MATCHING DEMAND **AND SUPPLY** IN THE DUTCH AGRICULTURAL KNOWLEDGE INFRASTRUCTURE

THE EMERGENCE AND EMBEDDING OF NEW INTERMEDIARIES IN AN AGRICULTURAL INNOVATION SYSTEM IN TRANSITION LAURENS KLERKX

Matching demand and supply in the Dutch agricultural knowledge infrastructure

The emergence and embedding of new intermediaries in an agricultural innovation system in transition

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Table of contents

I	Ger	neral introduction: setting the scene	11
	I.I	The place of the agricultural knowledge infrastructure within the	
		agricultural innovation system	
	I.2	Recent changes in the agricultural knowledge infrastructure	14
	1.3	Emergence of a paradigm of demand-driven delivery of agricultural	18
		R&D and KIBS	
	I.4	New organizational arrangements to meet the challenges of a	20
		demand-driven agricultural knowledge infrastructure	
	1.5	Objectives of the study and research questions	22
	1.6	Case selection and research methods	23
	1.7	Research issues	25
		1.7.1 Reflection on methods	25
		1.7.2 Reflections on focus	27
		1.7.3 Reflection on thesis style	28
	1.8	Outline of the thesis	28
2	Han	ds off but strings attached: the contradictions of policy-induced	33
	dem	and-driven agricultural extension	
	2. I	Introduction	34
	2.2	Privatization of extension: New roles for the state	34
		2.2.1 Assumed benefits of privatization	34
		2.2.2 Counteracting market failure	35
		2.2.3 Supply-side funding versus demand-side financing through	37
		voucher systems	
	2.3	The Nutrient Management Support Service as an attempt to foster	38
		publicly financed demand-driven extension service provisioning	
		2.3.1 Nutrient management as a theme of public interest	39
		2.3.2 The aims and methods of the NMSS	39
	2.4	Experiences with the Nutrient Management Support Service	41
		2.4.1 Research approach and methods	42
		2.4.2 Main findings regarding the four elements of the NMSS formula	42
	2.5	Reflective observations on the functioning of the NMSS	44
	-	2.5.1 Creating incentives for knowledge providers in particular	44
		2.5.2 Existing relationships versus spot market transactions	45
		2.5.3 The influence of the politicized context	46

		2.5.4 A lack of knowledge on nutrient management?	47
		2.5.5 The limited learning capacity of the project	47
	2.6	Conceptual reflections on publicly funded demand-driven extension	48
		2.6.1 The need to unpack the notion of demand	48
		2.6.2 Moving beyond classic knowledge products	50
		2.6.3 The functioning of the knowledge market	51
	2.7	Conclusion: The role of the state in a privatized extension system	52
3	Inst	titutionalizing end-user demand steering in agricultural R&D:	57
	farn	ner levy funding of R&D in The Netherlands	
	3.1	Introduction	58
	3.2	Farmer levy funding as a way of institutionalizing end-user demand steering in agricultural R&D systems	59
	3.3	Influences of the institutional context on the process of R&D project planning	61
	3.4	R&D planning in a system of farmer levy funding: the case of DCB	62
	71	3.4.1 Goal and method	63
	3.5	Results	64
	,,	3.5.1 The generation of R&D queries: a focus on operational issues	65
		3.5.2 The filtering of R&D queries: steering at different levels	65
		3.5.3 Decision making on fund allocation	67
		3.5.4 What happens after fund allocation?	67
	3.6	Discussion: weaknesses in levy-funded demand-driven R&D systems	69
)	3.6.1 The influence of the institutional setting on shaping demand	69
		3.6.2 The need to broaden the view on innovation	71
	3.7	Conclusion	72
4	Del	egation of research governance to networks: experiences with a	75
	mu	tiple goal boundary organization in organic agricultural research	
	4.I	Introduction	76
	4.2	Delegation of agricultural research governance to networks	76
	4.3	Changing roles for research councils in systems of delegation to	78
		networks: the emergence of 'multiple goal boundary organizations'	
	4.4	Exploring tensions in delegation to networks	80
	4.5	Case selection and research method	81
	4.6	Results: tensions at the different levels within Bioconnect	85
		4.6.1 Tensions experienced by users (farmers, industry, and	85
		advocacy groups)	
		4.6.2 Tensions experienced by researchers	87

	4.6.3 Tensions experienced by policy makers	88
	4.6.4 Tensions experienced by Bioconnect management	88
	4.6.5 Tensions experienced by consultants	89
	7 Discussion	90
	3 Conclusion	92
5	atching demand and supply in the agricultural knowledge	95
	frastructure: experiences with innovation intermediaries	
	Introduction	96
	Changes and challenges in the support of agricultural innovation	96
	Roles of innovation intermediaries in (agricultural) innovation	99
	systems	
	5.3.1 Demand articulation	99
	5.3.2 Network brokerage	101
	5.3.3 Innovation process management	101
	5.3.4 The setup of innovation intermediaries	101
	Experiences with innovation intermediaries in Dutch agriculture	102
	5.4.1 Aims and methods	102
	5.4.2 Reasons for the establishment of innovation intermediaries	103
	5.4.3 Types of innovation intermediaries	103
	5.4.4 Reported contributions	109
	5.4.5 Reported tensions	112
	Discussion: policy implications for setting up innovation intermed	ia- 116
	ries in agricultural knowledge infrastructures in transition	
	5 Conclusion	120
6	lancing multiple interests: embedding innovation intermediation in	123
	e agricultural knowledge infrastructure	
	Introduction	124
	2 Changes and challenges in the support of agricultural innovation	124
	6.2.1 Changes in thinking on innovation	124
	6.2.2 Changes in the agricultural knowledge infrastructure	125
	6.2.3 Challenges on the demand and supply side	126
	6.2.4 The emergence of innovation intermediaries	128
	6.2.5 Innovation intermediation as a core business or as a function within regular KIBS?	1 129
	3 Goal, case selection, and research questions	130
	4 Methods	132
	5 Results	133

