

THE FUTURE OF ORGANIC FARMING IN EUROPE: A SCENARIO ANALYSIS¹

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Introduction

Scenario analysis has been developed in the managerial literature as a tool for systematic strategic thinking and planning, in order to identify market relevant factors and to examine the interaction of current trends and uncertainties within a given market domain and time frame. Typical application range from corporate forecasting studies, strategic definition of complex ill-posed problems, option planning and crisis management. Scenario analysis hinges heavily on qualitative information and soft data.

Concerning the organic market sector, the lack of statistical data coupled with exponential growth of this market make the use of traditional forecasting techniques practically impossible, while scenario analysis enable to 'bound possible futures' on the basis of expert assessments generated through interactive brainstorming procedures.

This paper investigates the opportunity and potentiality in terms of policy option planning of developing scenarios using fuzzy logic, in order to exploit all the information deriving from linguistically defined variables/systems. The resulting fuzzy scenario analysis operates according to the general fuzzy rule-based systems scheme, hence requiring the definition of a suitable fuzzy rule-base, an inference engine and a de-fuzzification interface. The reader interested in the formal and theoretical aspects of the model can refer to Zanoli et al (2000) for more specific methodological details.

Here, the focus is mainly on the results of scenario analysis to EU organic market in 2010, showing five major possible forms that the European market for organic products may have assumed by 2010.

A discussion of the policy implications of specific developments in distinct scenarios concludes the paper, showing how scenarios might provides policy makers and organic market actors with a powerful tool for devising policies and strategies suited to the circumstances that may arise.

Defining scenario analysis

Scenario analysis is a way to define a suitable strategy for forecasting problems in complex and fast growing social system, and was originally developed for military strategy purposes.

In the words of Kahn and Wiener (1968), a scenario is an "hypothetical sequence of events constructed for the purpose of focusing attention on causal processes and decision-points"; Huss (1988) considers that a scenario is a descriptive narrative of a set of relevant factors that describe – from a probabilistic point of view – alternative representations of future economic conditions³.

Scenarios are an innovative approach with respect to standard time series and cause-effect deterministic models, which are usually based on extrapolation of future trends from the past, and

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³ For an introduction to scenario analysis see also Bunn-Salo (1993), and Schwartz (1992).

are more suitable to describe future states of highly complex, innovative and fast growing economic systems.

The basic aim of scenario analysis is not forecasting the future, or fully characterising its uncertainty, but rather bounding this uncertainty.

In this sense, scenarios may be seen as complementary to traditional forecasting and simulation techniques, in order to provide a composite picture of future developments for use as the background for policy-making and/or strategic planning.

In general, scenario analysis can be considered as an anticipatory (or *proactive*) strategic planning tool, and may be used as a support for policy making and public choice.

A brief overview of the methodology used

Three main methodological categories of scenario analysis can be identified: intuitive logic models, trend-impact analysis and cross-impact analysis, the former based on a intuitive and qualitative approach, and the other using more formalised models.

Concerning the application of scenario analysis to organic farming in the EU, the lack of detailed quantitative information about organic product market in Europe, together with the almost total lack of official statistical data for most of the European countries, imposes the use of qualitative information for the scenario analysis set up. Nevertheless, the aim of this research was to obtain a structured model of the organic farming system in the EU, which required a more analytical approach with respect to standard intuitive logic models. Fuzzy logic⁴ was therefore used to define qualitative variables in a cross impact context, allowing to reach a mathematically formalised model starting from qualitative information (see for more details Zanoli et al 2000).

The model is mainly structured distinguishing between external and internal variables: external variables are key factors acting as driving forces, influencing without being influenced by other variables in the organic market system, while internal variables are key factors influencing and being influenced by other variables in the organic market system. The relationships and causal links among variables provide additional information about how internal and external variables are interrelated. As a result, a range of complex interdependences was identified and mapped out in the form of influence diagrams, and defined in terms of a fuzzy rule base. A general overview of the scenario model is given in Figure 1 according to the general categories within which variables have been classified⁵.

The model was tuned to provide information about the evolution of the system by the year 2010.

All the information about the relevant variables and the nature of the relationships among them was raised from a panel of social scientists in the field of organic farming and belonging to various EU academic institutions, in occasion of a more general policy analysis project funded by the European Commission.⁶ Repeated meetings with the panel of experts were held over a three year period, in order to collect all the necessary information, and to reduce it to a manageable form with the support of brainstorming techniques and of decision making methods, like the Analytical Hierarchy Process (AHP) developed by Saaty (1980).

