Back from the Future: Towards Sustainable Glasshouse Horticultural in The Netherlands

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Abstract

The sustainability of the glasshouse horticulture industry in The Netherlands is determined by a number of different stakeholders, like government, society and consumers. Producers and representatives from these stakeholder groups may have different opinions about desirable development of production systems. The methodology of Sustainable Technology Development provides opportunities to bring stakeholders with different views together. This is done by identifying strategic problem perceptions among stakeholders, the creation of desirable and inspiring future visions, and backcasting from future visions to present day, which will clarify necessary actions. Several future visions were made for protected cultivation systems. Common elements are high-tech, high-output production systems in small scale multifunctional regions, like urban areas. Backcasting resulted in a number of promising research proposals. Stakeholders selected six promising projects, which will be carried out in 2004 and 2005. The results will contribute to more sustainable glasshouse production systems in The Netherlands. Another advantage of process oriented projects like this is the contribution to multiple stakeholder dialogue and social learning.

INTRODUCTION

Like other industries, the position and perspectives of glasshouse horticulture in The Netherlands is highly determined by government, society and buyers in the distribution chain, including consumers. Authorities define bottom-line conditions for horticultural production. Public and commercial organisations often require extra efforts, which have to be fulfilled to acquire a “licence to produce” and a “licence to deliver”. This leads to complex problems, which can not be tackled by single parties. Regarding to glasshouse horticulture, spatial planning and the use of fossil energy are examples of actual problems. These problems are embedded in existing systems and structures. Technological innovations are not enough to solve this kind of problems: balanced combinations of technological, social and cultural innovations are necessary. Producers, authorities, market parties and researchers should work together in the development of systems innovations for the development of a vital and sustainable horticulture.

This study was conducted to contribute to systems innovations for sustainable development of Dutch glasshouse horticulture, by developing a coherent program of research projects with a broad social basis. The main objectives were: 1. to obtain strategic views of different groups of stakeholders on Dutch agriculture in general and glasshouse horticulture in particular; 2. to draw pictures of horticulture enterprises in 2030, taking into account wishes and demands of different stakeholder groups; 3. to define research proposals, focused on critical factors in transition processes towards a more sustainable Dutch horticulture.

This study was conducted by order of the Dutch ministry of agriculture, nature and food quality (LNV). LNV asked Wageningen University and Research Centre (Wageningen UR) to develop programmes for the sustainable development of different agricultural industries, including glasshouse horticulture. In 2002 the research programme "Systems Innovations for Plant Production Systems" was started (Syscope, 2004). This programme contributes to desirable and sustainable plant production systems for the near and far future. The project described in this paper is a key project in this programme. The research programme "Future Livestock Production Systems" for systems innovation in animal production has a similar approach (Spoelstra, 2003). Besides the research of Wageningen UR, a number of projects on systems innovation in Dutch agriculture was done in order by the National Council for Agricultural Research (e.g. Van Oosten and Rutten, 2000; NRLO, 2000) and its successor "Innovatienetwerk" (Innovatienetwerk, 2004). Some of the ideas developed in the projects of Innovatienetwerk inspired our project, for instance "Glasshouse as a source of energy" (Houben et al., 2003). Furthermore, the Dutch national research programme "Sustainable Technology Development" can be mentioned. In this programme systems innovations projects were carried out in the fields of human nutrition, mobility, housing, water management and chemical services (Weaver et al., 2000; Van Kasteren, 2002). We used the methodology of Sustainable Technology Development in our project.

MATERIALS AND METHODS

One of the crucial aspects in systems innovations is to bring different stakeholders together, with different paradigms, desires and visions of the future. The Dutch national research programme "Sustainable Technology Development" (STD) proved that reasoning from future needs and functions is a good way to bring different stakeholders together (Weaver et al., 2000; Van Kasteren, 2002). Pictures of production systems in the future provide inspiration and create commitment for actions on present economical, ecological and social problems.

