

Facilitated Networks and Beyond: Policy instruments for agricultural innovation

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Abstract:

The innovation systems literature emphasises the importance of networks for agricultural innovation. Networks offer governments new opportunities to stimulate agricultural innovation. As a policy instrument, a so-called facilitated network often takes the form of a project, the goals of which include or entail the formation of new networks or the strengthening of existing networks. We report on an exploratory study comparing the effectiveness of facilitated networks to other policy instruments for agricultural innovation in the Netherlands.

We conducted semi-structured interviews with ten experts on networks and innovation. Policy alternatives to networks included research funding, innovation experiments, knowledge vouchers for entrepreneurs, practice networks, competitions for awards / prizes, innovation subsidies for individual entrepreneurs, legal exceptions, legislation and fiscalisation.

For the early phases of the innovation process, facilitated networks were seen as more effective and cost-efficient than the other instruments. This was especially the case for system transformation. However, other instruments can have comparable performance for innovation when they result in sufficient network formation. This can be achieved by implementing those instruments in ways that require the target groups to build coalitions and other forms of networks. Network formation was evidently seen as an important factor in the facilitation of innovation. Networks were also seen as effective for system optimisation, but not more cost-efficient than other effective instruments.

Finally, past policy experiences enable moving beyond the generic term of “(facilitated) network” to develop more advanced instruments for specific types and phases of innovation. An example in case would be to combine instruments such as research funding, innovation experiments and exceptions in legislation to better support invention and business case development for system transformation.

Introduction

Both innovation systems literature and current developments in agricultural extension emphasise the importance of networks for agri-food innovation. Furthermore, the emerging awareness about societal complexity and sustainability issues has led to a demand for policy instruments that can play a role in more radical, system transformation processes (Rotmans, Kemp & Van Asselt, 2001). In the traditional case, extension would be government-paid and aimed at system optimisation. However, since many governments have privatised their extension services, they need new ways to foster innovation. Many studies have indicated the potential of networks for these purposes (Birner et al., 2009; Leeuwis & Aarts, 2011). But how can governments use the power of networks to foster innovation?

Facilitated networks have been used by governments to facilitate, for instance, economic regional development (Laschewski, Philipson & Gorter, 2002) and agroforestry policy (Buck, 1995). Buck (1995) indicates that governments might *facilitate* networks to foster *innovation*. Also, Huggins Johnston and Steffenson (2008) emphasise the potential for networks to facilitate innovation, writing that the European Commission has increased its aims to facilitate interregional networks

for innovation and knowledge-based development. However, they also note that “such developments are relatively embryonic, with little evidence of their effectiveness” (p. 334). So, although networks are clearly important from an innovation systems perspective, it is not so clear to what extent governments can use the power of networks to support innovation.

In this paper, we report on an exploratory interview study to weigh networks against other policy instruments used to foster innovation. The main research question was: “What is the effectiveness of facilitated networks as a policy instrument to foster agricultural innovation, and how do they compare to alternative instruments?” The goal of the study was to identify those instruments that are best fit for governments to foster agricultural innovation.

The study context was the Dutch agricultural sector. In the Netherlands the agricultural extension services have been privatised (Wielinga, 2001). Furthermore, The Netherlands are faced with various agricultural sustainability issues that require government attention and system transformation (Veldkamp et al., 2009).

We first introduce the concept of network and explore how networks can be used as a policy instrument. Then system transformation and system optimisation are distinguished as specific innovation goals. We then outline our method, after which we report our results, illustrated by interview summary excerpts. In our conclusion, we compare networks with other policy instruments in their capacity to foster innovation.