		6.5.1 Perceptions about significance of InnoFac's activities to R&D and KIBS providers	133			
		6.5.2 Perceptions about InnoFac's firm structure	135			
		6.5.3 The position of other innovation supporting organisations vis-à-vis InnoFac	136			
	6.6	Discussion: tensions in the functioning of a for-profit innovation intermediary	136			
		6.6.1 Tensions in maintaining an impartial position	137			
		6.6.2 Tensions in generating revenues	138			
		6.6.3 Competing functions: the manifestation of function ambiguity	139			
	6.7	Conclusion: Implications for theory and policy	140			
7	⁷ Institutionalization of inter-firm network brokerage organizations:					
	a ca	se study from Dutch agriculture	140			
	7.1	Challenges of policy in duced notwork initiatives	140			
	7.2	Chantenges of policy induced network initiatives	14/			
		7.2.1 Neutrality vis-a-vis network participants	148			
		7.2.2 Neutrality vis-a-vis actors external to the network	149			
	P 2	Funding of network brokerage organizations in the agricultural	149			
	/.3	knowledge infrastructure: the case of the Dutch Dairy Farming	130			
		Academy	150			
		7.3.1 Background	150			
	1 74	Cool and method	151			
	/·4	Regults	152			
	/•)	7.5.1 The neutrality paradox: experiences with and perceptions about DFA's demand-driven character	155			
		7.5.2 The alienation dilemma: experiences with and perceptions of the place and function of DFA in the agricultural knowledge infrastructure	156			
		7.5.3 Funding continuity: perceptions about the funding of DFA	158			
	7.6	Discussion	160			
	-	7.6.1 Tackling the neutrality paradox through a demand-driven approach	160			
		7.6.2 Function ambiguity and the alienation dilemma	161			
		7.6.3 The emergence of a funding paradox	162			
	7.7	Conclusion	163			

8	Ger	neral discussion and conclusion	165
	8.1	The multifaceted nature of demand: what and whose demand is	166
		driving R&D and KIBS provision in the privatized agricultural	
		knowledge infrastructure?	
		8.1.1 What demand?	166
		8.1.2 Whose demand?	168
	8.2	Innovation intermediaries as a new organizational arrangement to	170
		enhance system interaction within the Dutch agricultural knowledge	
		infrastructure	
	8.3	The embedding of innovation intermediaries: juggling with	173
		demands, balancing interests, and institutional learning in the	
		agricultural knowledge infrastructure	
	8.4	Changing roles of government, farmers, and R&D and KIBS	177
		providers	
	8.5	Main conclusions	180
		8.5.1 The operationalization of demand	180
		8.5.2 New organizational arrangements	180
		8.5.3 Embedding of new organizational arrangements in the	181
		existing agricultural knowledge infrastructure	
	8.6	Policy recommendations and lines for further research	182
Ref	ere	nces	187
۸nı	non	div	215
лрј			215
Sur	nm	ary	217
Sar	nen	vatting	225
Dai	nkw	roord	233
List	t of	publications	235
C_{11}	rrice	ulum Vitae	727
Cu.		ululli vilat	23/

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General introduction

Setting the scene

This thesis deals with changes in the Dutch agricultural knowledge infrastructure. Smith (1997: 94-95) refers to a knowledge infrastructure as a 'complex of public and private organizations and institutions whose role is the production, maintenance, distribution, management and protection of knowledge. These institutions possess technical and economic characteristics that are not dissimilar to those of physical infrastructure.' In the context of Dutch agriculture, as elsewhere, the term has been often used to indicate the whole of agricultural research, extension and education establishments¹.

The Dutch agricultural knowledge infrastructure has been the subject of several studies that have documented its evolution over the years with regard to its objectives, its structure, and the interactions between the actors involved (e.g. Bos, 1989; Bos et al., 1991; Van der Ley and Proost, 1992; Proost, 1994; Vijverberg, 1996; Verkaik et al., 1997; Verkaik and Dijkveld Stol, 1989; Verkaik, 1997; Renkema and Leeuwis, 1998; Roseboom and Rutten, 1998; Rutten and van Oosten, 1999; Leeuwis, 2000; Wielinga, 2000, 2001; Nieuwenhuis, 2002; Proost and Duijsings, 2002; Maat, 2003; Hubeek et al., 2006; Mulder and Kupper, 2006).

This thesis fits within this line of study as it documents recent changes, such as privatization and functional differentiation, in the Dutch agricultural knowledge infrastructure. This introductory chapter aims to briefly describe the background against which the cases studied in the different chapters of this thesis have emerged, set the objectives for the study and provide a reflection on the methods used.

