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**Indicators on transition towards
sustainable agriculture**

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INDICATORS ON TRANSITION TOWARDS SUSTAINABLE AGRICULTURE

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ABSTRACT

In response to signals from society (including consumers and public authorities), many farmers change their practices to reduce their emissions to the environment. In addition, they also take efforts to improve animal welfare conditions and landscape features. Two types of positive reactions of farmers are conceivable. One is a more gradual approach, in which farmers step-by-step try to improve management practices. The second approach is a more radical one, and relies on the adoption of systems innovations by implementing new technologies.

This is the transition of the farm towards another type of farming, like organic farming, landscape farming or a high-tech precision farm. This radical approach might be chosen if a farmer is confronted with many conflicting problems, which can not be solved by individual, technical solutions.

Traditional pressure indicators, like nutrient surpluses or pesticide use are inadequate to understand major changes in farm structures. Moreover, there might be a time lag of up to five years before emission reductions are observed in response to changes in farm management practices. Other indicators are therefore needed to enable monitoring transition processes. In general the following steps can be distinguished in these processes, including (i) perception of the problem, (ii) images of the future, (iii) research and development, (iv) primary innovations in practise, (v) alterations of the system and (vi) institutional implementation. It can take several years from the perception of a new issue (like food safety) to the actual implementation of solutions or system changes. During this process the different steps can be monitored.

The problem perception might remain rather vague and may lead (combined with limited consensus in society) to a weak incentive for farmers. However, a clear problem perception, combined with a high consensus will most likely offer a stronger incentive for farmers to change their practice. An appealing picture of a new direction of the farm is a very important impulse for farmers. Several projects in the Netherlands showed farmers with a solid strategic plan for the future were better able to implement changes (with a higher profitability).

The current paper explores the experience gained from the Netherlands over the past couple of years to develop indicators on transitions towards sustainable agriculture.

KEYWORDS

sustainable agriculture, monitoring, transition, system innovation

INTRODUCTION

Based on signals from environment and society action is being taken by farmers, the food industry and governments to control harmful effects of agriculture on the environment. Actions taken by farmers can vary from minor changes in farm management up to the transition to a complete different farming system. However, the innovation might also take place beyond farm management practice, for example in the way the food chain is organised.

A farmer might opt for such an innovation when he considers that minor adjustments are insufficient to continue farming. This can be a positive choice, taken in a situation of relatively luxury (like quite a number of dairy farmers in the Netherlands who changed to ecological farming) or a more negative choice taken in a situation of economic crises.

Governments might also choose to initiate and stimulate a transition process, like has been done in the Netherlands. Faced with a number of fairly persistent environmental problems (increasing CO₂ emissions, loss of biodiversity, the disturbance of the nitrogen cycle), the Dutch government introduced a new long-term strategy in its fourth National Environmental Action Plan in 2001 (VROM, 2001). In this document the government chooses for “transition management” as a policy tool for a number of issues (including food production). This strategy requires large-scale institutional and technical changes within a context of uncertainty, complexity and integrated issues. This strategy might be seen as an elaboration of a number of principles as laid out in the OECD strategy document Policies to enhance sustainable development (OECD, 2001), like an integrative approach and long-term planning horizons.

The key of this transition is the development of new technologies and innovations which can lead to better production processes and make changes possible in the food chain and in consumption patterns. Different types of agriculture can contribute to this transition process.

This transition process has two characteristics, which are very relevant for the strategic choices in the transition process. These are uncertainty and the way values are incorporated in the process. The uncertainty is partly caused by the long time horizon of at least one generation and partly because many actors and aspects of life are involved, making it a very complex process. The way in which values are incorporated in this transition is crucial, since the incorporation of ecological and social values (besides the traditional economic values) is the key aspect of sustainable agriculture.

MONITORING THE PROCESS

In order to measure the progress of such a policy (or of the more spontaneous reaction of farmers on a changing setting) a different type of monitoring and indicators is needed than the traditional ones. This involves at least indicators at farm level to monitor responses by the agricultural sector. Indicators might also be required beyond farm level. Since the transition process has a long time horizon, it is not sufficient to limit the monitoring of the process to environmental indicators because there can be a large time lag between the onset of a transition and actual results in terms of environmental quality. Therefore, a kind of early warning indicators is needed, which can tell whether there is something happening. In addition, social indicators are needed to identify the responses by farmers to changes in societal demands and the transition towards sustainable agriculture.