The changing role of networks for agricultural innovation

A very traditional view on networks for agricultural innovation would include research as a source of knowledge, extension and education as knowledge and information channels, and agricultural entrepreneurs as recipients of knowledge. This view is especially applicable to the situation in which researchers produce knowledge in terms of new technologies, ideally embedded in machinery. Extension and education can spread this knowledge to the farmers, for instance by demonstration or written communication, and the farmers can apply it by using the new technology or machinery. This can be seen as a *linear innovation model*, because knowledge flows in one direction only, from research, via development and extension, to businesses, and finally consumers (Jacobsen, Beers & Fischer, 2011).

But agricultural innovation networks are shaped by their specific context and the innovation challenges that are part of it. A particularly linear model often is at odds with societal trends like privatisation of extension services and the shift to demand-driven extension (Klerkx, 2008), nor does it do justice to the complexities of real-world innovation processes, in which farmers become clients, sponsors, inventors and sometimes pioneers, rather than being mere beneficiaries (Andeweg & Van Latesteijn, 2011). In contrast to the linear model, scholars now emphasise that knowledge in innovation processes can originate from many partners in innovation networks, and knowledge flows in many directions, between many partners, instead of only one way (Jacobsen et al., 2011).

Finally, the emerging awareness of societal complexity and sustainable development has given rise to still more complex arrangements for innovation (Veldkamp et al., 2009). In the case of sustainability issues, the associated innovation challenges are often especially value-laden, and none of the actors is able anymore to deal with these challenges alone. Societal actors with diverging interests and values need to connect in order to co-create new knowledge and solutions for sustainability (cf. e.g., Funtowicz & Ravetz, 1993; Rotmans et al., 2001). Connections need to

be made between scientists, agricultural entrepreneurs, NGOs and governments (Regeer, Mager & Van Oorsouw, 2011). In the resulting networks, every actor can be a source of relevant knowledge and resources.

Perspective on innovation

To enable a more detailed comparison of networks and other policy instruments, we distinguish two goals for innovation processes and four phases (see Figure 1). With regard to innovation goals, we distinguish *system optimisation*, based on acceptance of the status quo and focussed on improving a certain sector, and *system transformation* (Rotmans et al., 2001; Schot, Hoogma & Elzen, 1994), which is aimed at inventions and innovations that have the potential to result in radical system-wide change (although not necessarily fast change—Geels & Kemp, 2007). System transformation (or *transition*) can be seen as a “gradual, continuous process of structural change within a society or culture” (Rotmans et al., 2001: p. 16). System transformation is often seen as a way towards sustainable development. We consider sustainability to be one of the main dynamic aspects of a complex societal system (Veldkamp et al., 2009). The complexity of the associated systems makes it very difficult, if possible at all, to steer system transformation. However, scholars often emphasize that working with heterogeneous networks, in which entrepreneurs, researchers, policy makers and NGO’s collaborate, can increase the potential for sustainable development (Wals, Van der Hoeven & Blanken, 2009).

System optimisation can be seen as a process of incremental improvements to an existing system or situation, with the aim to increase the system’s effectiveness and/or efficiency. Associated effects include economies of scale, increased durability, increased resource efficiency, etcetera. Take, for example, the automobile, with its internal combustion engine. Over the years, cars have become faster, safer, and more resource efficient. As a mode of transportation, the car has been quite optimised. However, there have hardly been structural changes to the system. In contrast, electrically or hydrogen powered cars would represent a clear break from the transportation *status quo*, requiring additional innovations in infrastructure (cf. Senge et al., 1994). In terms of networks, it appears that the linear model can lead to system optimisation, but not to system transformation.

With regard to phases in the innovation processes, we hold to the perspective that successful innovations see a progression from an invention that holds the promise of a breakthrough, a business case that uses this invention and is able to make a profit with it, adoption by first movers, who take the chance of also implementing this business case (and often modifying), and finally widespread adoption, when the invention has a proven past performance that is beyond doubt.

