Supply- versus demand-driven knowledge dissemination: a focus on 'strategic space'

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Abstract:

In this paper three different knowledge systems the Dutch government introduced into the agricultural industry are discussed: the 'knowledge triptych', the 'knowledge pyramid' and the 'knowledge network'. They range from a supply-driven approach in which knowledge is disseminated in linear and top-down fashion to a more demand-driven approach in which knowledge is disseminated in a circular and bottom-up fashion. These two opposite approaches reflect developments in the Dutch agricultural industry. An important focal point of development is the shift from expansion and safeguarding food production to raising competitiveness and sustainability. Research shows that both approaches are valuable but that they are more or less effective depending on objectives and circumstances. Roles of and relationships between relevant parties alter in the three knowledge systems. Two factors are always important in knowledge enhancement, namely trust and external factors.

Keywords:

Knowledge dissemination; knowledge system; supply-driven; demand-driven; agriculture, strategic space, policy instrument.

1 Introduction

The knowledge-based economy poses a number of challenges for (agricultural) entrepreneurs, policy makers, educators, advisors and researchers in the development and implementation of new models for its 'knowledge base'. Nowadays this not only requires strengthening competitive positions in a globally developing economy, it also needs to adhere to demands for sustainable growth. This first requirement corresponds to the Lisbon strategy of the EU countries [1] and the latter refers to the Gothenburg sustainability principles adopted by EU countries in the so-called EU Sustainability Development Strategy (SDS) [2].

The Dutch agrocomplex (forming 10.4% of the Dutch economy in 2004) [3] deals with new challenges to meet both market and societal demands for the development of sustainable agriculture. In the last decades different types of knowledge infrastructure systems have been introduced by the Ministry of Agriculture, Nature and Food Quality to support the transition process from a supply-driven to a market-driven agricultural industry. Whereas the production and diffusion of knowledge for this support used to be supply-driven, part of a instrumental policy approach, nowadays the challenges seem to require a more emancipatory approach where demand dictates the development of knowledge. This means less governmental influence and more responsibility for agricultural entrepreneurs. Entrepreneurs operate in a dynamic transparent environment and they are increasingly aware of the fact that they themselves are responsible for the development and implementation of knowledge for innovation [4, 5]. An instrumental approach is characterised by a government that directs the course that is followed to realise a given policy objective. The public aims are clear and communicated to all target groups. By contrast, an emancipatory approach is characterised by different stakeholders that interact with each other in order to find solutions for problems along an incremental process. In this approach the government is a stakeholder that does not dominate, but facilitates the target groups to articulate their problems and to direct the development of knowledge in order to reach suitable solutions that fit their business practices. This approach is known to be more circular and bottom-up [6, 7].

In this paper both the instrumental and the emancipatory approach are discussed. First, an introduction to the Dutch agricultural industry will be presented. Second, three different knowledge infrastructure systems introduced in the Netherlands between the 1960s and 2005 will be discussed ranging from supply-driven to demand-driven. These are: (1) the 'knowledge triptych', (2) the 'knowledge pyramid' and (3) the 'knowledge network'. This overview is followed by a comparison of the three systems assessing the suitability of the supply-driven and the demand-driven approaches for meeting the demands of a global economy and society. The paper ends with concluding remarks.

2 Knowledge development in the Dutch agricultural industry

Dutch agriculture is rapidly changing from a supply-driven to a market-driven industry that is characterised by highly regulated supply chains. In the 1950s the ideas of the social democrat Mansholt [8] were adopted to strengthen the economical foundation of

the agricultural industry and to improve living standards for agricultural entrepreneurs and their families. During the 1960s, in a climate of growth, social change and modernisation, the agricultural industry was given more subsidies and advice by the national government and the European Union to expand and intensify production. The public aim was to improve social standards and income for farmers, protect national food production and to improve the competitive position of the Dutch sector in the international market. With respect to the role and importance of knowledge to achieve these aims, the so-called 'knowledge triptych' was born. The triptych is a linearly managed tri-angulated model for knowledge dissemination between research, extension and education which functioned adequately until the nineties. Social and cognitive ties were tight between public researchers, extension workers and educators who worked closely together. Research results were translated in advice by extension workers in a manner to best suit the needs of entrepreneurs. Also educators translated research knowledge in curricula to best suit the needs of future entrepreneurs. Financial risks in innovation processes were considered low. All parties worked closely together and in general trusted each other. Better yet, it was possible that a research manager also did extension work and sometimes gave lectures at colleges and universities. The 'knowledge triptych' however did not last [9].