Sustainable Technology Development (STD)

The STD methodology is described in detail by Weaver et al. (2000). It provides a step-by-step working schedule (Fig. 1).

Step 1. The STD schedule starts with a strategic problem orientation. This orientation is done to clarify paradigms, demands and desires of different stakeholders. In face-to face interviews, respondents from production, government, technical supply, trade organisations, knowledge institutes and society were asked to give their opinion about present production systems. They were also asked to outline desirable production systems in the far future (one generation ahead, some 30 years from now).

Step 2. In the second step, the different visions are synthesised. This synthesis provides a starting point for creative sessions with stakeholders, in which future visions are visualised. Pictures of future production systems are drawn, including impressions of the surroundings and some interesting details, and stories behind these pictures are written down. The objective of these pictures is not exact realisation. The intention is that they give inspiration, that they provide directions for desirable developments.

Step 3. Backcasting reveals ways in which these visions of a sustainable future might be realised. In backcasting, pathways are described linking future visions back to today, with challenges and necessary actions in a logical time sequence. By reasoning back to present day, a set of possible actions is generated, which can be started today.

Step 4. Pathways and actions are analysed, further defined and evaluated. Experts on specific topics are consulted. Project proposals are defined.

Step 5. Projects proposals are selected by stakeholders. One of the most important criteria is commitment: stakeholders must be willing to contribute to the selected projects in time or money.

Step 6. Implementation: carrying out the projects.

Step 7. Dissemination and adaptation of the results.

Learning cycle

Going trough the stages of a STD project with a network of participants is also a process of social learning. The learning cycle of Kolb (1983) is useful for understanding learning processes. The elements of the STD methodology can be placed in the successive stages of the learning cycle (Fig. 2). Doing so will help the project management in setting up the project design and in the selection of participants. In the exploration phase the creation of diversity in opinions and ideas is necessary, and also creativity should be organised. In the next phase, analytical competencies are needed. The third phase requires a transparent decision making process, the fourth the right consortia to carry out actions.

RESULTS AND DISCUSSION

Step 1: Strategic problem orientation

At first, about 40 representatives of different stakeholder groups were interviewed, amongst them agribusiness entrepreneurs like growers, suppliers, and buyers; government representatives of different policy areas; several social groups like consumer organisations and nature and environment interest groups; and researchers from different knowledge institutes. They were asked to give their opinion and ideas on how agriculture enterprises should look like in Dutch society one generation ahead, some 30 years from now.

A lot of different ideas were found in which two dominant paradigms could be distinguished. The first group could be described as efficiency driven. A large number of respondents, among them most entrepreneurs, think of highly efficient, large scale production units, high-tech applications, production for the world market, and excellent logistical performance. The second group could be described as social driven. Some respondents, especially people representing social groups, think that small-scale production systems are more sustainable, embedded in areas with nature development and producing for local markets.

Step 2: Future Visions

Synthesis of these two main images has lead to the concept of “diagonal production systems”. Diagonal production systems are high-output systems using high-tech solutions, embedded in small scale regions with multifunctional combinations of horticultural production, housing and recreation. A two day workshop in April 2003 was organised to visualise diagonal production systems and to elaborate them with some critical elements. The result was a number of innovative plans for future plant production systems. Examples for protected cultivation are underground production, city horticulture and floating production units (Fig. 3). A plan was made for underground production of vegetables, mushrooms and ornamentals. Critical elements in this system are amongst others artificial lightning, transportation systems and optimal control of temperature, water supply and plant nutrition. For city horticulture, a shopping mall was designed in which horticultural production actually takes place, and even a complete village under a glass cover, providing opportunities for combinations of living, working and recreation. Important elements in this plan are social structures, artistic design and logistics. In order to cope with a dramatic consequence of climate change (flooding), a floating production system was designed. A lot of technical problems should be solved, but also some legal questions must be answered before this system could operate. The results of the workshop are described by Poot et al. (2003).

