three initiatives in support of the organics sector that are receiving direct funding from government via the Ministry of Agriculture and Forestry (MAF) which relate back to the Primary Production Committee's recommendations. They are the small-scale organic producers' certification scheme, being developed by the Soil and Health Association; a National Standard for organic products, being developed by Standards New Zealand; and, a development strategy for the sector which is being facilitated by a group of consultants. In addition to these initiatives, research underpinning organics is mainly provided through the mainstream science system funded by the government through the Foundation for Research, Science and Technology.

The small-scale organic producers' certification scheme is designed to assist small-scale producers of organic products to have their produce certified organic in a cost-effective manner through the use of local collective schemes. The aim is for the scheme to eventually cover the whole of New Zealand and be self-funding. At present there are twelve "pods" (distinct local groups of producers) involved. This scheme will be officially launched in November 2002.

Standards New Zealand is facilitating the development of the New Zealand Organic Standard and is involving a large reference group in the process. The standard will be at a level that will enable exporters to meet major foreign market requirements and it will ensure that domestic consumers are protected from producers making false claims about their products. It is anticipated that the standard will be published in December 2002 and that some organisation will take on the role of implementing it.

The final initiative, the development of a sector strategy, involves a project scheduled to be completed within calendar year 2002. It is anticipated that through a series of interviews and workshops a strategy for the sector will be developed which achieves widespread buy-in. The strategy will project expectations for 2020 and provide a guide as to how to meet these. It will provide a framework, or context, which will provide potential investors in the sector with confidence in its future direction.

Associated with the development of the strategy are studies on the constraints to conversion to organics and the development of a portfolio of success stories representative of the various organic production systems. The portfolio of case studies will be made available at the launch of the strategy and help give substance to the projections.

When the strategy and standard are launched in December it is likely that considerable attention will be given to the projected lifting of the voluntary restraint on applications to release genetically modified organisms into the environment which is due to be lifted on 31 October 2003. This constraint period was negotiated with industry by the government following a Royal Commission of Inquiry into Genetic Modification.

Royal Commission on genetic modification

The government established the Royal Commission in May 2000 and which reported back to government in July 2001. In a comprehensive review, it held numerous public meetings, received more than 10 000 written submissions and held a formal hearing lasting 13 weeks. The major conclusions of the Royal Commission were that New Zealand should keep its options open and proceed with caution when adopting genetic modification (GM) technology. A major theme of the report was to encourage the coexistence of all forms of agriculture.

The government, to a very large extent, agreed with the recommendations of the commissioners but decided to institute a voluntary constraint period for two years, during which time no one can apply to release a genetically modified crop into the environment. This restraint period is due to be lifted at the end of October 2003. During the restraint period a number of the recommendations are being acted upon such as changes to the laws regulating the use of GM technology.

The recommendations relating to organics that are currently being worked on are:

- A strategy to preserve the effectiveness of Bt *(Bacillus thuringiensis)* in the face of possible Bt-modified crops;
- Development of a code of practice to ensure effective separation distances between GM and non-GM crops; and
- MAF is charged with developing formalised networks to encourage constructive dialogue and communication between farmers using different production methods, and to provide mediation where necessary.

Conclusions

It is anticipated that the organic sector will continue to grow and primarily be directed towards affluent domestic consumers and their counterparts in other developed countries. Considerable research will be undertaken in order to develop production systems that are truly sustainable. Key areas include soil fertility and pest weed and disease management. Claims made for organic products will be examined critically. Strenuous efforts will be made to ensure that all farmers will be able to choose what markets they wish to produce for and how they will do that. Coexistence of all forms of agriculture will be the goal.

INRA AND ORGANIC FARMING: TOWARDS A RESEARCH PROGRAMME

Bertil Sylvander and Stephane Bellon[1]

Abstract

This paper sets out the way in which the French Institute of Agronomic Research (INRA) intends to develop its research into organic farming through a commitment to both pluridisciplinary and partnership-based studies wherein organic farming is considered an agricultural "prototype". Although this starting point still leaves scope for analytical research, it is also likely to reinforce the systemic approach. It leads to an understanding of the processes employed in production under the constraints of regulatory standards. The basic principles of partnership-based research presuppose that programmes are to be developed through consultation with organic farmers' representatives. Those principles therefore combine academic criteria and compliance with the requirements of organic farming. So far work has begun on compiling a database of scientific literature, scientific seminars on specific questions have been held in association with organic farming organisations (ITAB) and non-INRA researchers and practitioners, and a research programme is under development (by organising an in-house call-to-tender, in accordance with the applicable regulations). INRA allocates EUR 5.5 million annually to this programme. So far 55 projects have been assessed and 20 are on-going. About 32 full-time researchers work on those projects. The first subjects addressed relate to organic farming and: nutrition and health; crop protection; genetic resources; animal health; animal welfare; and the environment. The following questions are crucial to the research programme: what are the specific features of research into organic farming? Subsequently, does research need to change its objectives and approaches (increasing specialisation versus. cross-disciplinary research)?

Introduction

Agricultural institutions and trade organisations have long viewed organic farming as a marginal activity. INRA has been no exception, maintaining reservations about the practice. However, recent political recognition of organic farming has prompted various organisations to draw up policies to promote it. In France, this shift can be dated to the December 1997 introduction of a medium-term plan for the development of organic farming. INRA, for its part, announced its commitment to a research programme in January 2000, while emphasising the need to comply with the rules governing all research activity. In this paper we indicate how INRA intends to move ahead in this area and we give examples of its activities.

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INRA serves as a platform for the objectives and resources of most scientific disciplines with a bearing on agriculture, the environment, and food. At present, INRA has approximately 8 500 employees, 1 780 of whom are research scientists working in teams that also include engineers, technicians, and administrative staff. These teams are grouped into 17 research departments with each department pursuing its own scientific objectives within the strategic framework laid down by the institute.

Basic principles

INRA seeks to pursue an all-round approach combining cross-disciplinary and partnership-based research. It views organic farming as an agricultural prototype and draws the consequences of this in terms of its potential scientific repercussions. This starting point still allows for analytical research while also reinforcing the systemic approach. It leads to an understanding of the processes involved in farming to meet strict production standards and should, in the long term, yield innovative solutions. A further challenge is to understand the way in which the demands that society makes of organic farming are to be analysed and ranked by order of importance, whether in terms of production, processing, or control of the outputs of organic farming (product quality, ecological balance, environmental impact, macroeconomic optimisation, etc.).