This is not to say that we see innovation as a linear process—quite the contrary. In every phase, innovation is typically the result of ongoing collaborations between multiple actors in various combinations (Leeuwis & Aarts, 2011), and the underlying inventions are undergoing continuous change throughout the process (Douthwaite et al., 2000). Knowledge may originate from many different partners and flow in many different directions. However, even from this perspective it appears that inventions spread through a societal (sub)system that shares some characteristics with diffusion processes (cf. Rogers, 1995).

Innovation phase	System transformation / high value diversity	System optimisation / low value diversity
Invention		
Business case development		
Diffusion to first movers		
Mass adoption		

Figure 1: Goals and phases of innovation processes.

In this paper, we use this conceptualisation as a framework to assess the effectiveness and efficiency of networks and their alternatives.

Conceptual view on networks as a policy instrument

As a *policy instrument*, networks often take the form of a project, the goals of which include or entail the formation of new networks or the strengthening of existing networks. There is some contradiction here, because a project, by definition, is something that can be managed. Also, project members can be given specific tasks. We would not go as far as suggesting that project members can be controlled, but projects obviously offer more potential for steering than networks. Therefore it is important to note a couple of network characteristics that hold for networks in general. Networks with societal and policy relevance ... (Caniëls & Romijn, 2008; Klerkx & Leeuwis, 2009)

- ... consist of individuals that potentially can act in each other's benefit, they can act in each other's interests.
- ... have members that know each other, to a certain extent; they have some awareness of other members' opinions, resources and goals.
- ... are, in principle, 'self-organising'; they emerge when people meet, share, and then become aware of keeping in contact.
- ... do not organise activities. Rather, they are a resource for finding partners to initiate new activities.

This suggests that networks as a policy instrument are not networks in the strict sense. Rather, they are subsidised, project-like activities that result in the strengthening or emergence of networks. In this paper, we reserve the term "facilitated network" for such activities.

Method

The explorative nature of the study necessitated the use of in-depth interviews with a limited number of participants. We interviewed ten experts in the area of networks and innovations. Each interview took about one hour.

Participants

We selected the interviewees based on their expertise with facilitated networks used by the Dutch government to support innovation. Interviewees were selected from a broad range of domains to allow for a more complete coverage of possible perspectives on networks and innovations. The main selection criterion was whether the interviewee's expertise would help him/her to judge the policy-effectiveness of networks for innovation and to compare facilitated networks with other policy instruments. Both scientific perspectives on and practical experience with facilitated networks were considered meaningful expertise in this regard. The resulting selection included five policy makers, three researchers, of which two had also facilitated networks in the role of consultants, and two persons from the educational sector, who had participated in facilitated networks for educational institutions. All interviewees had practical experience with and/ or knowledge about networks, for example because they had used them as a policy instrument, because they had acted within or had led a network a network, or because they had facilitated such networks.

Interview guideline

A semi-structured interview guideline was used, which focussed on policy instruments for innovation. Interviewees were first asked to list the various policy instruments that they knew could be used to foster innovation. We then introduced our framework for innovation (i.e., the four phases and the two innovation goals) and asked the interviews to indicate for each instrument to which phase of the innovation process it related best, and to which innovation goal. Finally, we asked how each of the alternatives they named compared to networks.

All interviews were summarised by the interviewer. All summaries were then sent to the interviewee for corrections. The corrected interviews were used in the analysis.

Analysis

The interview summaries were analyzed phenomenographically (Marton, 1981, 1986). Phenomenographic analysis concentrates on the various ways in which a phenomenon appears. In our case, the analysis therefore concentrated on categorizing and characterizing the various policy instruments for innovation as mentioned in the interviews. Next, we coded for every policy alternative:

- The innovation phases for which it had a supportive effect
- Its cost effectiveness compared to networks
- The kind of knowledge processes (co-creation, circulation, transmission) that can be expected to result from using it

The analysis resulted in a list of alternatives and their effects and cost effectiveness. All interviews were first analyzed by the first author. The second author then checked the analysis and indicated areas of disagreement to establish intersubjectivity. In this specific case, the second author confirmed the analysis.