1.1 The place of the agricultural knowledge infrastructure within the agricultural innovation system

Over time, major changes have taken place in the relationships between end-users of knowledge (i.e. farmers) and the agricultural knowledge infrastructure. These relationships have changed because of shortcomings of previous innovation support systems for farmers (based on linear, 'science push' models of innovation such as the transfer of technology approach) that have been criticized in the broad literature on participatory research and extension (see e.g. Chambers et al., 1989; Pretty, 1995; Guijt and van Veldhuizen, 1998; Sumberg et al., 2003; Johnson et al., 2003), and because of the development of network and systems approaches to agricultural innovation such as the agricultural knowledge and information systems approach (AKIS, e.g. Röling and Engel, 1991; Engel, 1995), the agricultural innovation systems approach (AIS² see e.g. Biggs and Smith, 1998; Hall et al., 2001; Clark, 2002; Hall et al., 2004; Sumberg, 2005) and miscellaneous network approaches (Lacy, 1996; Thrupp and Altieri, 2001). With regard to conceptual development, Hall et al. (2006) speak about a transition from national agricultural research systems (NARS) to agricultural knowledge and information systems (AKIS), to agricultural innovation systems (AIS), with each approach building a more comprehensive view on innovation (see Hall et al., 2006: 23-26). Table 1.1 sets out the defining features of the three different models.

From the AIS perspective, the agricultural knowledge infrastructure forms part of such an agricultural innovation system, but is not necessarily the principal driver as Hall et al. (2006: vii) emphasize: 'The innovation systems concept embraces not only the science suppliers but the totality and interaction of actors involved in innovation. It extends beyond the creation of knowledge to encompass the factors affecting demand for and use of knowledge in novel and useful ways'. In a similar vein, Sumberg (2005: 4) indicates that 'research is now seen as one of the many 'stakeholders' within a 'chain-link' or 'network' innovation system.' The agricultural innovation systems approach also focuses on enabling and constraining factors for innovation other than knowledge, such as physical 'hard' infrastructure and social 'soft' infrastructure, including institutions such as informal norms, values, attitudes and practices, and formal rules embedded in legislation and policy (Hall et al., 2006; see also Smits, 2002; Klein Woolthuis et al., 2005). Innovation systems thinking has also been adopted by organizations aiming for transition in Dutch agriculture, such as Transforum, who speak of a transition from an agricultural knowledge infrastructure to an agricultural innovation system (Van Kleef, 2006)³.

The AIS approach is increasingly being applied, and likewise has become subject to increasing criticism. Dalrymple (2005) criticizes the AIS approach as being 'old wine in a new bottle' and states that 'In the case of agricultural research, for example, much of what is being proposed under the banner of 'systems of innovation' has in fact been done for some time, though not with the same label, and perhaps with a reduced scope.' Furthermore, Hall et al. (2006: 25), for example, see it as a weak-

ness of AKIS that 'The focus is restricted to actors and processes in the rural environment and the framework pays limited attention to the role of markets (especially input and output markets), the private sector, the enabling policy environment, and other disciplines/sectors. The AKIS framework recognizes the importance of transferring information from farmers to research systems but tends to suggest that most technologies will be transferred from researchers down to farmers.'

Defining feature	NARS	AKIS	AIS
Purpose	Planning capacity for agricul- tural research, technology development, and technology transfer	Strengthening communica- tion and knowledge delivery services to people in the rural sector	Strengthening the capacity to innovate throughout the agricul- tural production and marketing system
Actors	National agricultural research organizations, agricultural universities or faculties of agriculture, extension servi- ces, and farmers	National agricultural research organizations, agricultural universities or faculties of agriculture, extension servi- ces, farmers, NGOs, and entrepreneurs in rural areas	Potentially all actors in the public and private sectors involved in the creation, diffusion, adaptation, and use of all types of knowledge relevant to agricultural production and marketing
Outcome	Technology invention and technology transfer	Technology adoption and innovation in agricultural production	Combinations of technical and institutional innovations throug- hout the production, marketing, policy research, and enterprise domains
Organizing principle	Using science to create inventions	Accessing agricultural knowledge	New uses of knowledge for social and economic change
Mechanism for innovation	Transfer of technology	Interactive learning	Interactive learning
Degree of market integration	Nil	Low	High
Role of policy	Resource allocation, priority setting	Enabling framework	Integrated component and enabling framework
Nature of capacity strengthening	Infrastructure and human resource development	Strengthening communica- tion between actors in rural areas	Strengthening interactions between actors; institutional development and change to support interaction, learning and innovation; creating and enabling environment

Table 1.1: Defining features of the NARS, AKIS and AIS approach. (Source: Hall et al., 2006:23)

However, these contextual factors are considered essential under AKIS. As Röling (1990: 20) states: 'when modeling the AKIS, it is important to bear in mind that the system takes its place in a larger context, from which it is not separate.' According to Röling, such a context includes the policy environment (laws and incentives), structural conditions (markets, inputs, the resource base, infrastructure, and the structure of farming), the political and bureaucratic structure through which interest groups influence the system, and the external sector (donor agencies, international agricultural research centers and commercial firms).

