Chapter 11. Developing Sustainable Livestock Production Systems. Outline of a Learning and Experimentation Strategy (LES)

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Abstract

Over the past decade, the Dutch Government has increasingly emphasised the need for integral solutions to sustainability problems in the livestock production sector. This has led to the adoption of research approaches in line with Transition Management and system innovation that were developed in other domains. In 2008, the government set further policy targets of 5% and 100% sustainable livestock production at the farm level for 2011 and 2023 respectively. Policy measures included the stimulation of sustainable agriculture initiatives in the sector and demand for projects with a focus on system innovation. Two broad approaches may contribute to the realisation of these targets, the one top-down and the other bottom-up. Top-down approaches are usually research-led and characterised by the formulation of visions for future livestock production systems. At the same time, a broad variety of bottom-up initiatives are taken by farmers, who develop and try out new approaches to meet the challenges as they encounter them. Currently, the links between bottom-up and top-down processes are relatively weak. As both may contribute to system innovation, successfully combining the two approaches constitutes a crucial challenge. To this end we have developed what we call a “Learning and Experimentation Strategy” (LES) that is presented in this chapter.

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1. INTRODUCTION

During the second half of the 20th century, the evolution of livestock production in the Netherlands was strongly influenced by politics, policy and sector representatives. The main goal was to increase production efficiency, with a strong focus on export. Gradually, this modernisation process came under criticism for its negative side effects. Early critics emphasised the dangers of chemical pest and weed control, the emanation of malodours from livestock units and mineral surpluses. Later, the emphasis shifted to impaired animal welfare and to contagious and zoonotic animal diseases, especially after outbreaks of a variety of epidemic animal diseases in the past decade, including classical swine fever, foot and mouth disease, avian influenza and BSE. Recently, criticism has centred on livestock production’s contribution to climate change and its excessive drain on natural resources for food production.

Government policies have sought to resolve or mitigate these problems by stimulating research, subsidy programmes and regulatory actions. In most cases, these measures have led to specific problems being reduced through technical means and regulations for the livestock production system. Thus the agricultural system that had emerged during the first modernisation (Beck, 1992) met the first attempts at reflexive modernisation. The latter, however, also drew on various thoughts and approaches (hard and soft institutions) rooted in modernity. While the actors involved continued to increase production efficiency, they also tried to fine-tune inputs (nutrients, agrochemicals, manure, etc.) to meet societal needs.

The search for integral solutions has received increasing attention since the mid-1990s, which has led governmental policies to partially adopt research approaches in line with those of Transition Management and system innovation developed in other domains. In 2008, the Dutch government set the specific policy targets of 5% and 100% sustainable livestock production at the farm level for 2011 and 2023, respectively (LNV, 2008). Policy measures included stimulating sector initiatives for sustainable agriculture (sectoral ‘innovation agendas’), requesting projects with a focus on system innovation and societal design, and subsidising instruments for agricultural entrepreneurs and integral research.

Two broad approaches have evolved to meet the challenges faced in the livestock production sector: top-down and bottom-up. Top-down approaches are typically research-led and often start with the formulation of visions for future livestock production systems. These include redesigning primary production (Bos and Grin, 2008), the inclusion of new functions in primary production, vertical integration in the supply chain and combining the functions of different agricultural activities in agro-production parks (Grin and Van Staveren, 2007). The source of these visions for sustainability varies from expert analysis only, to extensive stakeholder consultation, to deliberate co-design by scientific experts and stakeholders.
At the same time, a broad variety of bottom-up initiatives is taken by farmers, who develop and try out new approaches to meet the challenges as they encounter them. Most of these initiatives are not guided by broad future visions and focus on specific aspects. Currently, the links between bottom-up and top-down processes are relatively weak. From the top-down perspective, bottom-up initiatives are even considered risky since they typically address a relatively small problem within the current system and might solidify the system rather than opening it up, whereas top-down approaches explicitly seek to change the system as a whole.

However, a system innovation can never be ‘organised from above’. It needs to draw on the ‘innovative energies’ within the existing livestock production sector, i.e. lessons learned in the bottom-up process. Successfully combining top-down and bottom-up processes constitutes a major challenge, which we address in this chapter.