SYSTEM INNOVATION PROCESS

In order to be able to see which kind of indicators could be used, it is useful to start with a description of the system innovation process. To evaluate the progress of such a transition process, the Netherlands Environmental Assessment Agency of the Institute for Public Health and the Environment (MNP-RIVM) has developed a framework (Ros and van Zeijts, 2003). In this framework six sets of activities in the society have been identified (see Figure 1).

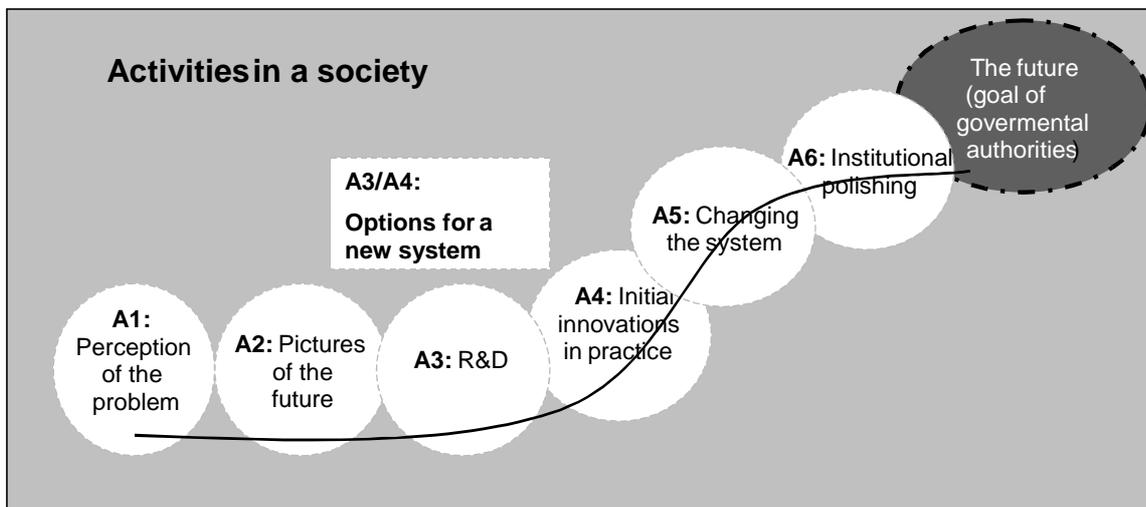


Figure 1. Activities in the system innovation process.

1. Perception of the problem

The extent to which problems are recognised by the parties concerned, with their corresponding priorities.

2. Pictures of the future

The stimulus of pictures of the system in the future for the parties involved in the transition process.

3. Research and development

Improvement of developments leading to new technological (and institutional) options for the future system, including the development time remaining, market opportunities and efficiencies, based on present knowledge.

4. Experiments in practice

The extent to which the first movers apply new options in practice, their successes and failures.

5. Changing the system

Measure 1: actions taken towards realisation of the desired new system.

Measure 2: the resistance to or motivation behind actions fitting into the transition process.

6. Final institutional polishing of the system

Intensity of control and the number of contraventions.

The activities as mentioned above can take place both in parallel processes as in (more orderly) serial steps. One of the major problems is that there might different processes happening at the same time. Some of the initiatives might finally end without any result, while others, still being humble right now, might turn out to be very important in the future. The first two activities (Perception of the problem and Pictures of the future) will be elaborated hereafter.

PERCEPTION OF THE PROBLEM

The overall problem always comprises a set of many related smaller problems. These smaller problems comprise all aspects of sustainable development: people, profit and planet. They also comprise short- and long-term aspects, as well as problems here and elsewhere. Although individual farmers will mainly experience short time problems which are nearby, they also face more long-term problems (Do I have a successor?, erosion, mortgages) and problems further away (influence of trade-liberalisation).

Many of these aspects are related, sometimes in win-win situations, but quite often in win-loose situations.

A survey of problems in agriculture and the food chain is presented in Figure 2. The survey serves as an example of the diversity of the overall problem and by no means pretends to be complete.