During the economic recession of the 1970s unrestrained growth led to the production surpluses and heightened awareness of negative environmental effects. The EC 'milk lake', 'butter mountain' and grain and manure surpluses had to be cut back. In the 1980s environmental issues increasingly dominated the political agenda. Whereas the agricultural industry and the national government had accentuated the same strategy of expansion, a gap between the government and the agricultural industry started to develop. This resulted in opposing strategies, a decline of mutual trust and at some point uncertainty and inertia in development [10].

In the early 1990s the industry was characterised by structural shrinkage. In a climate of economic growth, globalisation and adoption of ecological values by society, the government introduced policy measures to mitigate negative environmental effects. In order to stay in business entrepreneurs mainly focused on cost efficiency. The government looked for a new policy instrument to stimulate entrepreneurs to adjust their production methods in order to comply with environmental regulations and to retain their license to operate. One important example of policy instruments implemented was the 'knowledge pyramid', introduced to disseminate knowledge about manure measurements to agricultural entrepreneurs through a system that included researchers, experimental ('lab') farms and precursors, farmers who were considered to set an example [11]. This system was based on the assumption that lagging agricultural entrepreneurs would follow precursors when confronted with the necessity to change by being given examples of how to change [12].

In the late 1990s and early 2000s, the focus shifted towards the creation of a sustainable agricultural industry which is characterised by cooperation among all stakeholders, society included. In a climate of increasing international competition and sustainability awareness, a current policy experiment of knowledge dissemination was introduced which focuses on the entrepreneurial 'strategic space'. 'Strategic space' [13] can be defined as having a 'variety of options at your disposal to deal with problems' [14]. 'Options' can be viewed as 'alternatives for behaviour on either professional, operational or strategic level'. An increase in variety provides a basket of behavioural alternatives from which an entrepreneur can choose. This also means excluding

alternative directions. ‘It increases the innovative capabilities to solve specific business problems’[15]. ‘Strategic space’ can be enhanced by entrepreneurs by gathering information and by learning and interacting with colleagues and stakeholders [16, 17]. At the same time external influences can affect the ‘strategic space’ as well. Social, economical, political and technical factors can influence the ‘strategic space’, i.e. can increase or decrease options for change. As an experiment a network approach has been adopted which, instead of offering a box of solutions for environmental problems, supports entrepreneurs in articulating their own ideas. This experiment focuses on increasing levels of knowledge and establishing more social ties and knowledge knots between entrepreneurs and their stakeholders in order to increase their ‘strategic space’ to cope with global economic and social change. In the ‘knowledge network’ entrepreneurs are supported by knowledge brokers and through process guidance. These jobs are being performed by researchers and advisors.

Two significant factors have gained in importance in the Dutch agricultural sector. One is that the sector is becoming more competitive and knowledge intensive, meaning that the need and demand for knowledge is increasing. Entrepreneurs have to think of alternative intelligent ways to profitably produce an adequate amount of food on the same relatively small area of land. This means a change of professional strategies in food production. The second issue concerns the social demand for responsibly produced food that meets food quality, animal welfare and environmental standards. In order to achieve sustainable agriculture, innovation in for instance production methods, market approaches and logistic systems are required, not only for individual companies, but for entire supply chains. The new knowledge-based economy requires vital networks of actors (entrepreneurs, knowledge brokers and stakeholders) who relate to and interact with each other to create, store, transfer, use, monitor and evaluate knowledge together to generate innovative solutions [5, 18, 19].

Over the years the Dutch government has intervened in the market of supply and demand of knowledge in order to stimulate innovation processes. In this Triple Helix [20] the role and position of institutions have changed over the years. The government intervenes in the market of supply and demand of knowledge when it concerns public objectives. The main objective of the three knowledge systems discussed in this paper is to enhance ‘strategic space’ of the industry so as to safeguard its capacity to meet private and public demands. In each of the systems all actors have different relationships with each other and their roles differ. This will become clear in the next section.