Much research has been done on top-down approaches like Strategic Niche Management (Hoogma et al., 2002; Schot and Geels, 2008) and Transition Management (Rotmans, 2003; Loorbach, 2007). For this reason we focus on the bottom-up processes in this chapter but with the overall intention of combining this perspective with top-down approaches. We present a tentative framework to assess the potential of bottom-up initiatives, as well as top-down projects, to contribute to system innovation. This framework serves as a tool in a broad learning and experimentation strategy in which the lessons from top-down and bottom-up are combined in stimulating system innovation. We are currently (fall 2012) testing this framework in various sectors, and based on the findings we will modify and elaborate it for wider applicability.

**2. THE DYNAMICS OF SYSTEM INNOVATION**

The central issue in this chapter is how learning and experimentation in projects may contribute to system innovation. The traditional model sees innovation as a diffusion process: via innovators, early adopters, early majority, late majority and eventually laggards (Rogers, 1962). System innovations have also been described as a sort of diffusion process, distinguishing the following phases: pre-development, take-off, acceleration and stabilisation (Rotmans, 2003).

Although more recently extensive work has shown that these diffusion models are over-simplistic, they are still widely understood to be valid in policy arenas as well as scientific communities (e.g. Gielen and Zaalmink, 2003). Policy makers, after a successful project, immediately tend to ask the question: “And now, how do we scale up?” The so-called multi-level perspective (MLP; Rip and Kemp, 1998; Geels, 2002) provides a more dynamic view on innovation. The core of the MLP is that system innovations are shaped by interaction between three levels: socio-technical landscape, socio-technical regimes and technological niches (Figure 1). Socio-technical systems are located at the meso-level of socio-
technical regimes. These regimes indicate a set of shared rules that guide and constrain the actors within a production and consumption system in how they tackle the various challenges they encounter. This typically leads to evolutionary patterns of innovation. The socio-technical landscape is an exogenous environment of factors with a broader societal relevance, like the need to reduce CO₂ emissions. Technological niches are the breeding ground for radical innovations that initially fit the regime poorly.

In the MLP dynamic, system innovations develop as follows. A novelty emerges in a local practice and becomes part of a niche when a network is formed of actors that share certain expectations about the future success of the novelty, and are willing to fund and work on further development. Niches may emerge and develop partly in response to pressure and serious problems in an existing regime which can be either internal to the regime itself (such as animal welfare in industrial animal production) or come from the socio-technical landscape (e.g. the pressure to curb CO₂ emissions which affects more than just the animal production sector). The further success of niche formation is linked both to processes within the niche (micro-level) and to developments at the level of the

Figure 1. A dynamic multi-level perspective on system innovation (Geels, 2005)
existing regime (meso-level) and the socio-technical landscape (macro-level). Supported by actors willing to invest in the new concept (industries, R&D organisations, government) and initially protected from competition in the market place (e.g. through subsidies), the technology is improved within the niche, broader networks are formed around it, and more is learned about directions for improvement and the functions it may fulfil.

After some degree of improvement of the technology, and as more is learnt about its potential, it may come to serve for specific market applications, often typical segments that exploit new functional characteristics of the technology and focus less on cost structures (e.g. organic food). With further improvements, increasing reliability, and cumulated experiences and learning about its functionalities and potential applications, the technology can spread to other market niches and/or trigger the expansion of market niches. An important role is also played by processes of rule formation, such as the development of standards and regulations for the technology, and processes to reduce mismatches between the emerging technology and the rules of the dominant regime. As it starts to compete in or with main markets, the novelty may transform or substitute the existing regime and thus trigger a system innovation process.

This perspective allows for a very dynamic view on innovation processes, as its application to a variety of historical cases has shown. These studies, however, tend to focus on the vicissitudes of a specific alternative technology to an existing system (e.g. sailing ships replacing steamships; Geels, 2002) although the new technology does not simply spread but also changes in the process. While this is fine for retrospective studies, it is problematic to use as a heuristic tool in a ‘learning and experimentation strategy’ seeking to contribute to system innovation. We do not know which alternative development will play a key role in the shift towards a sustainable livestock sector. We need to acknowledge that ‘innovation in action’ is a lot messier than retrospective historical studies portray it. (See e.g. Elzen et al.; forthcoming).