Results

We first will report our results regarding networks, and then we will report on the following list of policy alternatives to networks:

- Research funding – Using government money to fund scientific research
- Subsidies for individual entrepreneurs – A subsidy for an individual entrepreneur with an innovation goal
- “Knowledge vouchers” for entrepreneurs – Money for entrepreneurs that they can use to “buy” knowledge from researchers as they see fit.
- Innovation coaches – Entrepreneurs can consult coaches for questions regarding innovation.
- Awards / prizes – Government opens a competition for an innovation award.
- (Exemptions from) Legislation – Governments can prescribe prohibitions or prescriptions / regulations by law. Incidentally, government can also explicitly allow exceptions to law to create room for innovative processes.
- Fiscalisation – Fiscal rules such as tax exemptions for innovative technology.

Knowledge networks, practice networks and innovation experiments

Subsidies to networks are directed at coalitions of entrepreneurs such as primary producers and chain parties up to grocery stores, and research organisations and NGO’s, with the main goal to support learning from each other and to develop new knowledge. The interview data yielded three qualitatively different interpretations of “network”. Firstly, *knowledge networks* are subsidized, with the main goal of bringing different actors together, especially “unlikely allies”. These networks fulfil a major requirement for successful innovation processes, namely, to benefit from mutual differences in knowledge and resources for innovation”. Our findings suggest that the main role of networks is to bring actors together who do not know each other yet and who may innovate together.

The interview data are ambiguous with regard to the connection of knowledge networks to the different phases of innovation. Some specifically mention the pioneering phase whereas others report about business case development and diffusion to first movers. Furthermore, knowledge transmission to the masses also has been mentioned, for instance, in case network partners organise demonstrations of new technology. The interview data warrant the conclusion seems that networks contribute to knowledge exchange between different types of actors and societal contexts.

The second category of *practice networks* (cf. Wielinga & Vrolijk, 2009) is much more concrete than the knowledge networks. In a practice network, two or more parties collaborate to implement a specific idea. One might speak of practice networks in terms of support to existing coalitions, because the subsidy candidates already know each other and presumably are already committed to a shared idea. Practice networks are different from knowledge networks in this regard.

A third form of network from the interview data is the *innovation experiment*.

“[In] an innovation experiment ... one creates a safe environment in which an entrepreneur dares to innovate, with guidance from researchers and some risk management. Other interested entrepreneurs can subsequently form an additional network around the entrepreneur in question.”

The interview data suggest that innovation experiments differ from practice networks in the sense that the latter usually consist of like-minded people with some common goals, interests and values, whereas innovation experiments consist of “unlikely allies”, actors with conflicting goals and values who are still prepared to commit to an innovative collaboration. Innovation experiments appear to be mainly oriented at system transformation.

Research funding

Research funding concerns government subsidy to research institutes. One might question whether innovation is a direct goal for research funding. Our conclusions also need to be read in that light. The interview data suggest that the extent to which research funding results in innovation strongly depends on the specific way in which that research is initiated and carried out. Some research programmes funded by Dutch government choose to focus on system innovation, which leads to a lot of interaction with societal target groups and more transdisciplinary activities (cf. Funtowicz & Ravetz, 1993). Such research activities by definition will result in network formation. Data suggest that, in this form, research funding contributes to the pioneering phase of innovation, especially geared towards system transformations. However, generally speaking, research funding may result in too few links with target groups / practice. Some interviewees suggest that researchers’ primary interest, to publish scientific articles, does not by itself contribute to innovation, nor does it often necessitate to contact possible interested target groups. In this case, newly developed knowledge will probably not contribute directly to innovation. This is a risk of using research funding for innovation.