The result was the individuation of the list of variables described in Table 1, and a set of more than 200 fuzzy rules linking the variables. Each variable was allowed to assume two or three qualitative values (e.g. the variable “CAP reform” was assigned the three states “unfavourable”, “slightly favourable” and “highly favourable” to organic farming) which were easily converted in real number using standard fuzzy logic membership functions.

⁴ For details about fuzzy logic and fuzzy models see among others Zadeh (1978)

⁵ More detailed influence diagrams concerning single variables interactions are available in Zanoli et al (2000)

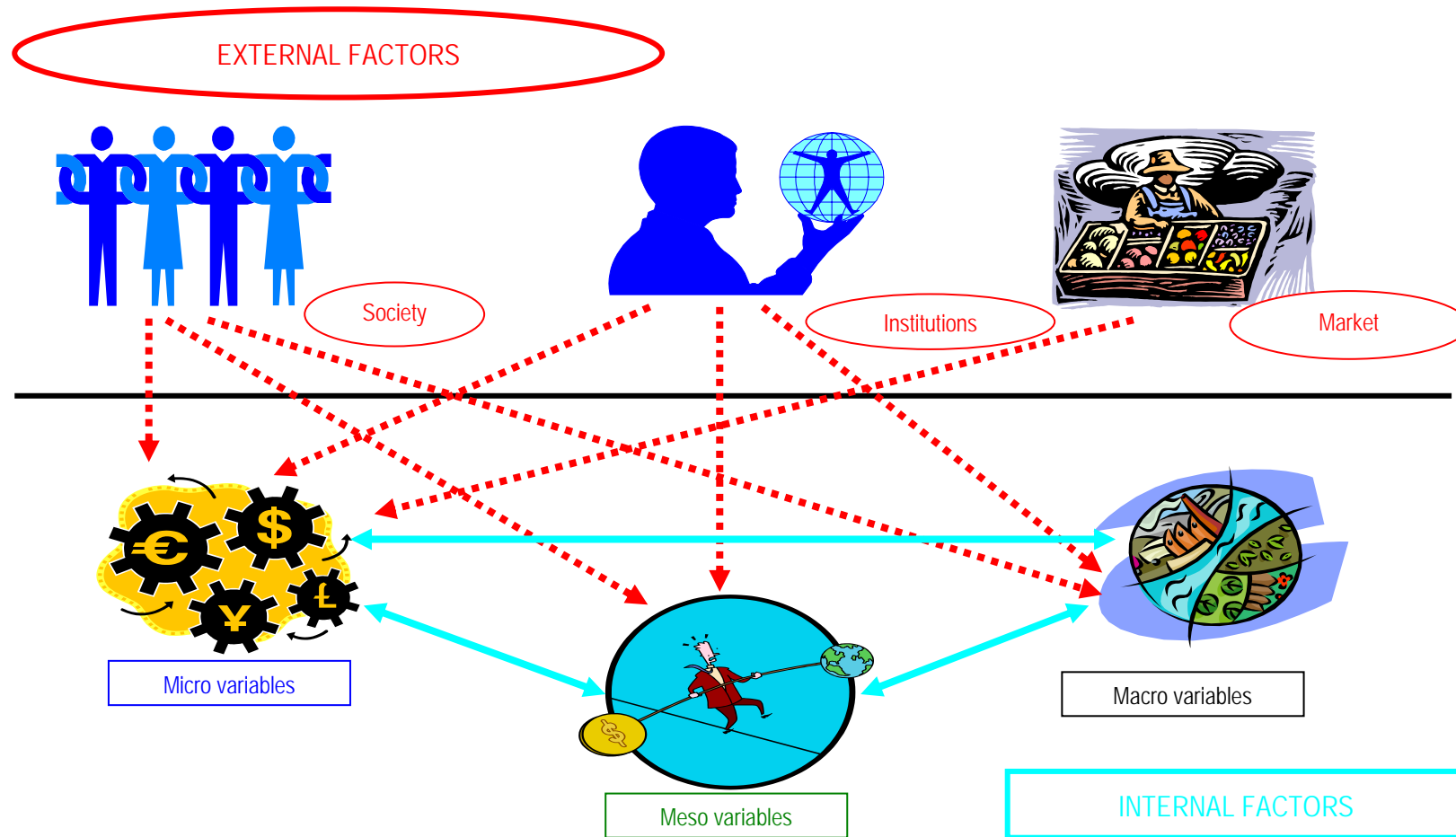
Note that for a more easy understanding of the model structure, external variables have been classified into three major domains: Society, Institutions and the Market. Similarly, internal variables are grouped in three sets according to the reference domains they relate to: micro-variables, which broadly refer to the core neo-classical micro-economic model of a competitive market; meso-variables, which relate to societal, institutional or market linkages between the micro-economic agents (firms and households) and the macro-environment; macro-variables, which refer to the so-called “macro-environment” defining the broad set of rules to which the market operators (firms and households) are bound in their interaction.