Step 3: Backcasting

In the next step the future visions were further analysed by the method of backcasting. This was done by addressing the question: Which parts in these future visions are critical for realisation (so called transition-points), but are impossible to realise at this moment? To gain better insight in the state-of-the-art and important developments of certain transition-points, a number of experts were interviewed, for example about city horticulture and about competence management. Based on the results of the backcasting process, a "long-list" of transition-points was made. Transition-points were classified in five areas: technique, rural & urban planning, entrepreneurship, transport & logistics, and management of transition processes.

Step 4: Defining projects

For the transition points found, research proposals were developed. This was done by addressing the questions: Which actions are necessary to fulfil the conditions relevant to these transition-points? Which knowledge should be developed, which technological, social and cultural innovations should take place? This exercise provided a long list of 28 research proposals.

For example. In one of the future visions, plants are grown underground. Therefore it was thought that highly efficient artificial lights are needed. The radiation from the lamps should satisfy the needs of the plants in an optimal way, so no energy is wasted. With existing lamps this is not possible, or at least not sustainable and profitable. A research proposal was written for the development of new types of lamps and research to clarify the exact wavelength needs of plants.

Step 5: Selecting projects

The long-list with 28 research proposals was presented in a workshop which was held February 2004. In this workshop, 32 representatives of different stakeholder groups made a selection of 6 projects. The most important criterion was commitment. Stakeholders selected projects in which they want to play an active role. Other criteria were the level of innovativeness and the contribution to more sustainable glasshouse production systems.

The selected proposals were:

1. Zero emission glasshouses: guaranteed no emission from energy, CO_2, water, nutrients, pesticides, artificial light, etc. from glasshouses.

2. Urban glasshouse cultivation: small scale combinations of living, working and glasshouse horticulture in urban areas.

3. Glasshouses as energy providers in an energy grid.

4. Alternative governance in glasshouse development: more governed by citizens and

consumers and less restricted by government laws (“from government to governance”).
5. Grower support systems: sensor technology and ICT replaces traditional grower competences.
6. Innovative biological production systems: glasshouses with high social values and excellent ecological performance.

Step 6 and 7: Implementation, dissemination and adaptation

In 2004 and 2005, the selected proposals will be effectuated in research projects. Although each project will be managed by itself and has it own group of participants and stakeholders, a lot of attention will be given to the coherence of the different projects.

CONCLUSIONS

The following conclusions can be drawn from our exploration of the future. It is possible to bring different stakeholders with different views on glasshouse horticulture together, by designing production systems for the far future, based on common shared needs and functions. This can lead to future visions that are inspiring and challenging. Reasoning back from future visions can provide realistic and feasible proposals for research and development. Selected projects are promising: stakeholders are committed and results seem to contribute to sustainable glasshouse horticulture in terms of profit, planet and people. With a multiple stakeholder process like this, participants are going through a process together, which leads to dialogue, mutual respect, commitment and social learning.

The selection of the right participants is important. In this project, most of the participants were entrepreneurs and researchers. It was hard to interest representatives of government and social groups. This probably explains the emphasis on technological topics in the selected proposals. But also for these more technological projects, a lot of attention should be paid on acceptance among stakeholders including government and society.

Keeping the developed future visions in mind is important when the projects are formulated, selected and carried out. There is some tension between long term visions and short term actions. People usually don’t have problems with sharing their “Jules Verne” visions of the far future. But they get more retained when it comes to commitment on projects starting today. Most stakeholders, especially entrepreneurs, will only participate when benefits are clear, goals can be achieved in short term and results will improve their competitiveness. An appeal on their values, desires and future visions might help to overcome this problem.