The task of INRA’s Internal Committee on Organic Farming is to make progress on three objectives: to better understand organic farming (through the compilation of a database of scientific reference works with links to other databases), to hold scientific seminars in order to transfer and discuss the research results (through the organisation of conferences on specific topics in association with organic farming organisations and with the participation of INRA and non-INRA scientists and practitioners[2]), and to develop a research programme (through the organisation of an in-house invitation-to-tender under the applicable regulations). Those objectives have to be achieved on three scientific fields (Table 1). The aim of the research programme is to identify motivated in-house teams and to construct a network that is both consistent and reliable in terms of sharing information, defining objectives and methods, providing research incentives, and evaluating and transferring results. INRA allocates EUR 5.5 million per year to this programme.

Table 1. The research programme objectives

Fields	**Objectives**		
	To better understand organic farming	***To transfer and discuss scientific results***	***To develop new projects***
Bio-technical	Production rules	Extension	Explanation
Production systems	How to combine objectives	Methodology and tools	Conversion of new systems to organic farming
Economics	Statistics	Supply chains Demand	Organic marketing initiatives

The basic principles of partnership-based research presuppose that programmes are to be developed in conjunction with practitioners. Thus, the Teaching and Research Department (DGER) of the Ministry of Agriculture and Fisheries has set up a co-ordination platform with INRA, ACTA

2. The subjects covered in 2000-2002 dealt with crop protection and organic farming, genetic resources and organic farming, animal health and organic farming and the assessment of techniques used in breeding.

(Union of Technical Institutes for Experimentation in Agriculture) and ITAB (Technical Institute for Organic Farming). This group is to support DGER in co-ordinating programmes on research, development, and education.

Current activities: internal projects

In 2000, INRA supported a number of research teams and experimental units currently working on organic farming (see Annex for a full list of current activities). The main objective was to strengthen such units and to enhance their research achievements by providing additional financing. Here are three examples from different domains.

In organic crop farming, the discrepancy between the kinetics of crop requirements and the soil nitrogen mineralisation rate affects wheat yield and grain quality. To help reduce the shortage of organic cereals in France, support was given to research into improving the nitrogen management of winter wheat by optimising spring fertilisation.

In fruit growing, an experimental unit in south-eastern France has been working for several years to optimise organic peach and apple production techniques. Fertilisation is being investigated by monitoring both the nitrogen mineralisation rate in soils and fruit quality. This work has now been extended to apple growing. The effects of mixed hedgerows on fauna that are beneficial to orchards is also under study and ties in with the wider question of biodiversity.

In organic livestock farming, priority has been given to sheep farming in the central mountain area of France. The aim is to compare two grass-based feeding systems with a view to extending lamb production periods. The study specifically addresses connections between animal feeding practices and health through a cross-disciplinary approach combining technical and economic studies, and associating research, training, and development activities across a range of structures.

Current activities: collaborative projects

During 2001, INRA and ACTA invited tenders for specific projects in three main areas identified by practitioners. These are described with examples below. As expected, responses came from research units and technical institutes alike. A common feature of the projects is their cross-disciplinary nature and the use of a battery of methods (field and laboratory studies, modelling, and testing).

One project seeks to reduce the use of copper by identifying disease tolerant crop varieties, optimising copper application methods, and testing crop management strategies. The project also tests alternative products (and bio-stimulators) and evaluates the effects of applying copper on various soil types with perennial crops.

A second project is designed to control grapevine yellows caused by the ampelophagous leafhopper *Scaphoïdeus titanus* (Ball). Special attention is given to local situations where biological control is effective and/or resistant vineyard plants are grown. The research seeks to understand the biological processes involved and to develop alternative control strategies.

Proposed projects on the production of seed and plants suitable for organic farming relate mostly to the actual planting material, particularly for field and tree crops. However, for seed production, a sanitary quality insurance process is also planned, focusing on key crop species and diseases.

For the future, INRA considers it essential for research programmes to investigate organic food quality (taste, nutritional quality, and safety) and wider social issues such as the environmental impact of organic farming as well as animal welfare, ethical trading, etc. This is the direction that future projects should take. Finally, we intend to evaluate our approach based upon systemic thinking and partnership-based research. Altogether, the following themes are covered by the current projects:

Table 2. The themes covered in INRA projects

Areas	Projects
Production	Seeds and plants (biotisation, seed protection) Breeding (cereals, cabbage, potatoes, cauliflower) Production techniques (rapeseed, fruits, sheep raising, durum wheat, rice) Fertilisation (cereals: crops requirements, soil nitrogen mineralisation, vegetables) Pest control (how to offset copper, grapevine yellow) Animal feeding (nutritive composition of feeds)
Environmental diagnosis	Farming sustainability Impacts of copper on soils
Social demand	How to improve specification according to social and consumer demand
Supply chain	Milk quality and supply chain management

The main question: the scientific status of organic farming research

The initial hypothesis that organic farming is a “prototype” leads to the questions of the specific scientific status of a research programme on organic farming compared with other research programmes. One approach would be to argue that science is the same everywhere for everyone and that such a programme should consider organic farming more as an area of research, separating the applied objectives that are specific to organic farming from the scientific objectives and resources that are generic (organic farming as an area of research). A second approach would be to treat organic farming as a specific object of scientific research and to maintain that specific objects involve specific mechanisms and methods, even if they must still bear the hallmark of scientific rigor (organic farming as a scientific object).

This question can be addressed concerning the scientific objectives of the research to be conducted as well as the research mechanisms and methodologies to be implemented. Therefore, we will handle both levels in the following discussion. However, before doing so, we will give some general remarks.

We feel it is too early to decide either way and that the programme should be assessed on the basis of concrete experience. The options should therefore be kept open as far as possible. However, we see the debate as an important one for two reasons. The first is obviously scientific and epistemological, while the second is political and institutional. The future of research programmes on organic farming will probably be determined in part by the way the debate is conducted and concluded. True, institutions’ programmes are influenced to some extent by political considerations, but funding for research is not so much a limiting factor as might be thought. Institutionally, the main thing is to convince research scientists themselves that a programme on organic farming is scientifically worthwhile and that they can also make a successful career out of projects of this sort. If the argument goes in favour of organic farming as a non-specific area of research, the scientific questions of interest will still need answering, although there may be fewer of them. Conversely, if the argument goes in favour of organic farming as a specific scientific object, the programme may become even more worthwhile in the future.

This debate is an important one and should be conducted both within the scientific community, and between the scientists and the practitioners of organic farming within the context of the partnership arrangements briefly referred to earlier in this paper. An essential condition for doing this is to show mutual respect for each party and its explicit rules.