	People Social (or human) perspective	Profit Economic perspective	Planet Ecological perspective
Here and now	<ul style="list-style-type: none"> • food safety • effects of eating habits on health • odour nuisance on farms 	<ul style="list-style-type: none"> • vulnerability for veterinary diseases 	<ul style="list-style-type: none"> • ecological value of agricultural land • animal welfare • environmental quality with short-term ecological effects
Here and later (conditions relevant for the future system)	<ul style="list-style-type: none"> • vital societal structure for farmers • Dutch landscape 	<ul style="list-style-type: none"> • Reservation of agricultural land • agricultural knowledge 	contribution to environmental conditions: <ul style="list-style-type: none"> • eutrophication • acidification • groundwater • pesticides and herbicides
Elsewhere Now and later (people and profit in developing countries)	<ul style="list-style-type: none"> • influence on hunger in the world • virtual water use in countries with shortages 	<ul style="list-style-type: none"> • influence on the loss of soil quality worldwide • trade regulations • guidelines for food safety and environmental protection in the production chain 	<ul style="list-style-type: none"> • emissions of greenhouse gases • ecological footprint • risks of biotechnology

Figure 2. A survey of related problems in agriculture and the food chain using the sustainability matrix (VROM, 2002).

Agreement on the seriousness of problems and priorities is important for acting efficiently. It is clear that an individual farmer needs help and guidance in this process of priorities. Sometimes problems are conflicting, especially between the people – profit – planet issues, but also within. Moreover, many problems can not be solved on farm level.

PICTURES OF THE FUTURE

It is important to create an attractive picture of a better future as a stimulating factor to overcome future barriers. Again, agreement between the most important factors is paramount. However, as reaching agreement on vague goals is easy but not very meaningful; the agreement should be on the basis of well-defined goals, and at a later stage on a clear picture of technology and institutions. However, defining too many details in the early stage of an innovative process might discourage players in the field and hinder

creativity: this is why an optimum level of agreement must be found. This optimum will change with the progress of the process.

Figure 3 shows the situation in the Netherlands for a series of issues by the end of 2002. As might be expected, the goal impulses are, in general, stronger than the means impulses. Most transition processes start with goal setting. It is not a general matter of course to obtain agreement on the goals. This will require networking and participation. And goals are only the first step, for it is especially the clearness of and consensus on the technologies and institutions that allow a transition process to advance. In this respect one of the key issues presented in the fourth National Environmental Policy Plan in the Netherlands was to keep all the options open. This is only a good strategy in the beginning of the transition process. In later stages, this strategy is probably not very effective when important investments in a new system have to be done by a group of investors. These investors depend on each other to profit from their individual investments. They will only take action if there is agreement on a clear approach.