These similarities between the approaches, according to Rivera et al. (2006: 587), can be explained by the fact that 'AIS did not evolve as a further development of the AKIS framework, but rather as a parallel development which did not build upon the insights of the AKIS literature and the practical experience in applying this framework. One reason for this parallel rather than consecutive development may be due to the fact that, considering the background of the leading authors, AKIS/RD evolved from the extension perspective, while AIS was developed from a research perspective.' Recent publications focus on the cross-fertilization and applicability of either approach (Assefa et al., 2006; Hall et al., 2006). Rivera et al. (2006), who analogous to Hall et al. (2006) make a comparison of the different models (i.e. NARS, AKIS, AIS), note that the AIS approach still needs to be transformed from an analytical concept into a workable operational concept to strengthen agricultural innovation through targeted interventions. Niosi et al. (1993) earlier made a similar comment, and an attempt was made to rectify the situation with reference to the original national systems of innovation (NSI) approach; a similar effort is currently being made with reference to AIS (see Hall et al., 2006: 70-83).

This thesis does not aim to specifically develop or criticize either the AKIS or AIS approach, but takes the systemic focus of these approaches as an important point of departure. However, while recognizing the importance of many actors and enabling and constraining factors for agricultural innovation, this thesis takes the agricultural knowledge infrastructure as its main unit of analysis, with a focus on four actor groups: on the supply side, agricultural research and agricultural extension, and on the demand side, farmers and government.

1.2 Recent changes in the agricultural knowledge infrastructure

In The Netherlands as elsewhere, agricultural knowledge infrastructures have undergone several reforms in recent years. These reforms, which mainly deal with the funding, governance structures, incentive mechanisms, and changing paradigms with regard to the form and content of service provision of agricultural knowledge infrastructures, are discussed in a vast body of literature. An important reform measure, in the context of both industrialized and developing countries, has been the privatization of public agricultural knowledge infrastructures, especially agricultural research and extension⁴ (see Table 1.2 for an extensive, though not exhaustive,

Component of the knowledge infrastructure	Conceptually oriented analyses	Empirically oriented analyses/case studies	Policy design oriented studies/ best practices/country review studies
Research	Barnes, 2001; Beynon, 1995; Beynon et al., 1998; Boehlje, 1998; Byerlee, 1998; Byerlee et al., 2002; Carew, 2001; Holt, 1998; Huffman and Just, 1999a, 1999b, 2000; Klein, 2001; Kremer and Zwane, 2005; Lacy, 1996, 2001; Leeuwis, 2000; Pardey et al., 1989; Read et al., 1988; Umali, 1992: Verkaik and Dijkveld Stol, 1989; Wielinga, 2001; Wolf and Zilbermann, 2001	Chema et al., 2003; Huffman and Just, 1999b; Roseboom and Rutten, 1998; Santamaría Guerra, 2003; Thirtle et al., 1997; Thornley and Doyle, 1984; Van der Meer, 2002; Wolf and Zilbermann, 2001	Beynon et al., 1998; Carney, 1995; Heemskerk and Mafuru, 1998; Heemskerk et al., 2003; Heemskerk and Wennink, 2005; Janssen, 2002; Janssen and Braunschweig, 2003; Knipling, 2001; Levidow et al., 2002; Wolf and Zilbermann, 2001
Extension	Anderson and Feder, 2004; Anderson and van Crowder, 2000; Bennett, 1996; Boehlje, 1998; Farrington, 1995; Feder et al., 2001; Hanson and Just, 2001; Hubbard, 1995; Ison and Russell, 2000; Katz, 2000; Kidd et al., 2000; Lacy, 1996, 2001; Leeuwis, 2000; Mullen et al., 2000; Read et al., 1988; Rivera, 1996, 2000; Rivera and Alex, 2004a, 2004b; Sulaiman and Hall, 2002; Sulaiman et al., 2005; Thorton et al., 2003; Umali and Schwarz, 1994; Van den Ban, 2000; Wielinga, 2000, 2001; Wolf and Zilbermann, 2001; World Bank, 2000	Bebbington and Sotomayor, 1998; Berdegué, 2002; Bloome, 1993; Bos, 1989; Bos et al., 1991; Currle et al., 2002; Davidson et al., 2001; Dinar, 1996; Fleischer et al., 2002; Frisvold et al., 2001; Goletti et al., 2007; Holloway and Ehui, 2007; Klerkx et al., 2006a; Labarthe, 2005, 2006; Macadam, 2000; Ozor et al., 2007; Proost and Duijsings, 2002; Riikka et al., 2002; Ritchie, 1997; Rivera, 1993; Solís and Bravo-Ureta, 2005; Van Crowder et al., 2002; Wallace, 1998; Wolf, 1998; Wolf et al., 2001	Birner et al., 2006; Carney, 1995; Chapman and Tripp, 2003; Chipeta, 2006; Garforth et al., 2003; Garforth et al., 2003b; Groot, 1998; Hoffmann et al., 2000; Katz and Barandun, 2002; Laurent et al., 2006; Needham, 1997; Neuchâtel Group, 1999; Qamar, 2002; Rivera, 1996, 2001; Rivera and Alex, 2004c; Rivera et al., 2002, 2005; Rivera and Gustafson, 1991; Rivera and Schram, 1987; Staff writer, 2006; Tacken, 1997, 1998; Wolf and Zilbermann, 2001;

overview of literature on reform measures ${}^{\scriptscriptstyle 5}$ in a gricultural knowledge infrastructures).