3. PORTFOLIO OF PROMISES

In the MLP, niches are the core locus for learning about and further developing novelties. A niche consists of a variety of projects that share a technical nucleus, e.g. electric propulsion for cars (Hoogma et al., 2002). However, using the niche concept in a sector like animal production is problematic because innovative projects and practice initiatives are widely diverse. For instance, they may relate to new types of animal food, new manure collection technologies, new husbandry systems, etc. As mutual learning between these initiatives is often minimal, they do not fit the definition of a niche in MLP.

To address such innovations we will use the term ‘promise’. The term promise expresses the idea that each of these novelties has appealing characteristics from a certain sustainability perspective (e.g. lower CO2 emissions), but also has
problematic (e.g. more expensive) or unknown dimensions. Initially, a promise may just be an idea or a concept, explored in a single project. After a certain period of time more projects may follow in connection with the promise. When these projects start exchanging information the promise may thus develop into a niche.

Historical cases show that system innovations are not the result of the ‘massive diffusion’ of a new technology but a lengthy process of combining and recombining ‘partial innovations’. This implies that, to induce or stimulate system innovations, the attention should not be on a single novelty (or promise) but on a range of novelties that we call the ‘portfolio of promises’. In a project seeking to develop a new ‘integrally sustainable’ husbandry system for dairy cows (“Kracht van Koeien” (Cow Power); cf. Bos, 2009), we identify about a dozen such promises, including the separate collection and processing of manure and urine, a minimum space of 360 m² per cow throughout the year, cheap but sustainable roofed shelters (rather than a closed barn), etc.

For each of these promises a learning and experimentation process is needed to find out how problematic aspects may be resolved in practice, and to explore whether new sustainability problems are created. For an individual promise, even if it does not (yet) constitute a niche, the Strategic Niche Management (SNM) approach provides valuable suggestions on how to do this (Hoogma et al., 2002; Schot and Geels, 2008). However SNM looks at the level of a single novelty and not at the portfolio level, i.e. across a variety of niches in MLP terms. To make a more encompassing contribution to system innovation, we need a learning and experimentation strategy that works at two levels: the level of individual promises and the level of the portfolio of promises.

The **individual promise level**: because we are looking not only at technical innovations but also at new practices, new meanings, etc., it is important to make various stakeholders, to whom the experiment may be relevant, part of the network exploring it (e.g. the ‘roofed shelter network’ in the Cow Power project mentioned above). Because a wide variety of ‘partial innovations’ will be required for a system innovation, a large number of such networks will be required over a long period of time (as system innovation tends to be a lengthy process).

The **portfolio level**: because a system innovation will result from a process of combination and recombination of partial innovations, it is important to analyse how various promises might be linked to create a full system that is more sustainable than the existing one. Such an analysis at the portfolio level (the ‘portfolio integration’) may lead to new experiments with associated promises (thus creating a new, more comprehensive promise) or may offer feedback for ongoing experiments to include certain aspects based on the portfolio integration. Because a variety of promise networks need to be running for a longer period this portfolio integration should be a more or less continuous activity.
We call this combination of learning and experimentation at two levels the “Learning and Experimentation Strategy” (LES). It can be seen as a twofold extension of SNM: (1) it addresses promises before they constitute a niche and (2) it looks at a range of promises (or multiple niches in SNM terms). In the next section we show that LES also extends further than SNM (as well as Transition Management) by incorporating ‘top-down’ as well as ‘bottom-up’ initiatives.

4. TWO COMPLEMENTARY LES APPROACHES: TOP-DOWN & BOTTOM-UP

Historical system innovations have rarely been planned and they usually developed solely out of bottom-up processes. The idea of deliberately bringing about system innovations to meet societal goals (like sustainable animal production) is relatively new. In top-down approaches like SNM and Transition Management (TM), organised projects are crucial to achieving this. Organising projects, however, does not imply that the bottom-up dynamic has been halted, something, which is overlooked in SNM and TM. A ‘complete’ approach to invoking system innovations should combine the top-down and the bottom-up processes. We will discuss each of these below.