Table 1 - Key influence factors in the European market for organic products

External variables:	Internal variables:
<p><i>Societal domain:</i> Food scares Consumer confidence Farmers’ altruistic concerns</p>	<p><i>Micro-variables:</i> Domestic demand for organic products Domestic supply for organic products Consumer price for organic products Farm-gate price for organic products Relative profitability of organic farming Intermediate standard products Processing and marketing capacity of organic farming</p>
<p><i>Institutional domain:</i> Controversial technological change in conventional farming Market globalisation CAP reform</p>	<p><i>Meso-variables:</i> Organic certification and labelling Availability of organic products Relative food quality Media coverage & profile Promotion & advertising of organic products</p>
<p><i>Market domain:</i> Consumer price of conventional products Farm-gate price of conventional products</p>	<p><i>Macro-variables:</i> Political climate towards organic farming Agro-environmental policy Direct producer support of organic farming Market development indirect support Technological change in organic farming Knowledge system in organic farming</p>

Source: Zanoli et al., 2000

Figure 1 - General framework of the organic farming scenario model



Source: Zanoli et al (2000)

The scenarios

The basis for the scenario generation process is the definition of different combination of the external variables states, that activate alternative evolutions on the entire system of variables according to the linkages among variables defined in the fuzzy rule base.

Though the potential number of possible scenarios is high, reflecting all the possible combinations of the variables states, to help the interpretation of the results it is necessary to individuate a limited number of consistent and highly contrasting combinations, that might broadly cover the main possible evolution of the system.

Five different combinations of external variables (of which three had two variants) were considered enough to cover a sufficiently wide range of possible futures, and generated accordingly five scenarios, that were labelled Gloomy liberalisation, World Trade Boom, Business as Usual, Fortress Europe, and Organic Paradise, reflecting the overall situation they represent.

Table 2 shows in detail the starting hypothesis for the various scenarios; note that the Current State column describes the situation of the external variables at year 2000, as it was perceived by the panel of expert.

In what follows, instead of presenting the evolutions of the single (internal and external) variables in each scenario, an overall narrative description of the results is provided, summarising the main aspects of the scenarios.

Table 2 - The combinations of the external variables in the various scenarios

External variables	Scenarios	Current state	Gloomy liberalisation	World Trade Boom		Business as usual	Fortress Europe		Organic paradise	
	Variables states			Consumers lose	Consumers win		Open to trade	Barriers to trade	Open to trade	Barriers to trade
Consumer confidence	low		(✓)	✓						
	average	✓	(✓)				(✓)	✓		
	high				✓	✓	(✓)		✓	✓
Food scares	low					✓		✓	✓	✓
	high	✓	✓	✓	✓		✓			
Farmers altruistic concerns	low	✓	✓	✓	✓	✓				
	high						✓	✓	✓	✓
Controversial TC in CF	decreasing	✓		✓		✓		✓		
	increasing	✓	✓	✓	✓		✓		✓	✓
Market globalisation	low							✓		(✓)
	average	✓	(✓)				✓		(✓)	(✓)
	high		(✓)	✓	✓	✓			(✓)	
CAP reform	unfavourable			✓	✓	✓				
	slightly favourable	✓	✓							
	highly favourable						✓	✓	✓	✓
Consumer price of CP	low			✓	✓	✓	✓	✓		
	average		(✓)						✓	
	high	✓	(✓)							✓
Farm Gate price of CP	low			✓	✓	✓	✓	✓	✓	
	average		✓							✓
	high	✓								

Note: When a value is intermediate between two states these are both indicated with (✓).