3 Three knowledge systems

In the previous section we have briefly described the evolution of the Dutch knowledge system in the agricultural sector over the last fifty years. We identified three main systems, the ‘knowledge triptych’, the ‘knowledge pyramid’, and the ‘knowledge network’. There was no clear-cut transition from one system to another but a dynamic reconfiguration of historically stabilized relationships between the dominant actors within knowledge systems. National knowledge systems are complex systems that can be divided into subsystems and into different levels which are characterised by their own evolutionary dynamics [21].

In this paper we focus on the direction (governance) of the knowledge flow between actors and/or institutions within the different knowledge systems. Within the knowledge flow different knowledge processes can be distinguished, like knowledge creation, knowledge storage and retrieval, knowledge sharing, knowledge application. Following Etzkowitz and Leydesdorff, [22] but slightly adapted, we distinguish three main institutions within the agricultural knowledge system: government, farmers, and university (and related institutions). The knowledge flow in knowledge systems is directed by a dominant (formal or informal) governance model. The governance model defines the relationships between the institutions and actors. National knowledge systems differ in the way the relationships are set and evolve. A more detailed framework is presented in section 4.

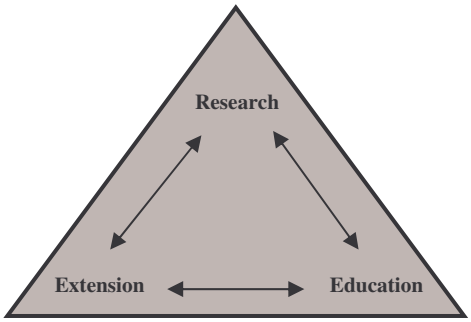
Recent studies on governance models of national knowledge and innovation systems advocate an inversion of top-down knowledge flows that still dominate most knowledge systems. Lundvall [23] argues that learning processes in interactions between users and producers provide the micro-foundation for economies. Gibbons et al. [24] contend that a new mode (mode II) of knowledge production is needed that is characterized by interdisciplinarity, co-development, negotiation, and balancing between supply and demand approaches of knowledge production. Nowotny [25] argues that a democratization of expertise is necessary in order to attain socially validated knowledge. It also implies that the traditional hierarchy between scientific knowledge and non-scientific knowledge should be broken down. She introduces the concept of social robustness of knowledge. In a similar way Von Hippel [26] argues that direct involvement of users and consumers in product development processes decreases the chance of innovation failures.

These studies emphasize the inversion of the direction of knowledge flows in knowledge and innovation systems. Demand-driven and community-based governance models are suggested to overcome the flaws of the more traditional, linear top-down systems. The three main knowledge systems, the ‘knowledge triptych’, the ‘knowledge pyramid’ and the ‘knowledge network’ differ in approach, from supply- to demand-driven approach. Their suitability and effectiveness will be discussed in the following sections.

The Knowledge Triptych

The ‘knowledge triptych’ (figure 1) is a public linear model of knowledge generation and knowledge distribution between research, public extension and education. This knowledge system has been well documented [27, 28].

Figure 1 The knowledge triptych



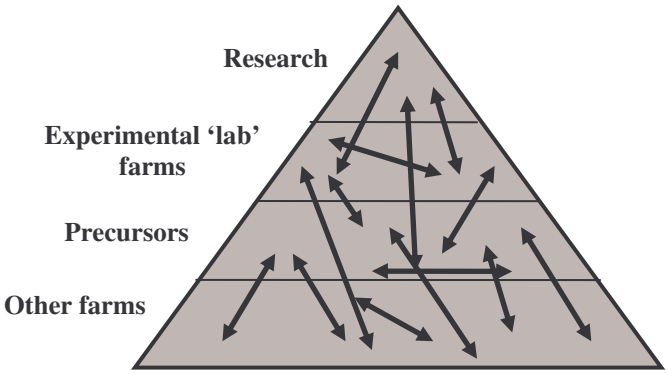
In this structure, the government bears the primary responsibility for the development and dissemination of knowledge to entrepreneurs to increase their 'strategic space' relating to business processes. This is an example of supply-driven knowledge dissemination through an instrumental policy approach. The government, in association with representatives of large farms, guides and stimulates intensification and expansion processes. The triptych has been very effective in both developing and distributing general public information regarding economic and political developments, and technical and financial information regarding agricultural business processes. It provided public extension workers and educators with a pool of information regarding practical research information. Social and cognitive links were strong between parties in the triptych. Extension workers, sometimes agricultural entrepreneurs themselves, visited individual entrepreneurs in person to discuss their profession and advised them on increasing their production and efficiency. The public extension workers understood the way of the farmer's life and the entrepreneurs trusted them because both the government and the entrepreneurs had the same strategic objectives. Educators used the research results directly to develop curricula. All parties involved, researchers, educators, extension workers, policy makers, entrepreneurs and other agricultural stakeholders interacted well and closely in formal and informal relationships [29], but there was no specific focus on cooperation with stakeholders outside the industry, such as consumers, civil society and the local community since they more or less shared the same interests.