Table 1.2: Overview of literature on reform measures and institutional change in agricultural research and extension

With respect to this shift to a private system, some have coined the term 'agricultural knowledge market' to describe the totality of private parties involved in the support of agricultural innovation (Holt, 1998; Leeuwis, 2000; Clark, 2002). The term 'knowledge market,' however, suggests that it is about trading knowledge that is made explicit, decontextualized and protected by intellectual property rights and patents (Foray, 2004). With regard to the emergence of such a knowledge market, Athreye (1998: 235) states that two conditions must be met:

- ⁴I. The alienation of knowledge from its context, which allows knowledge to assume dimensions of a commoditisable product that can be bought and sold and transferred thereafter to different uses.
- 2. The establishment of a reasonable frequency of transactions in that commoditisable knowledge to establish a specialised market in it. The existence of a specialised market does not depend only upon the existence of product or even the possibility of exchange. Regular markets emerge when producers can expect the existence of a minimum volume of exchange transactions. Only this allows knowledge to become a commodity in that producers of knowledge may be induced to make capital outlays and employ capital in order to produce knowledge embodied goods for exchange.'

Following this second condition, because knowledge for the support of agricultural innovation is typically embedded in intermediate products and services, it appears better to speak about a market in agricultural R&D and 'knowledge-intensive business services' (KIBS).

In the current systems perspective on innovation, which involves the interactive creation of knowledge, the market metaphor of demand and supply paradoxically suggests adherence to a linear perspective on innovation, as Leeuwis (2000: 84-85) states: 'According to market-oriented knowledge policy, especially 'applied' (agrarian) knowledge can be regarded as a private property and saleable good, for which the user must, in principle, pay. In this context, the phrase 'supply and demand' is used more and more frequently with reference to knowledge. The 'demand' side is mostly associated with users of knowledge while the suppliers are thought of as developers and transmitters of knowledge. The metaphor of supply and demand therefore carries with it the idea of a clear division of tasks between the three parties. In other words, innovation processes are essentially regarded as linear in nature.'

However, on the premise that knowledge is embedded in a service, and as services can be characterized as 'experience goods' (Van Dijk, 2002) that are not completely defined ex ante, the demand and supply metaphor indeed leaves space for co-creation⁶. Sarewitz and Pielke (2007: 7) state with regard to research that a strict delineation in demand and supply categories cannot be understood as 'conceptually discrete or fully coherent', but as these authors continue: 'while notions of 'supply' and 'demand' may embody considerable complexity, they also represent something real and recognizable: on the one hand, people conducting research that has been justified in terms of particular societal outcomes, and on the other, people making decisions aimed at contributing to those outcomes.' In this regard, Clark's (2002) characterization seems appropriate: the demand side refers to those involved in 'knowledge search' and the supply side refers to those concerned with 'knowledge use'. One should realize, however, that, in line with AIS thinking, for the support of innovation, enabling and constraining factors other than knowledge and information also play a decisive role, such as legislation, infrastructure, and institutions (Smits, 2002; Klein Woolthuis et al., 2005; Hall et al., 2006). In this thesis, however, the predominant focus is on the role of knowledge intensive services (R&D and KIBS) in innovation processes.

Reasons for privatization of public research and extension establishments and supposed benefits include increased efficiency and effectiveness, increased accountability, and reduced bureaucracy and corruption. The present thinking is that provisioning of agricultural R&D and KIBS should be pluralistic with mixed funding and undertaken by both public and private parties (e.g. Carney, 1998; Huffman and Just, 1999a; Byerlee et al., 2002; Levidow et al., 2002; Rivera et al., 2002), and different combinations of public, private or public/private funding and delivery can be used to attain several goals pertaining to public and private interests (see Katz and Barandun, 2002; Garforth et al., 2003a).

In conjunction with supposed benefits, risks have also been identified: assumed negative effects of privatization include exclusion risks (certain groups will be excluded, e.g. less resourceful farmers), substitution risks (the provision of certain goods may be endangered as they will be substituted by goods that are easier to market), high transaction costs, and decreased system interaction due to strategic interests. Many of these risks relate to the economic good properties of knowledge and information (i.e. in terms of excludability, rivalry/subtractibility, and appropriability of the good), which become commodities in the market for agricultural R&D services and KIBS (see e.g. Bennett, 1996; Beynon et al., 1998; Carney, 1998; Huffman and Just, 1999a, 2000; Leeuwis, 2000; Hanson and Just, 2001; Kidd et al., 2000; Katz and Barandun, 2002; Byerlee et al., 2002 for analysis of the economic good properties of research and extension and a discussion of risks).⁷ However, as Rivera et al. (2002) argue in the case of extension, although it has not become fully clear what the exact results and consequences of the privatization of agricultural extension are, for example in terms of transaction costs (Birner et al., 2006), there does not appear to be any return to previous systems of governance and organization of extension systems.