Subsidies for individual entrepreneurs

Subsidies for entrepreneurs can help governments to support entrepreneurs with investment plans. Such subsidies are thought to contribute to innovation, because innovations often go hand-in-hand with investments and financial risks. In their simplest form, these subsidies are meant for individual entrepreneurs, with the risk that they do not lead to much knowledge sharing. Subsidies to entrepreneurs appear to have a lot in common with practice networks, the main difference being that network formation is a hard condition for a practice network, and that network formation itself is believed to contribute to the innovative performance of the involved entrepreneurs. In this sense, practice networks may lead to more exchange of knowledge than subsidies to entrepreneurs.

In the interviews, subsidies to entrepreneurs were mostly connected to adoption by first movers. Some interviewees additionally mentioned that they may contribute to the pioneering phase and to business case development. Furthermore, the data suggest that subsidies for entrepreneurs are better fit to system optimisation than to system transformation.

“Knowledge vouchers” for entrepreneurs

The knowledge voucher enables an entrepreneur to invest in knowledge. The interviewees appeared to have some reservations regarding the effectiveness of knowledge vouchers for innovation. Some interviewees, however, thought that knowledge vouchers are sometimes underestimated, especially with regard to their effectiveness for the invention and business case development phases of innovation. Furthermore, in the past knowledge vouchers have sometimes led to network formation. The data suggested that the effects of knowledge vouchers are limited mostly to system optimisation:

Innovation coaches

The innovation coach is very similar to the knowledge voucher, the main difference being that an innovation coach may not only contribute knowledge but also advice and guidance for innovation. The data suggest that innovation coaches can sometimes benefit diffusion to first movers and mass adoption. Some interviewees also mention business case development as an effect: It is not clear from the interview data whether innovation coaches predominantly lead to system optimisation or system transformation. However, the similarities with knowledge vouchers suggest that system optimisation is the main effect of innovation coaches.

Awards / prizes

In principle, an award is very much like a subsidy for entrepreneurs, but with an explicit competitive element. Many interviewees mentioned this instrument, all with the example of the Small Business Innovation Research (SBIR) arrangement in mind. The SBIR arrangement is interesting for two reasons. First, a prize like SBIR is a way for the government to draw attention to a societal issue of government importance. Subsidies may have the same kind of effect, but prizes were suggested to be more provocative than subsidies. Second, the SBIR arrangement itself would lead to more network formation than subsidies for entrepreneurs. This would suggest that awards and prizes are similar to practice networks and innovation experiments, with regard to their effect for innovation.

The network formation associated with prizes like SBIR can result in knowledge exchange and co-creation. The interview data suggest that prizes and awards are especially effective for the invention and business case development phases of innovation.

(Exemptions from) legislation

Legislation can be used in various ways in the context of innovation processes. The interview data are mainly focused on prescriptions and prohibitions, which can be used to coerce innovation, but only if the advantages of the innovation are undisputed among policy makers and politicians. Furthermore, for an innovation to become part of law, it must be described very precisely. This makes legislation, in the form of prescription / prohibition, unfit for the invention and business case development phases of innovation, rather being aimed at diffusion to first movers and mass adoption.

It is also possible for legislation to mature as part of an innovation process. In this form of exemptions, legislation can lend space to innovation. This also relates to innovation experiments, which often need space for experimentation.

Fiscalisation

Fiscalisation can be used to create a better climate for investments. Government can use fiscal arrangements to make it more attractive for entrepreneurs to invest in innovative technology. Like legislation, fiscalisation requires that the innovation in question is well-specified, which means that fiscalisation is not so well fit to the first two phases of the innovation process. Furthermore, the advantages of the investment for the entrepreneur need to be clear before s/he will invest.

Performance and cost effectiveness of networks and their alternatives

The interviewees regarded networks as highly effective for innovation:

“Networks, both in terms of meetings of like-minded people and unlikely allies, are particularly effective and efficient.”

Some, however, offer some reservations about the cost-effectiveness of networks:

“Networks are relatively expensive for pure information spreading, but they do offer a lot for the invention and business case development phases.