4.1. Top-down

Generally, top-down approaches are research-led and start with the exploration of possible sustainable futures (Hirsch Hadorn et al., 2008). The nature of such explorations varies widely and could be based on the extrapolation of trends, scenarios, dynamic modelling, elaborating visions and actions of co-design or ad hoc methods to define requirements for a future system without the limitations of the existing one. Future explorations serve functions like giving direction to short-term actions, a certain loosening up from today’s preoccupations and achieving openness and congruence among stakeholders about a future orientation. Smith et al. (2005) distinguish the following functions of a future exploration or vision-building exercise:

- Mapping a ‘space of possibility’: Visions identify a realm of plausible alternatives for conceiving of socio-technical functions and providing the means for them to exist.
- Serve as a heuristic device: Visions act as problem-defining tools by pointing to technical, institutional and behavioural problems that need to be resolved.
- Provide a stable frame for target setting and monitoring progress: Visions stabilise technical and other innovative activity by serving as a common point of reference for actors collaborating on its implementation.
Serve as a metaphor for building actor networks: Visions identify relevant actors (by inclusion and exclusion), acting as symbols that bind together communities of interest and of practice.

Provide a narrative for focusing capital and other resources: Visions become an emblem that is employed for marshalling resources from outside an incipient regime’s core membership (see also Rotmans, 2003; Loorbach, 2007; Berkhout et al., 2004; Brown et al., 2000).

In the Netherlands, the Sustainable Technological Development (STD) approach (Weaver et al., 2000) has gained considerable attention. It starts by constructing visions of a desirable future and then uses a method called backcasting to define short-term actions. Backcasting is carried out in interaction with stakeholders (Quist, 2007). The Transition Management approach follows a comparable methodology (Rotmans, 2003). Here a ‘basket of visions’ is developed with a variety of stakeholders, which are also ‘translated back’ into concrete projects in the near future.

In our view, these top-down approaches to developing the future are too planning-driven. Innovation in practice is a very messy process in which a wide variety of stakeholders are active and one of the challenges is to use the ‘innovative energy’ that is already there. To achieve this, we have been involved in vision-building exercises with sectorial stakeholders for various livestock sectors, including laying hens, broilers, pigs and dairy cows. Most of the time the visions take the form of a report or brochure outlining the general ‘contours’ of more sustainable husbandry systems for a sector along with concrete suggestions for various ‘sub-systems’ (the ‘promises’). Via various communication outlets we made these images widely known to the sector and invited farmers to try and implement various aspects of the proposed system on their own farm. For laying hens, this resulted in a new system by the name of Roundel that is currently experimented with by farmers (Groot Koerkamp and Bos, 2008; Klerkx et al., 2009). For dairy cows, visions of four sustainable new systems were launched in early 2009 (Bos, 2009); and we have frequently been approached since by farmers who want to try out aspects of these systems. One of the promises now tried out by various farmers are new floors for cow houses. New floors could make contributions to aspects of sustainability, including animal welfare and the reduction of emissions (especially of ammonia with the early separation of manure and urine).

4.2. Bottom-up

The initiatives that these visions inspire can be seen as part of a ‘top-down’ dynamic which is driven by the explicit goal of developing ‘integrally sustainable’ husbandry systems. However we need to be modest as most of the innovative activity in a sector develops from the bottom up, and much of this is not (or
hardly) influenced by global sustainability visions. Since these ‘bottom-up’ initiatives by far outweigh top-down initiatives as far as numbers go, this begs the question of whether and, if so, how bottom-up initiatives could also be incorporated in a learning and experimentation strategy.

Let us take a closer look at this bottom up process, i.e. the ongoing process of innovation in the animal production sector that takes place for a variety of reasons. This does not mean that such actions are not guided by visions. They usually are, but these visions tend to be of a more local nature or address a specific dimension of sustainability (rather than the ‘integ rally sustainable’ visions of top-down approaches).

The agricultural (including animal production) sector can be understood in two different ways. In the first, agriculture basically refers to primary production on a farm, with the goal of producing all sorts of food products (called ‘conventional agriculture’). By far the largest volume of agricultural products is produced in a rather uniform fashion. Important characteristics of this system are cost price competitiveness and production for international food corporations (cf. Van der Ploeg, 2008). Innovation is driven by this competitiveness. Other directions for innovation are neglected and the embedding of agriculture in the existing system is considered self-evident. Visions of change are confined to the farm level or the desire that the food-processing industry take the lead (cf. the ‘Innovation Agenda’ for the pig husbandry sector in the Netherlands). From this perspective, local innovative initiatives are hardly relevant. They may lead to nice niche products but they will hardly contribute to sustainable development.