Scientists must be willing to accept the constraints of production standards as defining a model of farming under constraint and must construct their projects and protocols accordingly, and therefore must discuss their objectives and characteristics with practitioners. In some cases, this entails, in field experiments, constantly questioning the practitioners so as to learn about farming in accordance with the rules and practices of organic farming. Lastly, partnership-based research implies planning from the outset to include the relevant categories for action (Sebillotte, 1999). For example, a research project on fertilisation in organic farming must begin by asking about the adaptation of CORPEN indicators to forms of production.

Likewise practitioners will find it helpful to understand the logic behind the scientific approach: scientific questions are initially practical questions asked in different ways, often by (over)simplifying; they must be innovative and should not aim merely to apply or adapt tried-and-tested ideas; they are not therefore confined to experiments designed to test a given technique; protocols must be rigorous; results may be unexpected and even contrary to what was hoped for; they may sometimes be of little immediate benefit and they may take a long time to acquire; finally scientific knowledge is universal in character and must be certified by academic publication if it is to exist at all.

This mutual respect implies that neither partner can demand that the other break with the relevant ground rules. However, the partners may construct a common culture around the debate without either side imposing its culture on the other. In the day-to-day work of partnership-based research many things need to be developed jointly, both when deciding on the research objectives and when deciding how to achieve them.

The scientific objectives of the research programme

First, partnership-based research cannot be conducted successfully without clear objectives that are prioritised and agreed to by scientists and practitioners alike. Experience shows that this is difficult to achieve. Should one opt for fast and ambitious expansion of organic farming or slow but steady development based on a niche strategy? Among other things, this question dictates which localised and generic production techniques and systems are to be promoted as being consistent with the regulatory standards. Are we moving toward exclusively mixed crop-livestock farming systems or should specialised systems be developed? What are the consequences for major crops and for fertilisation? What connections are there with research into varieties suitable for organic farming? Should we seek to classify general objectives by rank order or to define relevant and viable categories of situation? This option would be compatible with localised production systems where the aim is not to maximise just one criterion but to achieve objectives, to validate the technical and economic feasibility of well defined systems, and/or to determine the limits of a given system.

In the case of genetic selection of wheat varieties in organic farming, for example, the ordering of the criteria of productivity, nitrogen content, ground cover rate, disease resistance, and straw length is necessarily related to the production systems employed. The multiplicity of situations seems to call for several rank orders but assumes some degree of openness in the choice of production systems which may not be agreed to by all and which could explain why there is no unanimous agreement about the criteria. It also assumes that we have data about the most relevant situations, which is difficult at present.

Production standards are an obvious starting point (prototype) but they are liable to change (in line with the technical and ethical logic of production or in accordance with new objectives related to society's demands). In addition, standards may be interpreted in accordance with situations and practices, which illustrates the diversity and variability of production systems even within organic farming.

The research mechanisms and methodologies

As concerns the research mechanisms, the first approach (organic farming as an area of research) implies that once the objectives have been defined (*e.g.* selection criteria for varieties suitable for organic farming), the resources are generic within the principles of organic farming, which principles may be debated but on the sidelines of the research project. The second approach entails reflecting about just how specific the research is. For example, organic farming calls for a systemic approach in its very conception of production. This is not completely exclusive, as systemic research is carried out for other production systems, but the approach may help in differentiating some organic farming research from strictly analytic approaches.

Nevertheless, this approach is complex because it entails varying several factors at the same time, which infringes the principle of "all else being equal". In some instances, it seems that the system can be broken down into almost independent sub-units (this might be the case for research in the Camargue on hard wheat and rice: genetic research, production systems, and value-enhancement processes are all partly independent). Conversely, in the case of INRA's investigation of sheep farming referred to above, it is helpful in order to increase the flock's productivity through three lambing sessions over two years to conduct research simultaneously into the economics of sheep farming, the cross-influences of animal husbandry, flock health, feed, and the quality of the meat produced. This is not self-evident and caused fierce debate within the team and with the practitioners.[3]

To this extent, it can be asked whether the systemic and analytic approaches are complementary, with the former looking into the way the system operates and at ways of optimising it (the Redon site in the Massif Central) while the latter seeks to identify phenomena and to study the action of one factor on one effect by comparing organic and non-organic systems (as at the Orcival site in the Massif Central). As such, it is pointless to oppose comparisons (suspected by some practitioners of tending to "evaluate organic farming") and the study of how an actual organic system operates, as the two approaches can be complementary.[4] This is why there is a continuum between experimental units, systemic arrangements, comparisons and pilot-farm networks, depending on the specific objectives in view (Niggli and Schmidt, 2002).

Another source of specific features about research into organic farming could be the understanding of biological variability, which is the corollary of agriculture based on natural

3. The same is true of the project for fruit tree growing (INRA Gotheron) where infestation by apple tree greenfly, nitrate fertilisation and the nitrate content of the soil, and the ecology of auxiliary insects close to hedgerows are being investigated at one and the same time.

4. The same can be seen for research on the quality of organic products: the systemic approach seeks to describe a phenomenon while the analytic approach seeks to explain it.

equilibria. This presupposes that practitioners and scientists alike come to consider learning about the scientific management of variability of living organisms in an uncertain environment as a primary objective. This is not a straightforward question as it is beset by scientific and political controversies. It prompts scientists to think about intentionally reducing variability (this is often the case in animal hygiene and product hygiene), and goes as far as genetic engineering. Adapting varieties to various situations may, for example, lead some geneticists to want to return to "population varieties" while their colleagues only see progress in F1 hybrids. This choice is not self-evident as it leads to controversy and contains very real challenges for scientists and laboratories.

Practitioners too are confronted with this question, for example, about how far and in what way to codify practices in production standards, which are necessarily simplifications compared with the actual diversity of practices and local situations. In doing this, legitimate questions are raised about generalising organic farming and about the limits of the system.

Finally comes the question of approaches that are so radically new (compared with "standard" scientific approaches) that they confound the scientists. This is the case, for example, with the principles of biodynamic agriculture, of homeopathy, or the "global" approach to quality based among other things on "tangible crystallisation". Such approaches demand a special effort if they are to be changed into research questions, and skills that are not necessarily found in institutes like INRA, prior studies of the literature in which validation by outside experts and scientific debate are primordial in insuring stringent protocols and general results. This process is not necessarily beyond reach but it will take time.