As government and the agricultural industry started to develop different views regarding future development due to changing societal demands, the 'knowledge triptych' became less effective [30]. While the entrepreneurs focused on efficiency the government aimed to mitigate environmental effects. Not only did the growing gap between the government and the agricultural industry strain their relationship, it stirred a debate about responsibilities. The government wanted the agricultural industry to take more responsibility for future developments. Furthermore, in response to public demand, knowledge institutions increased the specialisation of tasks creating a gap between business practices and themselves. A researcher specialising, for instance, in molecular biology generated knowledge of less practical importance to entrepreneurs (via extension workers) or students (via education). The formal privatisation of extension work at the end of the 1990s, increasing competition instead of cooperation [31], brought a definite end to the 'knowledge triptych' [32].

The Knowledge Pyramid

To support the viability of the agricultural industry whilst focusing on mitigating negative environmental effects, the government introduced the 'knowledge pyramid' (figure 2), an instrumental system that targets mitigating negative environmental effects of manure [11].

Figure 2 The knowledge pyramid



Through this system, solution-oriented operational, technological and organisational information regarding environmentally friendly business processes were developed and tested before being implemented by precursors. To disseminate the developed knowledge, a 'shop' on the Internet was opened where entrepreneurs could buy knowledge by paying for it with a knowledge voucher which was distributed by the government among agricultural entrepreneurs.

The original idea was that entrepreneurs would identify and articulate their knowledge problems and buy the knowledge required to reach a solution. This, however, is a difficult process for entrepreneurs who are faced with new legislation for the first time and not entirely clear about the actual problem, let alone how to find possible solutions: '*Wissen des Nicht-wissen'* [14]. The system intended to incorporate both the instrumental and the emancipatory approach, but the instrumental supply-driven approach proved to be dominant. Another assumption that turned out to be only partly valid was the belief that lagging entrepreneurs would follow precursors when confronted with successful examples and the necessity to change enforced by legislation [12]. Some entrepreneurs did follow examples and research showed that entrepreneurs trust and learn most from their own colleagues. But not all solutions could be translated to specific business contexts and some entrepreneurs simply did not wish or dare to adopt the views of the government. So they followed their own course of development.

An important difference between the triptych and the pyramid is the transfer process, the manner in which solutions were proposed for problems that entrepreneurs seemed to have. But the process of knowledge generation by the pyramid was in fact no different to that of the triptych. Although the pyramid included fundamental and practical researchers and precursors, knowledge intermediaries like extension workers, educators, supply-chain partners and advisors were essentially excluded from the formal system. In practice

entrepreneurs trust and learn a lot from their accountants, feed suppliers and advisors [11]. And students learn a lot from those involved in the industry on a daily basis [33].