Legend:

CP = conventional product

OP = organic product

CF = conventional farming

OF = organic farming

The first scenario is labelled “**Gloomy liberalisation**”, and its purpose is to describe a dramatic impact of ‘unrestrained’ globalisation on organic farming.

The underlying hypothesis is that Europe experiences an economic crisis which brings about a fall in social welfare and in consumer confidence. Nevertheless, European consumers are still concerned about the quality of the food that they intend to consume and will therefore be worried about its effects on their health. In the austere economic climate described by this scenario, farmers seek to increase their incomes, giving secondary importance to environmental protection and social issues. Moreover, the social impact of technological changes remains invariant.

The removal of income support, the cancelling of agro-environmental programmes and the substantial deregulation have depressive effects on the organic sector. The overall effect is that of organic production deterioration so that organic products are no longer perceived as qualitatively better than conventional ones. In this hyper-laissez-faire climate, in which regulation is reduced or non-existent, demand for organic products shrinks, and these products are once again consumed only by an elite prepared to pay high prices, which in fact do not fall. The lesser availability of products and their high processing and distribution costs, however, erode producers’ profit margins.

In this situation, the supply of ‘natural’ or purportedly organic products (in the absence of adequate regulation and consumer protection) nonetheless remain stable, exploiting the confusion on provenance entirely to the disadvantage of ‘genuine’ organic products.

As a general effect, this scenario therefore is generally and enduringly deleterious to the development of organic farming, on both the demand and supply sides.

The second scenario is labelled “**World Trade Boom**” and describes the development of the European agricultural sector in response to a regulated increase in trade-liberalisation.

Two hypotheses have been considered concerning consumers reaction to globalisation: in the first one (named “consumers lose”) consumers display confidence in agricultural product quality and show no suspicion or resistance to technological changes in the agricultural sector, especially in the field of biotechnology and genetically modified organisms. In the second one (“consumers win”) consumers become increasingly aware of the importance of the quality of the food that they eat, and of the health implications of its consumption, given the high visibility of food safety issues in society. Likewise, consumers are more concerned about the effects of (bio-)technological innovations in agriculture, which gives rise to a broad debate with the chemicals and seed producing multinationals on one side, and consumers on the other.

The feature shared by both variants of the scenario is that trade liberalization is the key factor in economic growth; as a consequence scenarios generate a growth of GDP in Europe and stimulate consumers’ optimism concerning their future welfare. In this environment, profit maximization is the goal pursued by all economic actors; in general, the dominant cultural paradigm is oriented more towards utilitarian matters than towards altruistic concerns.

Both variants produce similar results, with a decline in demand for organic products and a depressive effect on the perception of the quality of organic products, compared with conventional ones. There is also a crisis on the supply side, exacerbated by the lack of research and development. This is not surprising in view of the unfavourable political climate, which has negative effects on policies in support of organic farmers and also on market development. In this situation, substitute products (like integrated agriculture products) maintain their market share.

The third scenario is a “**Business-as-usual**” one, and describes the development of the organic sector on the assumption that no significant change is made to the decisions arising from the Berlin agreement on Agenda 2000. It therefore presupposes a political climate slightly in favour of organic farming deriving from application EC Reg. 1257/99.

The scenario for organic farming is not encouraging. The farm-gate prices of organic products fall, with dangerous consequences for the profitability of organic farm business. This effect is exacerbated by the reduced amount of economic support provided for organic farming and for agro-environmental measures in general.

There are no product or process innovations in organic farming that might stimulate improvements in its production techniques or raise the quality of organic products over that of conventional ones. This situation and the poor quality of certification services deter the public and policy-makers from adopting a positive attitude towards organic farming.

Increasing globalisation (as a consequence of the lowering of barriers against free trade) on one side and the ageing population on the other, leads to reduced consumer confidence in economic and social welfare, but the population is extremely worried about the long-term effects of genetically modified food products and about other controversial technological changes in agriculture.

The overall outcome is medium-to-low demand, given the few product or process innovations in the sector, accompanied by medium-to-high consumer prices, given the low level of supply and the inadequate performance of the sector engaged in the processing and marketing of organic products. Compatible with this situation is a slight increase in the supply of substitute products.

The fourth scenario is named “**Fortress Europe**”, and concerns a general policy development in line with that envisaged by Agenda 2000, but with a general attitude in favour regulation concerning trade and globalisation. We envisaged two variants of this scenario, according to the hypothesised reactions by the World Trade Organisation (WTO) due to the cautious behaviour of the EU about market liberalisation.