While fuelling the debate about the specificity of a research programme on organic farming, the foregoing developments raise the ethical question of the neutrality of science. From the outset, they adopt a "procedural" posture of science in the making (by the sociological interplay of the world of research and its environment (Latour, 1995) and of scientific research programmes advocated by Lakatos (Cabaret, 2002). This calls for a large dose of modesty, both because scientific truth is by definition falsifiable and consequently knowledge is historically dated, and because what were thought of as linear orientations of agronomic research defined by their own internal logic were in fact greatly influenced by the objectives of a historically dated agricultural policy and by the industrial rationale of the post-war period.

Conclusions and recommendations

In conclusion, it can be said that the complexity of the question and the specific nature of organic farming research addressed in this paper should prompt us to a good deal of modesty and patience, since the various projects need to be evaluated with a view to validating or rejecting many of the hypotheses set out here. The examples of partnership-based research conducted by INRA so far show that these are always historically long processes that are time consuming and that entail gradual, mutual learning processes with a view to defining common objectives as well as finalising (as joint constructions) mechanisms that are often complex and difficult to manage.[5] In addition, this type of research assumes, as we have seen, transverse scientific leadership, continual project monitoring, evaluation from the standpoints of scientists and practitioners and, of course, the unfailing support of the institutions and their research departments. On a more political front we need:

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5. GIS Alpes du Nord began in 1970, the Redon platform in 1980, the Camargue project in 1988 and the Gotheron unit in 1994.

- to lobby for a permanent network compiling the research projects in progress, project results, and scientific publications throughout Europe. The ECODIS has been rejected twice. This urgent question must be put before the EU.
- to work out a co-ordination system in order to gather practitioners' requirements for further research *e.g.* farmers, processors, consumers and institutions (certification bodies, etc.) and to evaluate research results according to their ability to fulfil those requirements. This system must extend to different levels: the projects themselves and the overall political level.
- to complete research projects, in order to reach a single definition of what organic farming is in Europe, since diverse interpretations of the EU regulations lead to unfair competition within the organic market and mar the image of organic farming.
- to conduct projects in closer relationship with non-organic research, in order to legitimise the specificity of organic farming in scientific terms and to ensure positive exchanges between research on conventional and organic farming systems.
- to diversify the fields of research, for example the impact of organic farming on the environment and rural development, better definition of animal welfare, nutritional and hygienic quality of organic products, consumer expectations and general education concerning agriculture in general (*i.e.* biology, economics, science); relations between overall social and political aspects and organic farming production methods world-wide (fair trade, energy balance, public policy evaluation, etc.).

Annex

INRA's current research projects

Internal projects (INRA, 2000-2003)
Cereal production: kinetics of crop requirements and soil nitrogen mineralisation rates
Fruit growing: fertilisation, fruit quality, hedgerows, biodiversity
Livestock production: sheep farming, extensive production, production periods, animal feeding, health
How to improve organic farming standards to meet consumer requirements?
Development of production systems in potato growing
Plant breeding for potato growing
Environmental risk assessment in dairy farming
Sustainability of organic farming holdings in dairy farming
Organic milk quality and supply chain management
Plant breeding in cereals, cabbage, cauliflower
Influence of wheat cultivation management on mycotoxins
Cultivation of organic oilseed rape
Influence of organic farming on nitric waste in soil
Development of organic rice and hard wheat in the Camargue (marshlands in Southern France)
Organic fertilisation in vegetable growing
Organic feed quality for pig farming
Collaborative projects (Call opened by INRA and ACTA, 2001-2003)
How to reduce the use of copper
Controlling grapevine yellows
Production of seeds and plants in organic farming
Fertilisation in organic farming

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DUTCH POLICY ON ORGANIC AGRICULTURE: A MARKET-ORIENTED APPROACH

Gabrielle Nuytens-Vaarkamp[1]

Abstract

The organic share in the total agricultural surface in the Netherlands is relatively small: 1.9% of the total agricultural area is under organic management. Dutch citizens want a sustainable form of agriculture, and organic farming has a pioneering role in this. In its efforts to promote organic farming, Dutch policy takes a market-oriented approach but the emphasis is on establishing co-operation between market players with the demands of the public and consumers as the guiding and controlling principle. Market players have formed a Task Force made up of representatives from all the links in the chain. In a chain plan, the parties set out targets to develop the market for the product group concerned. In order to communicate effectively the Task Force has drawn up a joint communication plan to improve the harmonisation between supply and demand and further the development of the organic chain. The first results are promising: agreements have been concluded in the pig production sector and more are likely to follow for organic bread, beef, fruit and vegetables. A first evaluation of the current chain approach will be made by the end of 2002 to determine whether it can replace the current subsidy scheme for the primary producer who wishes to convert to organic production.

Setting the scene

With a total surface area of about 4 million hectares and a population of 16 million people, the Netherlands ranks among the densely populated countries in the world.. The limited land area puts an almost permanent pressure on rural areas. The agricultural area amounts to 1.95 million hectares and in 2001 there were 93 000 farms. Farming concentrates on animals (56%), horticulture (21%) and arable cropping (14%). Fruit-growing farms account for 5% of the farms and mixed farms for 4%. This sector faces are many challenges as consumers are increasingly concerned about the environmental and welfare aspects of production methods. Effort are being made to balance economy and ecology through a more sustainable form of agriculture. The government has an encouraging and controlling role in this development.

In 2001, 1.9% of the total agricultural area was organically managed. On 1 July 2002, there were 1 562 organic farms, of which 322 farms were still under conversion. The largest sector in the Dutch organic farming sector is the animal husbandry sector. The number of organic dairy farmers has

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risen sharply in the past few years because conversion to that sector is relatively easy. Increasing consumer demand and the introduction of organic dairy products in supermarkets has also stimulated the growth of the organic market for dairy products.

Dutch policy on organic farming: an organic market to conquer

The market-oriented approach is the key to current policy on organic agriculture. Like other parts of the agri-food complex, the organic chain faces the challenge of developing over the coming decade into an independent sustainable sector able to compete in international markets, as well as setting the standard in Europe. Opting for a market-oriented approach has consequences for the role of the parties involved. The Policy Document on organic agriculture, "An Organic Market to Conquer", fleshes out the role of central government and the Ministry of Agriculture, Nature Management and Fisheries in particular, by bringing assisting to the organic chain from 2001 to 2004 inclusive.