Besides purposefully induced reform measures, such as privatization, affecting the agricultural knowledge infrastructure, the changes induced by structural changes in the agricultural sector have affected the relationship between, on the one hand, end-users of innovations (i.e. farmers) and large commissioners who may represent bodies of end-users such as government and collective funding bodies such as commodity boards, and, on the other, the agricultural knowledge infrastructure. The component parts of the agriculture knowledge infrastructure need to re-orient themselves towards heterogeneous demands for knowledge from their clients (e.g. farmers, agri-industries, government, the general public) because of trends towards specialization, multifunctionality, and scale increase, integration in production chains driven by consumer demands and operation on liberalized markets, and

societal demands such as food safety, animal welfare, and ecological sustainability (see e.g. Bonny, 1998; Zilbermann et al., 2001, Reardon et al., 2003; van Huylenbroeck and Durand, 2003; Grin, 2004). All these demands and challenges make agriculture increasingly knowledge intensive (Byerlee et al., 2002; Hall et al., 2006). This reorientation from a supply-driven agricultural knowledge infrastructure towards an agricultural knowledge infrastructure addressing heterogeneous demands (Verkaik, 1997; Rutten and van Oosten, 1999; Janssen and Braunschweig, 2003; Allaire and Wolf, 2004; Smits, 2002; Byerlee et al., 2002; Just et al., 2006; Hall et al. 2006) would need to include a shift from a mere production-technical focus towards providing services aimed at improving more generic business and management skills (Phillipson et al., 2004). These services should support the entrepreneurship of farmers, a topic that has been receiving renewed attention on policy agendas (Lans et al., 2004; Bergevoet, 2005; Phillipson et al., 2004; Pyysiäinen et al., 2006; Mulder et al., 2007; Vesala et al., 2007). Knudson et al. (2004: 1333) define entrepreneurship as 'the personalized drive and capability to commercialize a product, service, process, or business idea.' Within agricultural entrepreneurship, an inclination towards innovation is seen as a key feature (Gielen et al., 2003; Lans et al., 2004; Knudson et al., 2004; Gray et al., 2004; De Lauwere, 2005). In line with this literature, and in the context of this thesis, this concerns mostly innovation at the level of farmers, although entrepreneurship and innovation are also seen as important in the context of agri-food chains (see e.g. Omta, 2002; Stijnen et al., 2002; Batterink et al., 2006; Duysters et al., 2006).

1.3 Emergence of a paradigm of demand-driven delivery of agricultural R&D and KIBS

With regard to the delivery of knowledge intensive services (R&D and KIBS) for the support of agricultural innovation, privatization of the agricultural knowledge infrastructure and changing demands from the agricultural sector have induced a shift from supply-driven towards demand-driven modes of working (e.g. Rivera et al., 2002; Heemskerk et al., 2003; Rivera and Alex, 2004c; Hubeek et al., 2006).⁸ This requires institutional change and capacity building on both sides of the market in R&D and KIBS (e.g. Katz and Barandun 2002; Just et al., 2003; Chapman and Tripp, 2003; Garforth et al., 2003a). This in turn has implications for several actors preoccupied with agricultural innovation. This thesis focuses mainly on the position of farmers, R&D and KIBS providers, and government.

For farmers it implies that they need to articulate their demands with regard to knowledge and look for suitable R&D and KIBS providers or other cooperation partners, select these, and interact during the subsequent transaction. In this regard, Coehoorn et al. (1991) argue that, without effective demand, it is difficult for knowledge system institutions to be client oriented. However, Just et al. (2003) argue that agricultural enterprises with low analytic competencies (i.e. knowledge, experience,

organization) are limited in their ability to create useful knowledge from externally sourced information: they state that it takes knowledge to create or access new knowledge.⁹ This is supported by findings of De Groot (2003) who argues that many farmers experience an 'information overload' and have difficulties acting successfully on the market for R&D and KIBS (see also Garforth et al., 2003a; Garforth et al., 2003b; Laurent et al., 2006). In many respects, there are analogies with constraints experienced by other small and medium enterprises (SMEs)¹⁰, a group to which agricultural enterprises such as farms increasingly are considered to belong (Tacken, 1998; Senker and Faulkner, 2001; Bergevoet, 2005).

For R&D and KIBS providers it implies that they have to put effort into procurement and become responsive to the needs of clients. This has a number of implications.

For KIBS providers

Under privatized regimes of agricultural extension service provision, farmers become clients, sponsors, and stakeholders rather than being mere beneficiaries (Neuchâtel Group, 1999; Katz and Barandun, 2002), and KIBS providers become contracted (see Rivera et al., 2002; Katz and Barandun, 2002, for several case studies). Also, the content of KIBS provision is changing: in the 'public funding-public delivery' era, extension has already developed from intermediation between research and farmers whose mere goal was technology transfer, to the provision of a broader range of communicative functions (Coutts, 1995; Van den Ban, 1998; Leeuwis and van den Ban, 2004: see page 30 for a summary), a development which under the current privatized regime has resulted in a pluralistic array of agricultural KIBS providers fulfilling particular functions. Phillipson et al. (2004) signal an increasing relevance of generic (i.e. non-agricultural, non-technical) business service provision to support farmers in the current context of agriculture.