In the second view, by contrast, the multitude of local initiatives is seen as a potential source of change and inspiration. These initiatives are not only seen as an effort to innovate at the farm level but they are inseparable from their institutional context. Roep et al. (2003) refer to this process in the agricultural sector as ‘technological-institutional’ design, which is connected to what they call ‘effective reformism’. Their basic idea is that, especially in the agricultural sector, farmers’ initiatives typically aim at simultaneously bringing about technical change and creating a new institutional environment (new routines and links with various stakeholders, including advisors, supplier and processing corporations, public authorities, the general public, etc.). In this process, the expectations of farmers as well as the other stakeholders change. Thus, such initiatives may form the ‘seeds of transition’ (Wiskerke and Van der Ploeg, 2004; see also Roep and Wiskerke, 2006) although they are not guided by ‘integral sustainability’ visions.

This means that such bottom-up initiatives are certainly relevant to a learning and experimentation strategy for sustainability. LES should analyse the contributions of such bottom-up initiatives, as well as the potential and actual contributions of top-down organised projects to the development of individual promises and the portfolio as a whole. This is captured in Figure 2, which gives a representation of the multi-level dynamic, focusing on the relationships between projects, practice initiatives, promises and the regime.
Some explanatory remarks concerning the figure:

Two-way arrows are used to indicate that influences may go both ways.
Projects and initiatives may contribute to more than one promise.
Some of the promises are shown in dashed lines, indicating they are (still) conceptual ideas that are not or are hardly supported by a network. One of these is not supported by any project or initiative, indicating it is still just a conceptual idea.
Projects and practice initiatives may influence each other directly.
Projects and practice initiatives may also have a direct influence on the regime.
Promises may also influence the regime.
Promises may influence one another.
One isolated initiative is not connected to any promise as an example of many such initiatives that do not fit the portfolio of promises.
5. Assessing Promises

Farmers implement innovations for a variety of reasons. There may be thousands of such initiatives, some of which may be inspired by sustainability motives while many others are motivated otherwise. This raises the question of how to assess which initiatives might make a contribution to sustainable development. This is not simply a matter of listening to the farmers’ motivations, as historical studies show that later developments may take very different directions from those intended or aspired to by the initiators.

We can approach this issue in various ways. Firstly, we may ask the question “Which initiatives are sustainable?” This may sound like an over-simplistic question but it is one that the current political situation in the Netherlands (as well as in many other countries) confronts us with. A 2008 white paper from the Minister of Agriculture states that by 2011, 5% of the Dutch husbandry systems should be sustainable (LNV, 2008). Therefore, the Ministry needed criteria to measure whether the target had been met. In the Netherlands such criteria have been and are being developed in the form of sustainability indexes for various agricultural sub-sectors. These indexes provide criteria that are assessed in a quality assurance scheme. (cf. www.smk.nl)

The second approach to assessing bottom-up initiatives is to see them as part of an ongoing process. The question then becomes: “Which initiatives have a potential to contribute to sustainable animal production?” This requires a broader set of assessment criteria such as the presence of a broader vision on sustainability, institutional embedding and change, risk insurance for individual farmers, room to learn and experiment, potential to eventually implement the innovation in a commercial setting (e.g. via initial financial support), etc. Such criteria are more qualitative than under the first approach and more open to debate.

A third approach would consist in reversing the question: “How can we use these initiatives to learn about possibilities for sustainable animal production?” The initiatives are then seen as learning experiments to produce knowledge on barriers and opportunities for sustainable development. They can thereby become part of the ‘portfolio of promises’ within LES. This requires a process of continuous monitoring of innovations explored in the animal production practice, and an assessment of the relevance of locally learned lessons within the broader portfolio.

An important aspect of this third approach is that bottom-up initiatives (especially when analysed in conjunction with top-down projects) can be used to learn about uncertainties. Some of the main uncertainties are: (1) whether the innovation envisaged compares favourably to existing practices; (2) whether the innovation produces new unforeseen risks when applied over a longer period of time and on a larger scale; and (3) how the innovation potentially compares with other competing solutions. Furthermore in connection with the overall goal of
In LES, we follow a combination of the second and third approaches. The points raised above suggest that we need a tool to assess the various promises, based on their potential contribution to sustainable animal production. Tentatively, we are now using an evaluation framework in which we assess each initiative based on the following dimensions:

- **Sustainability gains/losses**: an assessment of whether the novelty might improve sustainability at the level of various people/planet/profit sub-dimensions and animal welfare;
- **System renewing potential**: an assessment of whether the promise might help break the lock-in in the existing system;
- **Risk of strengthening lock-in**: conversely, is there a risk that the innovation might consolidate the existing system and block further renewal for a long time to come (e.g. because of huge investments made)?
- **Giving momentum to change processes**: does the novelty set things in motion that can be expected to continue for a considerable length of time?