The organic sector has an excellent record of socially responsible business practice. In all links of the chain, organic production largely meets social requirements in terms of environment, animal welfare and biodiversity, and plays a pioneering role for the entire agri-food complex. There is a growing demand for organic produce. While total food sales in the European Union are stagnating, sales of organic products are rising. Consumers are motivated not only by social conscience, but also by the healthy and reliable image of these products. The certification of products and the method of production with the Dutch "EKO" quality mark contribute to this image.

The organic sector is moving quickly from a pioneering into an expansion phase, although this growth is currently proceeding in fits and starts. The chain is not yet performing well enough on a scale great enough to generate sufficient demand and in strength to continue to meet high consumer expectations. Furthermore, there seems to be some hesitation within the chain which, at a time when market prospects are better than ever, is not taking sufficient initiatives. The market players have a primary and joint responsibility. There is an important role to be played by the retail, wholesale and catering trades. They form the link with the consumer and, as the demand for organic products grows, they can exert influence on the conversion process.

Responsibility for investment in the future lies within the organic chain itself. However, the combination of market prospects on the one hand and the pioneering role of organics in the area of social responsibility and innovative enterprise on the other justify a policy of incentives to give a boost to the organic sector. We have opted for a stronger market-oriented approach: the market must be the guiding factor and the different parts of the chain must capitalise on the market potential for organic products. The Dutch government hopes to accelerate growth by providing a temporary impetus, with the emphasis on establishing co-operation between market players. It is hoped this will contribute to organic agriculture as a socially responsible and innovative type of operation with effects for the entire agri-food complex.

Commitment from all parties

Obtaining commitment from all parties involved is essential for promoting organic farming. In spite of the positive factors which should favour the growth of organic production methods, the production chain is confronted with a number of bottlenecks. Flaws in the chain mean that supply and demand are not properly harmonised, result in high prices for the consumer and uncertainty for primary producers unsure of sales in the mid to long term. As long as sound co-operation between the various partners is lacking, the growth of organic farming will not be able to achieve its full potential.

The key to finding a solution is the consumer. The modern citizen increasingly demands products that are produced in a responsible manner. However, in the Netherlands this same citizen also balks at paying high prices for organic products. The Dutch government believes that the traditional approach, where the emphasis lies on stimulating supply, is no longer the most appropriate and the only way. This is why Dutch policy takes a market-oriented approach: the demands of the public and consumers are the guiding and controlling principle in the agri-food complex.

A distinction must be made here between the public and consumers. Although the public demands high standards, this not necessarily reflected in consumer buying patterns. The consumer is not always prepared to pay the high price required by these production methods. The consumer's wishes must be central to the promotion of organic farming. These wishes are translated to all links in the organic chain. An increasing demand for organic products has a knock-on effect in encouraging primary producers to convert. Production costs would then be reduced. If the links in the chain work together more efficiently this will lead to a wider range of organic products being made available to the consumer at lower prices.

The choice of a market-oriented approach means a change in thinking. It is, after all, the market partners that will have to make good the improvements to the organic chain. It is not desirable for the government to have the leading role. Its job is to facilitate the change. The government supports, challenges and spurs on the process.

Task force

On the initiative of the Ministry of Agriculture, Nature Management and Fisheries the market partners have formed a Task Force for the market development of organic farming, made up of representatives from all the links in the chain (the Dutch Organisation for Agriculture and Horticulture; Platform Biologica, the umbrella organisation for organic farming and nutrition; the Netherlands' Society for Nature and Environment; the Dutch Association of Food Trade Organisations; the Rabobank; Triodosbank (financial banks); Stichting Merkartikel, the umbrella organisation for processors with a private brand). The Task Force works to get the process underway.

The work of the Task Force resulted in the signing of an agreement in 2001 which contained statements by the parties that a change should be made in production and marketing in the coming years from a product-based to a market-based approach. In addition, the parties agree that market, product and production development is primarily the responsibility of the market partners, and that umbrella organisations and the government will concentrate on fulfilling an important stimulating and facilitating role for the market partners. The concrete target of the agreement is: *by 2004 organic products will have an average of 5% of the market share of consumer spending on food and drink in the Netherlands at an acceptable price for all parties, that is from consumer to farmer/producer*.

Chain plans

The intentions laid down by the parties to the agreement will be made operational for each product group in so-called chain plans. Chain plans for each product group are necessary because the rate of development and bottlenecks can vary from product group to product group. In a chain plan, parties together set out targets to develop the market for the product group concerned. It is essential that the market partners commit themselves to these targets. In the execution of the chain plans, the government will make financial contributions to concrete activities which promote market development and chain co-operation. The financial support will be limited to projects in which several market parties have an interest, projects which will not get off the ground without extra government support and which contribute to the targets agreed in the chain plans.

It is still too early to make a final evaluation of this chain approach, but the early signs are promising. The first tangible results stem from the two agreements to scale up organic pig production. Each agreement consists of price arrangements between a supermarket, a slaughterhouse and a group of pig producers. The idea being that the producers sell their pigs to the slaughterhouse at an agreed price after which the meat is sold to the supermarket. The price agreed is fixed for three years and is based on real costs. The market parties have asked the Ministry to introduce an investment scheme. This scheme will allow farmers to invest in the replacement of their conventional pig housing with organic housing.

Expectations are that these agreements will soon be followed by chain plans for organic bread, beef, fruit and vegetables. Where necessary the government will decide on additional support in the form of market studies, product promotion and/or specific support of the primary producer. It might also provide funding for the recruitment of so-called chain managers. Hiring such persons who bring market partners together in chain agreements has proved to be effective in the pig production sector.

Consumer information

In addition to chain organisation, a market-oriented approach requires special attention to be given to consumer information. In order to communicate effectively, the Ministry of Agriculture, Nature Management and Fisheries and the Task Force are working from their various areas of responsibility with a joint communication plan.

Early in September 2002, Cees Veerman, Dutch Minister of Agriculture, Nature Management and Fisheries, launched a media campaign promoting organic products. Through to 2004, consumers in the Netherlands will be informed about organic products via advertising on television, magazine articles, a website and leaflets. This promotion campaign is facilitated by the government at the request of market parties. The Dutch government is financing the media campaign while the industry is spending an equal amount on product-oriented promotion campaigns. They have organised promotional offers allowing people to taste products in the shops and organic products are given extra shelf space. Shop assistants are being trained in selling organic products and answering consumer’s questions.

The purpose of the media campaign is to reach a new group of consumers who are less influenced by idealistic purchasing motives and more by the quality and range of products. In addition, good communication can make it clear to the consumer why the price is higher for organic products so that he or she will be prepared to pay more.