For R&D providers

R&D establishments also have to respond to calls to make more impact and have to become responsive to the needs of end-users. This calls for institutional learning and change in R&D establishments (e.g. Smits, 2002; Hall et al., 2003; Santamaría Guerra, 2003; Sumberg and Reece, 2004; Sumberg, 2005). They should evolve from a linear, supply-driven approach to innovation to a demand-driven, systems approach to innovation. R&D establishments need to reflect on whether they should shift from developing science and technology capacity and move towards innovation capacity. This includes responding to calls to science to come to new relationships with society, through approaches such as the mode 2 science approach (Gibbons et al., 1994)^{III}, the post-normal science approach (Funtowicz and Ravetz, 1993), and the triple helix approach (Etzkowitz and Leydesdorff, 2000).

The role of government is also changing. As many argue, safeguarding the proper functioning of the market in R&D and KIBS (i.e. counteracting market failure) requires the continued involvement of the government (Bennett, 1996; Beynon et

al., 1998; Hanson and Just, 2001; Pardey et al., 1989; Pray and Umali-Deininger, 1998; Alston et al., 1998; Huffman and Just, 1999b; Roseboom, 2002) in the role of client for specific services that have a public or merit good character and/or as a market supervisor (Rivera et al., 2002; Currle et al., 2002; Kuhry et al., 2002; Rivera and Alex, 2004b). As in the case of farmers, such a client role requires specific skills for government to adequately articulate its demands, contract appropriate services, and interact during the subsequent transaction (Hubbard, 1995; Huffman and Just, 2000; De Groot et al., 2003). With regard to the market supervisor role, the government can resort to three safeguarding instruments that are available to it when provision of goods is left to the private sector: (1) the promotion of competition between different providers, (2) the setting of legal rules and contracts, and (3) the promotion of institutional responsibility by setting quality standards and rules (Beynon et al., 1998; WRR, 2000; Currle et al., 2002; Rivera and Alex, 2004b).

1.4 New organizational arrangements to meet the challenges of a demand-driven agricultural knowledge infrastructure

To meet the various new demands and challenges indicated in the previous sections, agricultural knowledge infrastructures worldwide are in a process of institutional change, as many of the authors mentioned in Table 1.2 indicate. Institutional change refers to 'the evolution and dynamic interplay between 'rules and norms' and organizations, usually associated with the need to perform a new task or to perform an existing one differently' (Hall et al., 2001: 785).¹² Such an institutional change process affects all actors mentioned in section 1.3, i.e. farmers, R&D and KIBS providers, and government.

The purpose of this thesis is to document certain elements of this institutional change process with regard to the Dutch agricultural knowledge infrastructure and report on the emergence of new organizational arrangements that have developed as a result of, or in light of, this institutional change. The focus is on the interface between demand and supply for R&D and KIBS to support agricultural innovation. Several authors have argued that, in the context of a pluriform market for R&D and KIBS, organizational arrangements need to be created to adequately connect demand and supply for agricultural R&D and KIBS services, as well as fulfilling other bridging functions (Enzing et al., 1998; Senker and Faulkner, 2001; Clark, 2002; De Groot, 2003; Van Mansfeld, 2003; Buurma et al., 2003; Maijers, 2004; Oerlemans and Assouline, 2004; Sulaiman et al., 2005; Wolfert et al., 2005; Hall, 2006; Ortiz, 2006; Wielinga, 2006; Aflakpui, 2007; Roep, 2007). In this regard, Garforth et al. (2003a: 13), on basis of a broad review of experiences in the Western European context, point to the 'importance of facilitation in order to help farmers make the best use of information and advice in making decisions,' arguing that, from a client perspective, diversity means a rich set of options from which their particular needs are more likely to be met than from a single integrated service. Integration does, however, require support to land managers in finding their way around the multiplicity of sources of information and advice.'

A growing number of empirical studies ¹³ have been undertaken to describe and analyze such organizations that match demand and supply, both between R&D and KIBS providers and farmers, and between other actors relevant to agricultural innovation, such as peers (i.e. other farmers), education establishments, government, agri-industry (both suppliers and processors) and advocacy organisations (Paine, 1999a, 1999b; Smallbone et al., 2003; Phillipson et al., 2004; North and Smallbone, 2006; Kenny and Nettle, 2006; Kilpatrick et al., 2007; Crawford et al., 2007; Goldberger, forthcoming; specifically concerned with The Netherlands are studies by Bos et al., 1991; Diederen et al., 2000; Van Lente et al., 2003; Smits and Kuhlmann, 2004; Wielinga, 2001, 2006; Kersten et al., 2005; Van Bavel et al., 2006; Vokurka et al., 2005; Van Baalen et al., 2005; Hubeek et al., 2006; De Beuze et al., 2006; Lans et al., 2007; Vanhaverbeke et al., 2007; Crandemir and Van Lente, 2007).