In the first variant, the European Commission’s policy, is accepted as the basis for further WTO trade agreements. Given that an agreement has been reached between EU and WTO members, some market globalisation for agricultural products is achieved anyway, which is accompanied by the spread of new farming technologies – biotechnologies in particular.

In exchange for openness to imports and the lowering of domestic prices, support is given to small family-run farm businesses, on the pattern of the current version of the ‘Green box’. Given that this is a compromise, agriculture achieves relatively modest growth, although the consumer and farm-gate prices of food products decrease. This is accompanied by a moderate upturn in consumer expectations concerning economic growth.

There is a shift in the FEOGA budget towards spending for agro-environmental and rural development, and agro-environmental policy is boosted. The profitability of organic farms increases, while R&D stimulates technological progress which stimulates organic production. A drawback in this globally positive scenario is that the wide adoption of controversial technological innovation in agriculture increases consumer fears about the quality of food and its implications for human health, which becomes a central issue: as a consequence, consumer confidence in the quality of organic products increase, exerting positive effects on demand. The overall effect hence is that both demand for and supply of organic products grow, also on account of greater utilisation of organic products by processors and distributors.

In the second variant, domestic European policies on support for agriculture and rural development are not accepted at the WTO negotiations. Consequently, the Uruguay Round agreement is the only basis for definition of agricultural trade, and disputes conclude in frequent and increasingly harsh reprisals by foreign trade partners (above all the USA). As a consequence, trade globalisation takes place at a lower rate, causing a consistent but slow reduction in farm-gate prices – on both the supply and demand sides. The EU still plays a significant role in agricultural policy in general, hence also in agro-environmental terms, facilitating the control of controversial technological change innovation in agriculture.

Furthermore, public opinion is quite interested in food safety issues, though the lower consumer confidence about economic growth does not “pull” the demand for organic farming products. This is also because of a political climate which is slightly favourable for organic farming and which makes the certification system more efficient. But this is not accompanied by adequate efforts to promote organic products at both the private and public level, so that they remain largely unknown to consumers, who treat them with suspicion.

The supply of organic products increases but the organic market continues to be a ‘niche’ market.

The fifth scenario (“**Organic Paradise**”) presents the best (but still realistic) conditions for the development of organic farming. It also has two variants, according to the level of market globalisation and trade liberalisation assumed. Europe experiences a period of prosperity and economic stability which increases the level of consumer welfare and confidence. Consumer expectations concerning economic growth are higher and their propensity to consume consequently increases. Due to their higher standard of living, consumers are more interested in the quality of life, and this generates greater interest in quality food products and in environmental issues.

Worries about genetically modified products and other controversial technological changes induces growing numbers of consumers to buy organic products, which they perceive as safe and guaranteed. Concerning the farmers, the maximisation of profit is no longer their only objective, but it is accompanied by numerous other goals, among which is protection of the environment.

Both variants show similar results, the expectation is that trade liberalization will lead to a general increase in GDP and in welfare; in order to deal with the competition from non EU countries products’, European countries develop new production models which give priority to quality, and this favours organic products. In fact, domestic demand for organic products increases as well as supply, under the growth of the incentives provided by an agricultural policy very favourable to organic farming, and of high and generalised support for organic farmers. All the factors able to stimulate the supply of organic products are in place: greater research effort, better information and technical advice, and specific technological innovations. Because of the positive impact of organic farming on the environment, policy-makers are willing to assign organic farming a central role in the achievement of environmental sustainability.

In both variants the scenario is highly favourable to the increased supply of organic products, but demand grows more slowly.

Focussing on the performance of the organic sector and on the assumption about the macroeconomic situation and the economic policy, the results of the scenario analysis can be summarised as follows.

“Organic Paradise” and “Fortress Europe” are the two scenarios showing the best results in terms of organic farming development, and they share a similar approach to economic policy and international trade policy, where European Union institutions maintain an active role concerning agricultural policy. Nevertheless, they differ substantially as far as the hypotheses about the economic cycle are concerned, that is positive in the first case and negative in the second one.

On the other hand, the other ‘extreme’ scenarios – “World Trade Boom” and “Gloomy Liberalisation” share the common hypothesis of deregulated economic policy, although they differ in terms of the hypotheses concerning the economic cycle, that is highly positive in the first case, and recessive in the second one. Nevertheless, both scenarios produce similar results for what concerns the organic farming sector, showing the worst performance of both organic demand and supply.