Supporting organic primary production

The emphasis in Dutch agriculture policy has shifted from supporting the producer to stimulating demand. The Dutch government believes that co-operation in the chain will ultimately provide sufficient guarantees to allow primary producers to convert to organic production. A better organisation of the chain and proper harmonisation of supply and demand will provide a stable market for organic production.

Since the 1990s, the Netherlands has had a conversion scheme in place to support farmers who wished to convert to organic production. The scheme will come to an end by the end of this year if the evaluation of the current chain approach shows that the conversion scheme in its present form is no longer necessary.

The Dutch government realises that the market-oriented approach requires a change in mind-set. It is not the conversion of primary producers that is most important, but the strengthening of the organic chain. We are, however, firmly convinced that this approach offers the best guarantees in the long term for a strong organic sector.

Conclusions

By promoting co-operation between market players in the chain the government aims to strengthen the organic sector in the Netherlands. This co-operation is reflected in the chain agreements and a joint communication plan to improve consumer information. The government's job is to facilitate matters and to spur on the process.

The emphasis in Dutch agriculture policy has shifted from supporting the producer (the conversion scheme) to stimulating demand. The major market parties support the government's chain approach and the first results are promising. A first evaluation of the current chain approach will be made by the end of this year. This evaluation will make clear if and if so, in what form, a government conversion scheme is still necessary. The final objective of the current approach is ensuring that chain agreements will strengthen the organic market so that primary producers can be certain of adequate sales.

WAYS TO IMPROVE THE ORGANIC FOOD CHAIN: A CONSUMER-ORIENTED APPROACH

Bettina Brandtner and Erhard Hoebaus[1]

Abstract

Consumers' decisions on how their organic food is produced, processed, handled and marketed are key factors in the organic food production chain. Consumer attitudes, concerns and decision criteria on organic food are crucial points of departure for recommendations to the actors in the organic food chain for a consumer-oriented approach to improve and to bolster the organic production chain. At present, insufficient data or knowledge impede practical recommendations in some areas.

European study launched

A concerted action of institutions from seven European countries commenced in 2002 to identify consumers' values and concerns with respect to organic food, and to describe current production and control methods.[2] The concerted action aims at giving an overview of current practices and at establishing practical recommendations for all actors in the organic food chain.

Consumer criteria are surveyed by reviewing and compiling the results of existing local, regional and national studies on consumer concerns, needs, attitudes and responses to organic products, production methods, and marketing and distribution channels. Different consumer values towards organic food in different European regions are taken into account.

Current management and quality assurance related to the chains of production, processing, and distribution as well as to labelling of certified organic foods will be exemplary described and compiled. The detailed descriptions will cover selected commodity groups of organic food widely produced in the EU: wheat bread, fresh cabbage, fresh tomatoes, fresh apples, wine, fresh eggs, fresh pork, fresh milk, plain yoghurt.

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1. Ministry of Agriculture, Forestry, Environment and Water Management, Austria. The authors wish to thank Kirsten Brandt, project manager, for permission to present an overview of the concerted action.

2. Participants in the concerted action: Denmark: Danish Institute of Agricultural Sciences (DIAS), Royal Veterinary and Agricultural University (KVL), Kirsten Brandt, Project Manager. Italy: Institute for Food Science and Technology (ISA). United Kingdom: University of Aberdeen. Netherlands: Agro EcoConsultancy BV (Agro Eco). Portugal: Universidade de Trás-os-Montes e Alto Douro (UTAD). Norway: National Institute for Consumer Research (SIFO). Switzerland: Swiss Research Institute of Organic Agriculture (FiBl). Austria: Ludwig Boltzmann Institute for Biological Agriculture and Applied Ecology (LBI).

Each selected commodity will be analysed, using the procedures developed for Hazard Analysis by Critical Control Points (HACCP), for each of the following seven aspects of safety and/or quality: microbial toxins and abiotic contaminants; correspondence with traditional values about proper food; nutrient content and food additives; harmful micro-organisms; freshness and taste; natural plant toxicants and adulterations.

The assessment of each Critical Control Point will reveal the adequacy of current procedures for production management and control, and the range of current problems and opportunities with regard to improving the safety and quality of each commodity group.

Conclusions

The expected output of the concerted action are practical recommendations for improvement of procedures and control along the organic food chain to be given to the stakeholders involved (consumers, regulating bodies, sales outlets, distributors, producers and safety authorities). Relevant stakeholders (researchers, research policy makers, safety control units) will be made aware of identified research areas with insufficient scientific data for practical recommendations.

ORGANIC FOOD FOR PUBLIC INSTITUTIONS

Thomas Rech[1]

"Eating out" in Austria

"Eating out" is a growing trend, given the rising number of people working outside of their home, geographical and social mobility and the increase in single households. These days, families hardly ever come together at lunchtime to share a meal. "Eating out", because of its immense economic importance and trend-setting qualities, takes centre stage in the entire food industry. In Austria, an average of 3 million people go out for meals and drinks every day, that is, almost 40% of the overall Austrian population. Two million of them make use of different forms of industrial catering; about one million people visit restaurants. This also has a great impact on the ingredients and the way in which food is prepared, which is reflected in the cooking at home.

About one-fifth of what consumers spend on food goes towards eating out. This corresponds to a spending volume of approximately EUR 3.3 billion a year. As for industrial catering, food at the workplace plays the greatest role by far. Approximately 52% of all working people take their meals at their workplace. This is equivalent to about 80% of all those who get their food through industrial catering. At restaurants, as well as in industrial catering, there is a growing predilection for Austrian regional dishes and ethnic cuisine. The value-added share of "eating out" with respect to overall food production has doubled over the last ten years and now accounts for more than 30%. The food sector (including agriculture) in Austria accounts for an estimated 15% of employment, with the number of those employed in industrial catering rising constantly.

Structure of this sector

As for eating out, a distinction is made between industrial catering and restaurants. Industrial catering comprises both public and private kitchens at companies, institutions and schools as well as food delivery services. In contrast to the gastronomic sector, providers of industrial catering services usually "cater" to consumers' desires and tastes to a much lesser extent.

The structural separation of home and work led to changes in family structures, which have also affected, in particular, demand for catered food. Among other things, we need to mention the increase in the number of working women. While in the past women would be in charge of preparing meals for their families, in addition to caring for relatives that require special attention, these tasks are now being fulfilled, more and more, by companies and public institutions.

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1. Ministry of Agriculture, Forestry, Environment and Water Management, Austria.