For each of these main dimensions we distinguish various sub-dimensions. We are currently (fall 2012) testing this framework by applying it to the dairy cow and greenhouse horticulture sectors. We are exploring whether this leads to a meaningful comparison of various promises (top-down projects as well as bottom-up initiatives) and whether this serves as a good starting point for an analysis at the portfolio level. This empirical testing is likely to lead to some changes in the methodology and thus help us to refine the Learning and Experimentation Strategy that we seek to develop.

### 6. IMPLEMENTING LES

To implement LES, we started to develop the portfolio of promises for one specific sector, notably the dairy cow sector. In essence, the portfolio can be seen as a huge database that provides various pieces of structured information on each of the promises that it contains. This information covers aspects like:

- Description of the novelty;
- Expected contribution to sustainability (on about a dozen dimensions);
- Valuation of the novelty by different stakeholders (approval or disapproval);
- Barriers for implementation (about a dozen different barriers distinguished);
- Network of actors involved;
- Lessons learned and state of affairs.

Early 2012 we have used this approach to make an overview of renewal activities in the animal husbandry in three sectors (pigs, dairy cows and poultry) in the Dutch province of Limburg. This was part of a provincial initiative (supported, i.a., by the provincial authorities and the farmers representative organisation LLTB) to stimulate sustainable animal production in the province. In an interactive setting with innovative farmers and other stakeholders it appeared that this overview triggered a lot of creativity on possible new activities.

To be able to use the portfolio, various filters will be developed. Users may, for instance, select promises that address either specific sustainability challenges or promises that address a broad variety of sustainability challenges. It will also be possible to use it at the portfolio level by searching for groups of promises, which, when combined, address a wide range of sustainability challenges.

At this point it is essentially researchers who are involved in the development of this tool, but in the long run LES will be able to work only if various stakeholders become committed and involved. We have therefore started to explore ways of making this happen. We are attempting to link LES to a Dutch initiative called the ‘Implementation Agenda’.

This Implementation Agenda is an agreement between various parties to actively work on the implementation of a system innovation towards sustainable animal production for the next fifteen years. It was signed by a variety of parties in 2009, including the Ministry of Agriculture, sector representatives and NGOs. The Implementation Agenda specifies a variety of challenges that should be addressed but not how this should be done (Uitvoeringsagenda, 2009). In our view the LES approach offers a good method for implementation.

We have therefore opened talks with people who are responsible for the implementation of the Agenda. If we can convince them that this is a good method to achieve their goals subsequent discussions will have to address who will be responsible for what and who will execute which tasks. In our view, who will 'own' the portfolio, who will maintain it and keep it up-to-date, who will make portfolio analyses, etc., are issues that still have to be decided on. Ideally, this should become a shared responsibility between all parties involved. As researchers, we think we could make important contributions but we can only do so if various stakeholders are also committed and agree to play active roles.

12 “Uitvoeringsagenda” in Dutch. In full "Uitvoeringsagenda Duurzame Veehouderij": Implementation Agenda Sustainable Animal Husbandry.
7. CHALLENGES FOR FURTHER LES DEVELOPMENT

We are developing LES as a strategy to contribute to system innovation via a combination of learning from projects and learning from practice initiatives. Fulfilling this ambition presents a number of challenges and raises various questions. Below, we list some aspects that need further elaboration:

Promises monitor. Various system innovation projects in the Netherlands are being monitored to optimise learning, but it is necessary to extend this to the monitoring of practice initiatives. This raises various new questions, e.g. which of the numerous initiatives should actually be monitored? The evaluation framework in the previous section can be used to help make such decisions.

- Promises analysis and evaluation. The results of a variety of projects and bottom-up initiatives need to be evaluated in relation to one another. But how to do this and translate it into topics for further exploration (e.g. via new projects) is a matter that still needs to be defined. The evaluation framework above provides a first stepping stone for this.