The “Business as usual” scenario is also not particularly favourable for organic farming, though it is neutral and surprise-free in terms of both the economic cycle and economic policy.

Scenario analysis as a tool for policy option planning

Though the delineation of different possible futures could be considered by itself a powerful tool for policy makers, scenario analysis can be considered just as a propaedeutical step towards more in depth policy analyses (Zanoli et al, 2001).

In particular, scenario analysis results may be used to test the effectiveness and overall performances of different policy option, using a “windtunnelling” approach: scenarios become a sort of virtual world where it is possible to test the effects of different strategic policy options.

According to Van der Heijden (1997), a scenario-option matrix can be defined, where rows and columns represent respectively policy options and scenarios. The matrix elements can be interpreted as a measure of the degree of compatibility/attractiveness of the various options when analysed referring to the various scenarios. The degree of compatibility may be assessed in a qualitative way, using

numeric, linguistic or graphical marks; Table 3 is an example of scenario option matrix with symbols ranging from --- (lowest compatibility) to +++ (highest compatibility).

As a result, dominated options can be individuated, that is options that turn out to perform worse than any other in every scenario; also, it is possible to analyse in more detail which are the necessary conditions (i.e. scenarios) for an option to be effective and preferable with respect to the others.

The same approach can be used to investigate which actor or group of actors is likely to be more benefited or prejudiced by the various scenarios or by the different policy options.

A scenario-actors matrix and an options-actors matrix can be created to assess in a qualitative way the most favourable scenario(s) for the various actors, or alternatively the overall expectable impact of a single scenario across all the actors. Also, possible “dominated” or “most favoured” actors could be individuated, that is actors that will respectively suffer or benefit more than any other in each scenario. The information collected with the scenario-actors matrix can be used as a feed back for the policy options generation process, and may be integrated by that coming from the option-actors matrix. In this case the aim is to consider in detail how the range of options may influence the different actors, and the matrix is structured using options as column indicators and actors as row indicators (Van der Heijden, 1997).

To summarise, a policy options planning process based on scenario analysis can benefit from:

- an overall evaluation concerning how policy options might behave under different scenarios;
- an analysis of the possible effects of the scenarios for the main actors involved, showing critical areas for intervention;
- a clearer idea of the consequences that the policy options might produce for the actors.

Table 3: An example of Scenario-option matrix.

Policy Options	Scenarios		World Trade Boom		Fortress Europe		Organic Paradise	
	Business as usual	Gloomy liberalisation	consumers lose	consumers win	open to trade	barriers to trade	open to trade	barriers to trade
Option 1	++		-		+	++	++	+++
Option 2			-	-		+	++	+++
:								
Option j	-	+++	+	++			-	--
:								
Option n	-	+	++	+	-	--	--	---

Source: based on Van der Heijden (1997)

Conclusions

Two main conclusive remarks may be derived from this paper. The first one refers to the potentiality of scenario analysis as a tool for forecasting the future of the organic farming sector, and for assessing the possible effects of different policy options. In particular, our scenario model addresses the question of whether or not organic farmers and other organisations and institutions involved in organic farming are well prepared to face the uncertainties of the future as portrayed in our scenarios, helps policy makers realise the potential impact of some decisions on the future of organic farming in Europe, and why their decisions could have these effects and finally identifies the key driving forces which may be used to influence the future development of organic farming in Europe. Therefore, scenario analysis may be effectively used to offer alternative options to both policy makers and market actors in devising their strategic direction and translating new insights into actions.

The second remark refers obviously to the results of the model. They support the idea that, from a policy point of view, the crucial determinants of the future development of organic farming in Europe are basically connected to the agricultural and agro-environmental policy which will come into effect

after the implementation of Agenda 2000, and also to the effects of the globalisation process and to the results of the Millennium Round WTO negotiations. The other main factor to be considered, refers to the future perception and attitudes of consumers and society towards issues concerning food safety and the use of modern biotechnology in food production.

As a very general rule, the scenarios show how the organic farming sector benefits from a more regulated economic policy environment, while it seems less sensitive to the economic cycle.

Scenario analysis should be regarded as a learning and iterative process that may promote discussion and build consensus in shaping future policy options; a shared vision of the future of organic farming in Europe is the necessary framework for developing appropriate recommendations for agricultural policy after Agenda 2000.

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