The interview data give reasonable insight in the cost effectiveness of the various policy instruments. We cannot draw a very clear picture, though, because for many instruments the effectiveness for innovation depends on the specific form in which the instrument is implemented. For example, interviewees doubted the effectiveness of subsidies for entrepreneurs and subsidies for researchers for innovation. To ensure effectiveness, the implementation of these instruments should include attention for network formation—according to the interview data, the effectiveness of subsidies increases with the extent to which their implementation safeguards network formation. Or, in other words, the more they resemble networks as a policy instrument, the more effective they are.

Some interviewees point out that choosing specific policy instruments also means choosing for increasing or decreasing financial space. Networks, subsidies, prizes, awards and fiscalisation are all ways in which government spends money on innovation. However, fiscalisation and legislation can also be used to increase financial pressure, which may have great innovative effect, but with very little control over the outcomes. Rather than speaking of cost effectiveness, one might conclude that there is a trade-off between costs and control. The higher the costs, the more control over the outcomes.

Networks were regarded the most effective instrument for system transformation. If we add fitness for the innovation process to the above deliberations about cost effectiveness, then the interview data suggest that networks have the most effectiveness for the invention and business case development phases of innovation, in case of system transformation. Networks may be expensive, but the interviewees have not mentioned any alternative that would have comparable effectiveness.

In case of system optimisation, the data did not offer many leads to compare networks with other instruments.

Conclusions

The main research question in this study was “What is the effectiveness of facilitated networks as a policy instrument to foster agricultural innovation, and how do they compare to alternative instruments?” Our results show that answering this question requires taking into account the innovation goal (i.e., system transformation or system optimisation) for which the instrument is used, and the innovation phase in which it is used. Facilitated networks were regarded the best policy option for system transformation, in the invention and business case development phases. Furthermore, the analysis showed that the interviewees associated network formation in general with effectiveness for innovation, especially when the networks include “unlikely allies”.

Figure 2 summarises the interviewees’ thoughts about how the alternatives to networks related to the innovation phases and goals.

Innovation phase	System transformation / high value diversity	System optimisation / low value diversity
Invention	Research funding	Awards-/ prizes
Business case development	Innovation experiments	Knowledge vouchers
	Exceptions in legislation	Business subsidies
		Innovation coach
Diffusion to first movers	Legislation	
Mass adoption	Fiscalisation	

Figure 2: Policy instruments for innovation and innovation goals and phases.

Comparing the effectiveness of other instruments with networks is hard, because these instruments can be implemented in many different ways. Rather than choosing either networks or other instruments, it is important to choose an *implementation* of a policy instrument that fosters network formation. Research funding is an example in case. In the form of funding for traditional research, the main interest of the researchers would be to publish their results in high-ranking journals. However, specific strands of research exist that aim to contribute to system transformation and therefore choose to collaborate with entrepreneurs and policy makers offer a more network-oriented alternative of research funding. In such an implementation, research funding results in sufficient network formation to effectively foster innovation.

Facilitated networks were also seen as highly effective for other innovation purposes, but not particularly cost-effective in comparison to other effective instruments (knowledge vouchers, business subsidies, innovation coaches).

According to the interview data, legislation and fiscalisation were especially fit to the last two phases of the innovation process, because they require that the invention in question is already well-defined and specified. The analysis showed that legislation was seen as possibly cheaper than other policy instruments, but interviewees also noted that government had less control on the resulting innovations than in case of facilitated networks.

Combining policy instruments to tailor to specific innovation contexts

The term network itself proved to have a very broad meaning, referring to many different types of networks. Interviewees pointed out that, by now, a lot of experience has been gained with using networks to foster innovation. This suggests that it should be possible now to move beyond the generic term of “(facilitated) network” and to develop more advanced instruments that foster

specific types and phases of innovation. An example in case would to use elements of research funding, innovation experiments and exceptions in legislation to better support invention and business case development for system transformation.

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