- Portfolio analysis and evaluation. The next step is to move beyond the promises level and analyse the data collected at the portfolio level. We still need to develop methods to collectively evaluate data on various promises and relate them to one another. One starting point may be to evaluate the data against the background of various visions of a sustainable new system (e.g. as developed in the Cow Power project) but this would still require new evaluation methods.

- Portfolio management. In the present situation, management takes place at the level of projects and, to a lesser extent, at the level of programmes. A Learning and Experimentation Strategy, however, would also require forms of management at the portfolio level which are currently non-existent.

- Stakeholder management. A system innovation will require contributions from a variety of stakeholders, which can occur only by involving them in various activities in LES. However, who to involve in which of the tasks above is still an open question.

8. CONCLUSION

The societal and political pressure to develop more sustainable animal production systems (as well as other agricultural systems) has grown over the past decade and is not likely to go away. Meeting these expectations will require system innovations in various sectors (such as animal production) and sub-sectors (e.g. dairy cows, pigs, etc.). Approaches like SNM and TM have provided a variety of suggestions on how to use learning in series of projects to contribute to sustainable development.
However what these approaches overlook about the ongoing dynamic within these sectors is the fact that a large number of stakeholders are tinkering with a variety of innovations trying to solve a range of problems as they experience them. Historically, in system innovations such bottom-up processes were the dominant drivers of transitions. Current attempts that seek to bring about system innovations towards sustainability therefore cannot ignore this bottom-up dynamic and should make it part of their strategies.

The LES approach that we propose here does acknowledge this bottom-up dynamic. It attempts to combine the learning that takes place in bottom-up practice initiatives (often farmer-led) with the more deliberate attempts at learning in planned projects that are often research-led. This combination does more justice to the innovation dynamic that is actually taking place than the more narrow focus on projects by approaches like SNM and TM.

Combining top-down and bottom-up in LES also allows for the strong and weak dimensions of each of these approaches to be combined, namely:

- **Top-down approaches** are driven by the development of a vision (or set of visions) of an integrally sustainable new system. Thus, sustainability goals are embedded in the process. Their weakness is that these new visions and their constituent parts (the promises) do not fit in well with the existing system. This makes it difficult to ‘anchor’ (cf. Elzen et al., forthcoming) these novelties within the current system and to gain practical experience. Yet anchoring is needed to get a transformation process going. Starting this process ‘from the outside’ is difficult and may trigger a lot of resistance.

- **In bottom-up initiatives** such anchoring is guaranteed since the initiatives come from within the existing system. But because of this anchoring it is difficult to include broader sustainability issues, which would require more radical steps.

In current practice (as well as in transition initiatives in other sectors), top-down (i.e. driven by integral sustainability visions) and bottom-up constitute separate approaches. Certain parties may be working only on one approach, and hardly be in touch with parties working on the other approach. Both, however, will contribute to the system innovations in the making. Furthermore, because each approach has its weak and strong sides, it is important to combine them into a learning and experimentation strategy, LES.

Current policies often make a distinction between improving sustainability in the short term by adapting existing systems and working on integral sustainability in the long term through system innovation. While bottom-up initiatives are primarily seen to contribute to the former, this is a limited view. Judging such initiatives on direct sustainability criteria may indeed provide information on their potential to make short-term contributions. However, incorporating other criteria as well (cf. the evaluation framework above) may reveal their potential to contribute to more integral sustainability in the long term as well. This also offers the opportunity to link learning from bottom-up initiatives to learning in various top-down inspired projects. Furthermore, by ‘zooming out’ to the
portfolio level, an integral analysis may generate new ideas on how linking various promises together (irrespective of whether they come from top-down or bottom-up) could contribute to a system innovation through the identification of a ‘higher level’ promise. This type of broader learning and experimentation strategy therefore attempts to combine (1) top-down and bottom-up approaches and (2) the individual promise (which in some cases may be a niche) and the portfolio levels. It thus seeks to make much more effective use of existing innovative potential in the sector than other approaches and is likely to make a larger contribution to the development of a sustainable livestock production sector.

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References


13 The title of this chapter emphasises “doing” and is inspired by the perspective on reflexive innovation developed in Wageningen UR (Bos, 2008; Bos and Groot-Koerkamp, 2009). The description of this project is based on Grin et al., 2003, Bos and grin, 2008 and on personal communication with one of the programme designers, April 7th, 2010.