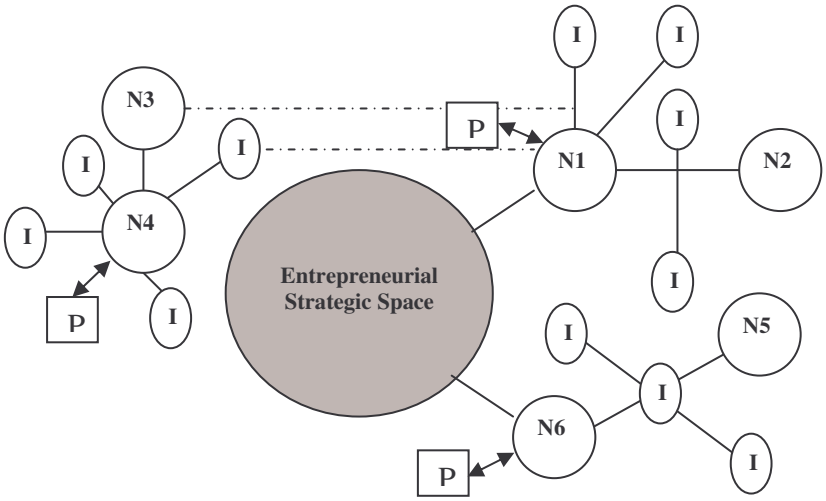
The pyramid did not offer a complete solution to the growing gap between research, extension or advice and education. Such knowledge brokers could have assisted (future) entrepreneurs in articulating their questions and need for knowledge and/or they could have bridged the gap between researchers and practitioners. Another problem with this system is that it did not include the interaction with stakeholders. This is necessary because civil society, consumers and European regulations especially minimised the 'strategic space'. These factors were unfortunately not taken into account. For instance in legislation, the system came up with solutions that complied to one law whilst conflicting with another. Moreover, certain solutions that would have assisted legal compliance would be rejected by the local community. Another example concerns the sustainable products brought to market without consumers willing to pay a higher price for it.

Even though this system has not been effective enough to make entrepreneurs articulate their knowledge needs, it did create awareness among entrepreneurs about (societal) needs and demands of other stakeholders. It also supported them in complying with environmental regulations by increasing their professional operational and strategic knowledge regarding ecological processes and business processes. Research shows that more than 50% of the agricultural entrepreneurs in the early 2000s (population circa 80.000) were well informed about possible solutions to their administrative and technical problems in complying with environmental manure regulations. Another advantage was that by introducing the pyramid, cooperation between policy makers, researchers, entrepreneurs, and in the end, knowledge brokers, increased. It did narrow the gap between theory and practice and between researcher and entrepreneur, but relationships were ad hoc and not imbedded [11].

The Knowledge Network

The ongoing transition to a sustainable agricultural industry requires a shift in responsibilities. In the past, the government took responsibility for sustainable development and imposed regulations to manage negative environmental effects and support entrepreneurs economically. Under pressure from the European Union, entrepreneurs will face downsizing of financial support in the near future. Furthermore, increased global competition requires a market approach of production and supply-chain management. In order to enhance competitiveness, diversification strategies need to be adopted as well. The transition also requires interfacing with society to meet demands regarding animal welfare, food safety, regional development and air and water quality. Whereas production was previously supply-driven and brought to market, production is shifting towards a market-driven approach supported by society. These changes require an alternative set of skills, type of knowledge and relationship with the business, knowledge and social environment. Therefore an emancipatory policy experiment 'Networks in Livestock production' (www.verantwoordeveehouderij.nl) has been introduced to support the enhancement of the 'strategic space' of entrepreneurs by entrepreneurs (figure 3).

Figure 3 The entrepreneurial 'strategic space' (N = network, I = individual, P=process guidance)



Through the experiment 'Networks in Livestock production' the government provides support to entrepreneurs in a network to enhance their 'strategic space' provided that the focus is on sustainable development. Policy aims are not spelled out like in approaches mentioned above. The framework (namely sustainable development) can be broadly interpreted. The focus is on the entrepreneurs articulating their own knowledge needs on the basis of the problems they have identified. The networks that are being supported can be horizontally oriented, (entrepreneurial study clubs, colleagues, often consisting of innovators and early-adopters [34]) or vertically oriented (supply chain partners and stakeholders are part of the network).

We mentioned earlier that the triptych and the pyramid differed particularly in terms of the process of knowledge diffusion. A 'knowledge network' like 'Networks in Livestock production' differs from the other approaches mentioned in both the diffusion process and the knowledge creation process. The government facilitates these processes by providing entrepreneurs with knowledge brokers who offer process guidance. These knowledge brokers assist for instance in locating financial support, matching knowledge demand and supply, fill knowledge gaps, stimulate interaction with other stakeholders and facilitate group processes.