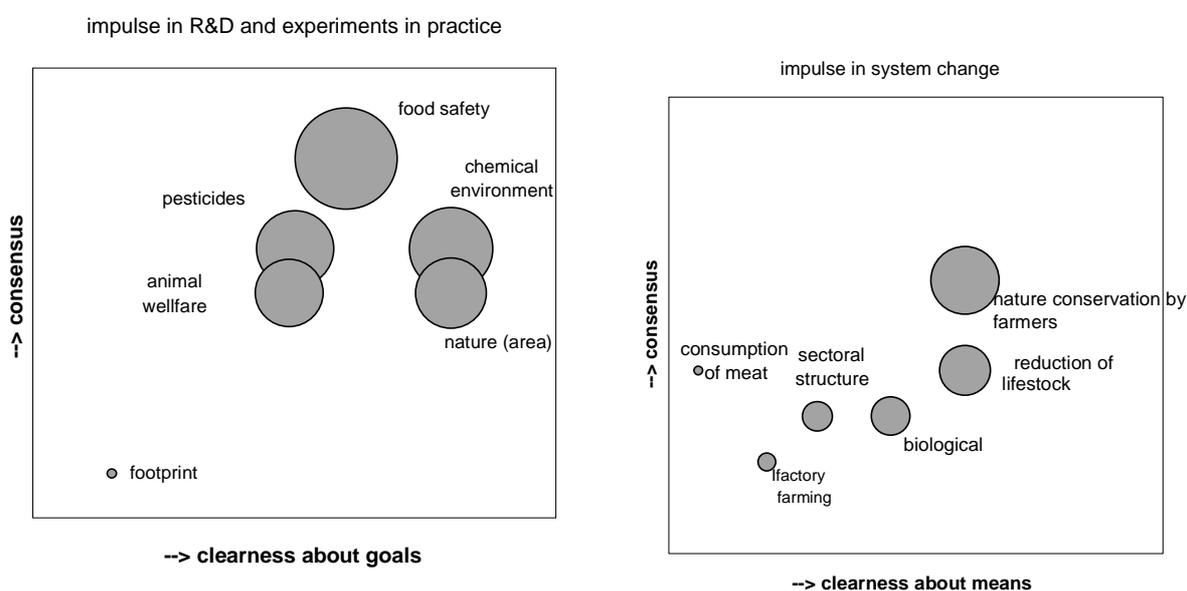


Figure 3. Impulse of future perspectives: the larger the circles the greater the impulse (Ros et al., 2003).

INCENTIVES FOR FARMERS

Farmers are expected to respond to signals from society. Evidence from the past indicates that economic incentives tend to dominate. However, other incentives need to be considered as well. These other incentives result from societal preferences for food, including a wide range of indicators regarding the region of origin, organic production methods, quality of food, as well as animal welfare and food safety issues. Societal preferences also build on farm characteristics, such as tradition and cultures of farming communities, long-term viability of a holding, respect for other people and the environment. A balance needs to be achieved along the range of features on the three dimensions of sustainability and they need to be incorporated in farm management practices. Market and price signals of course are vital to understand viability of agriculture, but such signals interact with indicators from the dimensions of people and planet. Essentially, the three dimensions of sustainability needs to be integrated at the farm, and farm management practices should match with them. Monitoring the three dimensions of sustainability will help to balance the three dimensions and strengthen the transition of agriculture towards sustainability.

Severe animal disease problems in the Netherlands during the past five years have stimulated a public debate on the future of livestock production. There is an increasing demand for better quality of food and agricultural production methods that meet such societal demands. Improvements on the balance between

the triple Ps need to be made, and indicators are needed that cover the three dimensions of sustainability. This effort is aimed to strengthen long-term viability and international competitiveness of livestock production in the Netherlands, taking into account societal demands regarding public concerns (e.g. animal welfare, environment and landscape features) that are interlinked with demands for quality of food.

SUGGESTION FOR MONITORING

We would like to suggest four directions of monitoring:

- (1) strengthen the development of indicators that cover the three dimensions of sustainability and allow for the balance between the dimensions of people, planet and profit.
- (2) extend farm management with indicators on development in farm management;
- (3) develop indicators to establish which kind of incentives farmers are experiencing;
- (4) pay attention to developments above farm level;

The three dimensions of sustainability

So far, farm management indicators have emphasised the economic and environmental dimensions of sustainability. Relatively little attention has been paid to the social dimension of sustainable agriculture. Yet social-cultural indicators will be increasingly needed to allow for the transition of agriculture towards sustainability.

Development in farm management

It is important to foresee future developments in farm management. This could perhaps be done by asking farmers an number of simple questions, e.g.:

- Is it clear which goals you have to comply to (now and in the future)?
- Are these goals achievable? What is the distance between the present situation and the goal?
- Do you have a strategic plan for the coming years?
- Do you have an idea of how your farm will look like in 10 years?

Another helpful indicator might be the level of education of farmers and the farmers' age.

Incentives for farmers

Market and price support programmes provide incentives to farmers to change their practice. Cross compliance measures, for example currently are implemented to put constraints to farmers for eligibility to receive direct payments. In addition, market incentives through contracts with the agrifood sector have gained importance over the past half a decade and they provide major incentives for changes in farm management practices. In addition, the internalisation of unpriced externalities has gained momentum, which contributes to the transition to sustainable farming.

Developments above farm level

As set out above, a number of different activities can be distinguished in the transition process. A number of these activities take place above farm level. It is important, but difficult to include progress in these activities in the monitoring program.

In the Netherlands, these indicators are still under construction, so any help on this subject is welcome. We also realise ourselves that we do not have yet a operational set of indicators available and that comparison of the progress in this process between countries is a difficult exercise.

Possible elements for such an exercise are:

- How is consensus between stakeholders on problem perception and future farming systems developing?
- How is R&D developing; what are chances on breakthrough of new technologies?
- Which technologies / and possible institutional innovations are being tested on farms? In which stage are these tests?
- How are factors that encourage or discourage system changes developing?

We feel it is worthwhile to work on an assessment of the present state of the transition process.

LITERATURE

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