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Figures

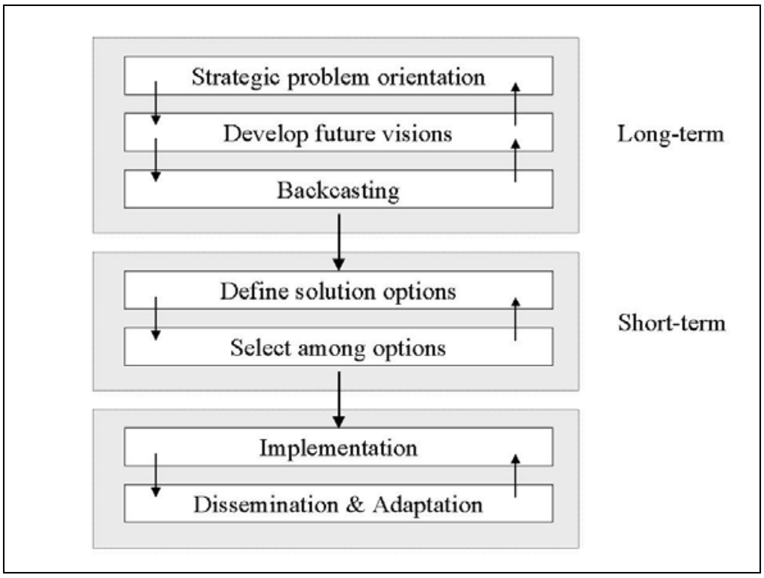

Fig. 1. The STD schedule

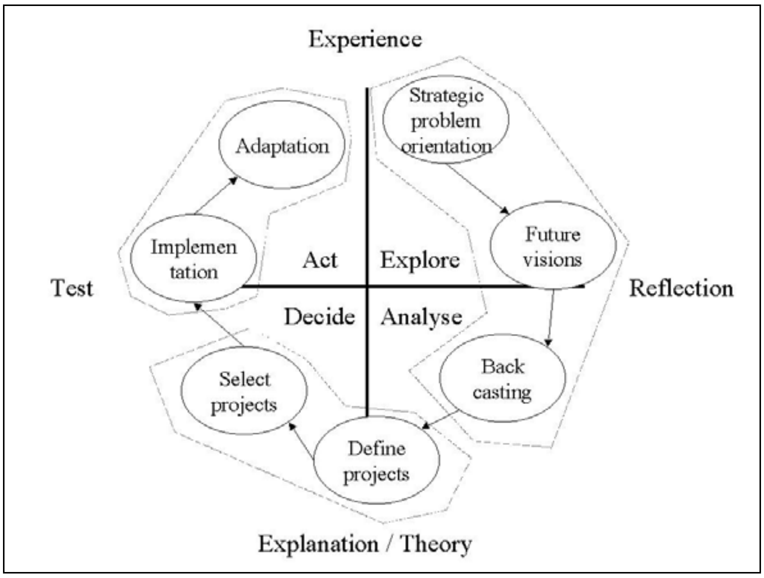

Fig. 2: STD steps placed in the Learning Cycle of Kolb

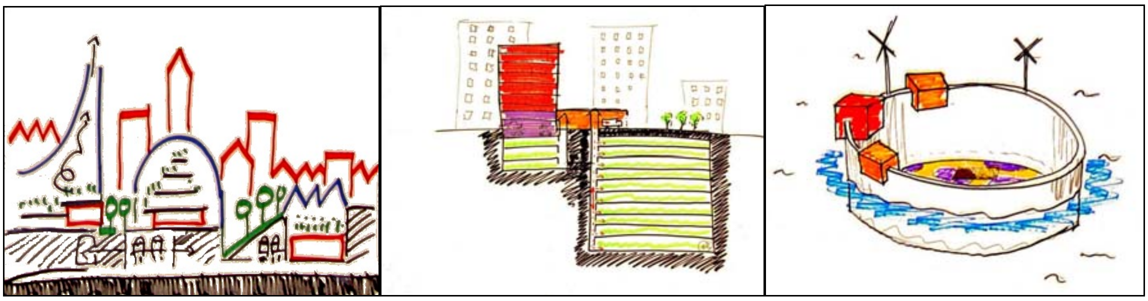

Fig. 3: Examples of future visions of protected cultivation systems