Research into this demand-driven approach has shown three main advantages. First, the knowledge being developed is indeed directed by the entrepreneurs or their close advisors. They have taken responsibility for generating the knowledge they need. Second, the knowledge being developed fits the purpose for which it is being developed, namely the entrepreneur and his or her business. It takes context-specific factors into account which was not entirely the case in the previously mentioned approaches. Third, the number of knowledge knots is increasing and relationships are strengthened between researchers and practitioners, among partners in the supply chain and between entrepreneurs and the community in which they work and live.

However research shows disadvantages as well. The most important one is that once the developed knowledge, funded by both public and private funds, becomes interesting on a professional strategic level, the network could close, not willing to share its

competitive knowledge with other entrepreneurs. This constitutes a problem of ownership. At the same time, the knowledge being developed and exchanged within the network tends to focus more on operational use. First, this can be attributed to the fact that operational problems are often experienced by multiple entrepreneurs; it is seen as a common ground. Second, participants in the networks believe these problems can be solved in the near future for short term value [17]. Researchers have been monitoring and evaluating the experiment 'Networks in Livestock Production' for two years [17, 35, 36, 37, 38]. The government has extended the programme due to its success. However, issues regarding 'competitive value' and exchanging developed knowledge by precursors with lagging entrepreneurs still have to be dealt with. Like any transition, this is a long process and it requires trust, both between the parties involved (social trust) and in the value of the knowledge being created (cognitive trust) [39].

A final disadvantage is the fact that so far the educational institutions are excluded from participating in the experiment. In some cases, it is not necessarily significant, but in general the desire for more cooperation between educators and other knowledge brokers (researchers, advisors, extension workers), policy makers and (societal) stakeholders is increasing [32, 40].

All parties are looking for alternative knowledge roles and a new infrastructure to meet the dynamic demands of our knowledge-based economy. Nowadays an increasing number of initiatives are starting; projects in which different knowledge brokers and stakeholders interface or cooperate together to enhance 'strategic space'.

4 Supply-driven versus demand-driven knowledge systems

In the previous section we have described the structure and effectiveness of the three knowledge dissemination systems. In this section these three systems will be compared and evaluated.

Three knowledge systems compared

In table 1 the different characteristics of each instrument are compared.

Table 1 A comparison between three knowledge systems in Dutch agriculture

Characteristics	*Knowledge Triptych*	*Knowledge Pyramid*	*Knowledge Network*
Driving force	Supply-driven	Supply-driven	Demand-driven
Process characteristics of knowledge development and dissemination	Instrumental	Instrumental	Emancipatory
	Top-down	Top-down with an emancipatory aspect	Bottom-up
	Planned	Ad hoc	Incremental
	Linear	Linear / circular	Circular

Main responsibility / director of knowledge	Government	Government and research institutions	Entrepreneurs
Formal actors in the system	Research Education Extension	Research Experimental farms Precursors Other farms	Entrepreneurs Research Civil society Local community Supply chain partners
Communication channels	Formal knowledge ties	Formal knowledge ties	Informal knowledge ties / building networks
Focus on	Intensification and efficiency strategies	Mitigating negative environmental effects Stimulating legal compliance	Increasing strategic space
Industrial development	Convergence	Convergence	Divergence
Ties:			
Cognitive ties	Strong	Strong	Strong
Social ties	Strong	Weak	Strong
Strategic space:			
External forces	Low political and societal demands	High political and societal demands	High political and societal demands
Knowledge development	High development of knowledge	Increasing awareness of environmental problems High development of mainly operational knowledge	High development of business / chain / local specific knowledge
Knowledge dissemination	High dissemination of knowledge	Medium dissemination of knowledge	High dissemination within networks Low dissemination of knowledge with other entrepreneurs

Source: 'knowledge triptych' information based on Geerling et al., 2004 [11]; 'knowledge pyramid' information based on Van Baalen et al., 2005 [14]; and information concerning the 'knowledge network' based on Geerling-Eiff et al., 2005 [17] and Van Baalen et al., 2005 [14]; information concerning 'strategic space' based on Geerling et al. 2004 [11] and Van Baalen et al., 2005 [14].

The three knowledge systems compared in table 1 stimulate innovation processes in the agricultural industry and ultimately affect the knowledge economy. The effectiveness of each system depends on the context in which it is being implemented.