Eating at one's place of work, without having to leave it (self-catering), is the most common form of "eating out" — 25% of people do that three days a week; another 10% at least once a week. The second most common type is eating at industrial-catering institutions (cafeterias or canteens at companies and universities or institutions) — used by 12% at least three days a week and 22% at least once a week.

Among those that eat at home at least occasionally, the age group of up to 30 years is the one group represented most prominently, with respect to all different types of locations and variations. The marketing of products also entails the selective conveyance of certain corporate philosophies and attitudes that are closely linked to gastronomic culture. Concomitant qualitative interviews with selected representative companies specialising in "eating out" have shown that health considerations play an important role; it is primarily about improving the products in terms of nutritional physiology. Much importance is also attached to taste and the pleasure of dining. However, price does not seem to be the decisive factor. For better quality, customers will often accept higher prices.

Institutions of industrial catering (companies, schools or other training facilities) offer, for the most part, partial service (lunch and/or snacks), which covers about 30% to 50% of a person's daily requirements. Full service is mainly offered by old people's homes, hospitals, barracks and penal institutions. Public institutions with a particularly high demand for food services are schools, military and old people's homes.

Growing demand for different types of industrial catering resulted, in particular in combination with rising personnel costs, in an increase in the use of convenience products (finished products, frozen vegetables, etc.) and in the establishment of centralised industrial catering outfits, which are capable of supplying a large number of customers because of new methods of preservation and distribution. For example, companies with a small number of employees and public institutions frequently have their meals catered by specialised firms. The Austrian catering market is characterised by a high level of concentration. A few large catering companies (for example, Gourmet or Wigast) supply most of the companies and institutions that buy their meals from the outside. Other catering companies are generally of local importance only. Attempts by foreign catering companies to gain a foothold on the Austrian market have failed so far due to regional differences in taste.

Why should industrial kitchens use organic food?

The increased amount and variety of organic foodstuffs in the past few years has made it possible and practical to use organic food in industrial kitchens. The market volume amounts to approximately EUR 240 million. Since public institutions such as hospitals, government facilities, old-people's homes, day-care centres and schools are to lead by example, and because organic food is viewed positively by large parts of the population (especially among the educated), the political interest in organic food is significantly growing. Additional reasons for using organic food at public institutions:

- Implementation of the Kyoto Protocol and compliance with environmental requirements: industrial agriculture is responsible for about 2.3 tonnes of CO_2 emissions per hectare. This also includes the high rate of fossil energy consumption needed to produce mineral fertilisers. Compared to conventional agriculture, organic farming helps to reduce CO_2 emissions by 60%. Organic farmers can achieve this by not relying on mineral fertilisers and imported fodder.
- Consumers demand food produced "without chemicals".

- Consumers demand meat from farms where animals are treated humanely.
- Consumers demand food that is considered healthy.

Examples of organic products at public institutions

Feasibility study on maximising the use of organic food in industrial kitchens of Vienna hospitals[2]

A pilot project conducted at the Rosenhügel hospital over a period of six months has shown that the monetary share of organic food can be increased substantially. In day-to-day business, tests were carried out to determine whether cereal products, meat and sausages, fats, dairy products, fruit and vegetables from organic farming might be able to find their way on to menus in a large way. The share of organic vegetable products increased by more than 50%. All the pork and beef used was organic; with respect to meat and sausages, organic products accounted for 78% and 85% for grain and cereal products. The organic share for fats and for milk and dairy products increased to 65%.

The study also showed that the quantities of organic food available on the market would be enough, across almost all product groups, to supply all Vienna hospitals. Organic beef, in particular, is available in sufficient quantities in Austria, provided that not only the best pieces are processed, but also other parts of the animals. With respect to organic fruit and vegetables, however, supplies cannot be guaranteed for the entire year and in sufficient amounts due to growers' seasonal dependence and distribution problems. In addition, the lack of organic convenience products (*e.g.*, frozen food) explains why frozen organic vegetables, for example, are hard to find during off-season, and if found, they would be very expensive and subject to very long transport routes. Increasing demand has already resulted in a significant rise in the organic convenience products on offer.

The cost increase per meal was lower than one would have expected based on the prices for individual organic products. This was made possible through a policy of skilful purchasing and through the fact that regional and seasonal availability was taken into consideration. On average, meat and sausages, for example, are 30% more expensive. Shorter cooking times have led to fewer material losses, thus making it possible to compensate for the premium by more than 10%. Additional savings came from the reduction in the portion size of meat for reasons of nutritional physiology. The market prices of milk and dairy products are only about 5% higher than the prices of products from conventional agriculture.

Further savings may be derived, in particular, from reducing the use of convenience products, because the additional personnel costs for processing raw products is often cheaper than the use of finished products. This was an essential aspect in assessing the situation based on economic factors: labour input helps to save money. The input of labour for kitchen activities such as preparation of salads, as well as the seasonal adjustment of menus, can lower the costs by reducing the number of purchased finished products.

Streamlining kitchen staff is economically counter-productive from this point of view. The additional personnel costs resulting from the use of less-processed foodstuffs amount to about 17 cents per patient and day. However, the savings potential from reducing the use of convenience products accounts, on average, for more than 50 cents per patient and day, with an organic share of 50%.

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When looking at the results from an economic point of view, it becomes clear that it is possible to increase the share of organic products to 30% for industrial kitchens without any substantial increase in cost, provided that the better quality meat is taken into account with respect to cooking; that meat portions are reduced by 2 to 3 decagrams; and provided that vegetable and fruit are included in the menus according to their seasonal availability. Leaving the aforementioned measures aside would increase the costs of food input by about 17% per patient and day. If the accompanying measures are used in a reasonable way, achieving an organic share of 50% with a cost increase of about 20% will be a realistic goal; if savings potentials are ignored, the costs will rise by more than 30%.

If the costs for repairing environmental damage, which arise in connection with the rehabilitation of intensively, industrially farmed land (conventional agriculture), such as the purification of drinking water, are taken into account, for the purposes of cost transparency, the use of products from organic farming may be significantly more economical. The project shows that the share of organic food can be increased to about 50% without any special problems.

Organic food used by industrial kitchens; pilot project: "Residential home, Saggen", Tyrol[3]

The input of regional organic products from Tyrol amounted to 53% of total sales at the Saggen old people's home during the trial year. This input was offset by cost increases of 10% of the total budget for meals (not excluding beverages). But it is important to note that the number of meals provided also increased during the project's time frame due to strong demand for organic products.