Since the 1960s the knowledge system moved from an instrumental supply-driven to a more emancipatory demand-driven approach incorporating more stakeholders. The paradox lies in the development from convergence towards divergence of strategies in the industry while at the same time businesses need to cooperate with each other and other stakeholders in the supply chain and the society in the transition to a more sustainable agricultural industry. The 'knowledge network' proves to be useful in developing knowledge but competitive pressure limits the support and activities for disseminating knowledge across the agricultural industry especially when it concerns knowledge of strategic value.

A second tension is seen between the stimulation of knowledge and innovation processes while at the same time 'strategic space' is limited externally by social and political demands. The challenges involved in developing alternatives to cope with the increase in political and societal demands are considered significant.

Implications for intervention

Both supply-driven and demand-driven approaches are effective but in different circumstances and for different purposes. Research has shown some distinctive effects.

The supply-driven, instrumental approach has the advantage that it can build on existing competences and capacities of research institutes. It has an answer for the problem of '*Wissen des Nicht-Wissen'*. This approach is useful for the broad dissemination of information in an industry with converging strategies. Linear models are well suited to create awareness about a specific problem, to inform the public about new technologies, to influence attitudes regarding the environment or to inform the public about changed regulations. For example, the manure problem is a social problem that needs to be addressed with strict regulations that could undermine the agricultural industry. If solutions are needed in a relatively short time, the government will direct the course of action in order to achieve this aim. This approach is limited in its effectiveness however because it does not fit every business model and practice. It does not take into account the diversity in management styles.

The demand-driven approach builds on networks of entrepreneurs. The entrepreneur is the pivot in the knowledge creation and dissemination processes. Ties are fostered between entrepreneurs, partners in the supply chain, knowledge brokers and other stakeholders. An emancipatory process is recommended to support divergence of strategies on a small scale and when societal and professional objectives coincide. New ties with stakeholders and supply chain partners increase the 'strategic space' of entrepreneurs. Diversity in a network and relationships between networks increase the level of knowledge development in general. Too much diversity however reduces the ability to understand each other and it reduces the potential of finding common ground. There has to be a sound balance. Energy and drive are important characteristics of well functioning networks of entrepreneurs who benefit from 'strategic space' building. The development of knowledge is however limited to applied knowledge. There is, for instance, no incentive for developing scientific fundamental knowledge.

Knowledge is a powerful weapon [38] A 100% demand-driven approach gives entrepreneurs control over knowledge development and knowledge exchange. To

stimulate innovation and strengthen individual competitive positions, this is a sound approach. However, to benefit the overall economy at least the basis and the process of the developed knowledge need to be enhanced. For that purpose a more supply-driven, instrumental approach would be more appropriate. This is especially the case when risks of investment in certain types of knowledge are high, when costs are too high for one entrepreneur or a network of entrepreneurs or in the case of high uncertainty regarding the expected Return on Investment.

In order for both systems to function effectively trust is crucial [41]. First, social trust is necessary to accept knowledge as being valid information from a trustworthy source. Social trust is also of the essence for developing and exchanging knowledge in a learning community or a so-called network of practices. Second, cognitive trust is necessary for the exchange of knowledge so actors can relate to and understand one another.

5 Concluding remarks

In this paper three different approaches to knowledge creation and dissemination were discussed. In the transition towards a sustainable society, other industries (e.g. shipping, clothing, domestic articles, toys, oil, etc.) are also confronted with new knowledge challenges.

The Dutch government has intervened in the market of supply and demand of knowledge through the years in order to stimulate innovation processes. In this Triple Helix [20] the role and positions of institutions have changed throughout the years, due to or resulting in collapsed knowledge infrastructures. New systems have been developed but, as research shows, need to fit the business context. All parties involved are currently searching for new systems, interfacing ties and alternative roles to reposition themselves in the knowledge economy of the agricultural industry which in increasing matter is dominated by a trend of life long learning, learning organisations with a focus on performance, competence management and entrepreneurship [9]. ‘Strategic space’ can be enhanced by learning but is less effective when external factors limit strategic options. Especially consumers, civil society, local community and legislators should take that into account in their own decision-making-process.

A final remark is that research tends to limit its focus to the non-lineair relationship between knowledge and innovation excluding other key building blocks for innovation. Future research could focus more specifically on the relationship between knowledge and these building blocks.

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