Within the organic product groups, the highest price hikes were found for eggs (46%), followed by pork (25%), veal (21%) and potatoes (18%). The price increase for baby beef is low, at 7.8%. By purchasing fully rendered animals, ready for processing in the kitchen, the workload increased on some days, but it also helped to keep the price increase low, as compared to conventional meat. The frying losses of organic meat are also smaller.

In order to keep the residents of the home happy, it was necessary to make only a relative small number of changes to the menu. The kitchen of the Saggen home had already switched to fish products before the start of the project, and so it was possible to meet this requirement for the most part. The actual changes had to do, mainly, with improved product quality and higher product safety. There were no serious problems with delivery; the experience with all the suppliers was positive throughout. The various requirements of regular supplies resulted in closer co-operation among farmers.

In conclusion, the product exchange for eggs, potatoes and dairy products was relatively free of any problems; with meat, it was somewhat more difficult. Sticking to the budget seems easier if whole animals, fully rendered and ready to be processed, are bought, rather than individual parts. Direct deliveries by farmers (including commercial contract processing) constitute another requirement for minimising costs. But this requires even better co-ordination among producers. The newly formed trading co-operative of farmers, "Bioalpin", can make substantial contributions to this.

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"Organic food for industrial kitchens" initiative — purchasing group Tulln[4]

February 1999 saw the launch of the pilot project "*Bio in der Großküche*" (Organic Food for Industrial Kitchens) in the region of Tulln (Lower Austria) as well as the creation of a purchasing group that comprises the following partners, feeding a total of 1 500 people a day:

- two hospitals;
- five old people's homes;
- the regional fire-brigade school in Tulln; and
- the vocational college for agriculture.

A special driving force behind the purchase of organic products is species-compatible animal husbandry. This is why almost all animal food is also nearly completely organic.

Organic farmers and regional traders participated in public tenders and placed their organic bids. The highest organic bidder was awarded the contract for a year. Apart from the goods put out to tender (meat, dairy products, baked goods, potatoes, and eggs), seasonal fruit and vegetables as well as juices and, occasionally, carp, duck, and pasta are bought from organic producers in Tulln. For special occasions, there is also beer, wine and sparkling wine of organic quality.

Keeping all the employees of the institutions informed and motivated was a crucial pillar of the project. For example, each institution organised an afternoon information session for its staff. Those in charge of the kitchens visited suppliers — slaughterhouses, organic meat plants, organic dairy farms, organic mills and pasta producers, growers of organic vegetables and farms — in order to get a first-hand look at the production process. At monthly training sessions and at regular meetings at the local pub, kitchen managers discussed, among other things, the different possible uses of organic food and organic labelling. Attention is drawn to the special organic offerings using appropriate decorations in the dining halls, specially designed posters, table banners/stands, folders and special notices in the menu. Senior citizens from the old-people's homes take part in trips to their suppliers of organic food. Patients and their families are kept informed of promotional events for organic products.

During the period under review, from May 1999 to December 1999, the additional costs for total food purchases accounted for 8.4% — organic food for 51%. The fact that the purchasing group required larger quantities allowed for more attractive prices. Lower material losses from cooking, and thus a higher yield, smart menu-planning and the use of seasonal offerings were the factors leading to such relatively low additional expenditure for kitchens.

All the organic product groups offered were given top grades by about 1 500 diners. They especially emphasised the quality of fruit, vegetables, potatoes, meat (which was especially tender), and dairy products. For that reason, organic food became the norm at the nine institutions. Currently about 40% of the input is organic. The project "*Bio in der Großküche*" was managed by the association "*ERNTE für das Leben*" and "die umweltberatung" of Lower Austria. In addition, it was financially supported by 5b subsidies of the EU, the Austrian Federal Government and the Federal Province of Lower Austria. The project lasted from October 1998 to February 2000.

4. Project initiator: "die umweltberatung" (Environmental Consulting), Lower Austria, oesterreich@umweltberatung.at: www.umweltberatung.at/. Organic-food association: "ERNTE für das Leben" ("HARVEST for life") bundesverband@ernte.at.

Practical tips on using organic food in public institutions[5]

(a) Planning must be done jointly: The general acceptance of organic food depends on the commitment of kitchen teams. Discuss your ideas in the course of preliminary talks with staff and opinion-formers related to kitchens, administration, works council, dietary services, and teaching staff.

(b) Start by choosing the right organic product: Putting together a complete organic menu will be very demanding on suppliers and the kitchen organisation. Start gradually by using uncomplicated organic products, which will result in acceptance among staff and guests; this will help to build trust in the quality of organic products and to professionalise supply.

(c) Give preference to regional food: Regional food products, which can be readily supplied, are ideal for starters. Depending on your region, a starter product could be pasteurised milk, potatoes, vegetables, or baby beef (from suckler-cow farming).

(d) It is all about seasons: In spring and summer, we particularly prefer crisp salads and fresh vegetables. Salad buffets are therefore quite popular at cafeterias. The absolute favourite is the vegetable buffet. Three to four carefully prepared types of organic vegetables a day will make for variety and may be used, depending on a person's personal taste, as a side-order or a main course. Autumn and winter are the perfect seasons for switching over to meat. Of course, beef is available all year round, while special promotional weeks of organic beef may be highly attractive in winter, it cannot be ruled out that such a campaign may flop in the middle of summer. Carp is available from autumn to spring. Spring is also the ideal time for sampling lamb or rabbit. Poultry is available all-year long. Dairy products, too, are in season all the time.

(e) Introduce organic components step by step: Existing industrial kitchens should introduce organic components gradually. This makes good economic sense, because it keeps additional costs with respect to purchasing and the kitchen within acceptable limits. The higher prices for organic products will have only negligible effects on menu prices. It would be more practical to introduce organic components throughout all the dishes on the menu, rather than create entire "organic menus".

- Benefits for the kitchen: The new business relationships can be developed gradually. The existing order system can be maintained, because the number of suppliers stays the same.
- Benefits for suppliers: Ordering larger quantities of a certain product facilitates delivery. In addition, prices can be set at more attractive levels if there is a purchasing guarantee.

(f) Measures to reduce costs when putting organic products on the menu:

- Buy seasonally — make use of the products on offer at any given time;
- replace individual menu components — this will be easier on your budget than developing entire organic menus;
- offer inexpensive meat stews and vegetarian dishes;
- reduce the size of meat portions in favour of vegetables and side-dishes;
- substitute veal with organic baby beef;
- do not only use the expensive fine pieces of animals;
- use expensive convenience products selectively only.

5. Prepared by the ERNTE association and "*die umweltberatung*": www.biokueche.at.

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