However, the experience with such 'bridging organizations' to connect demand and supply for knowledge intensive services in the context of innovation processes has been better documented, and more in-depth, for the industrial sector. The literature amply describes experiences with such intermediary organizations for the support of SMEs in the industrial sector (e.g., Bessant and Rush, 1995; Johannessen et al. 1997; Hassink, 1996, 1997; Isaksen and Remøe, 2001; Muller and Zenker, 2001; Bougrain and Haudeville, 2002; Gelauff, 2002; Van Looy et al., 2003; Jacobson et al., 2004; Pittaway et al., 2004; Vos, 2005; Siemsen, 2005; Pollard, 2006). Van der Meulen et al. (2005) state that there has been an overall tendency towards expansion of the number and an increase in the diversity of such intermediary institutions, and Howells (2006) notes that the body of literature is ample but dispersed, and still growing. They are referred to by diverse names such as Technology Extension Organizations (Kolodny et al., 2001), Technology Centers (Kaufmann and Tödtling, 2002), Innovation Centers (Coehoorn et al., 1991), Innovation Promoters (Caputo et al., 2002), Business Link (Major and Cordey-Hayes, 2000; Curran and Storey, 2002) or local names such as the Japanese Kosetsushi Centres (Jzushi, 2003). Many of these names suggest functions similar to those involved in agricultural extension (in fact, Martin and Scott (2000) mention agricultural extension in this regard), and indeed agricultural extension fulfills a bridging function as well. However, these organizations usually differ in the sense that they are not organizationally integrated in a larger system together with research and education establishments. Especially before the reform of public agricultural knowledge infrastructures, agricultural extension could often be typified as being part of such an integrated system, but in the context of pluralistic agricultural KIBS provision it has become a heterogeneous entity.

1.5 Objectives of the study and research questions

In light of the developments outlined above, the objectives of this thesis are three-fold:

- I. It seeks to document the operationalization of demand-driven R&D and KIBS provision.
- 2. It seeks to explore and increase understanding of the functioning of new organizational arrangements in the agricultural knowledge infrastructure for matching demand for and supply of R&D and KIBS.
- 3. It seeks to assess the embedding of new organizational arrangements in the agricultural knowledge infrastructure by exploring the positions and roles of the actors in the knowledge infrastructure vis-à-vis such new organizational arrangements, with an emphasis on end-users (i.e. farmers), R&D and KIBS providers, and the government.
- With regard to the first objective, the main research question is: How is demand generated and articulated in order to guide R&D and KIBS provision for the support of innovation, and what is the role of different actors in the agricultural knowledge infrastructure?

With regard to the second objective, the main research question is: What kind of organizational arrangements have emerged to fulfill an intermediary role between the demand and supply side in the market for R&D and KIBS? Focus points relating to this question are reasons for emergence, organizational structures, mandates, and incentive mechanisms of these new organizational arrangements.

With regard to the third objective, the main research question is:

How do the actors in the agricultural knowledge infrastructure respond to the activities of these new organizational arrangements? Focus points relating to this question are the perceptions of these actors about the contribution, position in the knowledge infrastructure, organizational structures, mandates, and incentive mechanisms of these new organizational arrangements.

By answering these questions, the thesis aims to contribute to a number of discussions. A first discussion to which the thesis wishes to contribute is that prevalent in the literature on the reforms of agricultural extension about how to operationalize demand-driven working, especially with regard to the division between demands driven by private interests and the demands driven by public interests, and how both kind of demands can be fulfilled (cf. Leeuwis, 2000; Garforth et al., 2003a). Part of this discussion concerns how new organizational arrangements can contribute to restoring and/or renewing system interaction within the knowledge infrastructure that has been altered and sometimes disturbed by reform measures such as privatization (cf. Holt, 1998; Leeuwis, 2000; Nieuwenhuis, 2002).

A second discussion to which the thesis wishes to contribute is the ongoing conceptual development and stock-taking of organizational arrangements that fulfill an intermediary function in knowledge infrastructures and innovation systems and/or in relation to innovations in which multiple actors are involved. Therefore, it responds to pleas for such a study by e.g. Engel (1995), Den Hertog (2000), Van Lente et al. (2003), Pittaway et al. (2004), Smits and Kuhlmann (2004), and Howells (2006). Hall et al. (2006) state that the role of coordinating the agricultural innovation system at the sector level is currently often missing or overlooked. The thesis addresses several elements of importance for the elaboration of a comparative framework for understanding the functioning and development of intermediary organizations as suggested by Van Der Meulen et al. (2005)¹⁴, i.e.:

- The functions of the intermediary organization within the systemic context.
- Configuration of relations in which the intermediary organization is involved, including also its resource position.
- Competences and degree of independence of the intermediary organization.
- Phases in the development of an intermediary organization, from its early development towards institutionalization and situations of crisis and institutional change.

By answering the research questions relating to the second and third objective, the thesis aims to deliver results that can provide relevant insights for such a comparative framework.

I.6 Case selection and research methods

This thesis consists of six case studies. All of these case studies are situated in The Netherlands. Table 1.3 gives an overview of the different case studies and the discussion to which they particularly contribute. As Table 1.3 shows, all the case studies deal with intermediation between demand and supply for knowledge and information. Most studies deal with new organizational arrangements, although the Dairy Commodity Board as a science intermediary ¹⁵ has a longer tradition, but has to operate within a changed context (of privatized versus public provision of R&D). As the area of study requires an in-depth understanding of ongoing dynamics at the interface between several actors that play a role in the agricultural knowledge infrastructure, a qualitative rather than a quantitative study was deemed more appropriate. A case-study approach has therefore been used to collect and analyze data. Rather than analyzing a limited number of variables as in a quantitative approach, the case studies presented here involve in-depth examinations of situations involving innovation intermediaries in the hope of gaining a deeper understanding of the dynamoics at work in the various institutions and to point the way to further research.

Case	Chapter of this thesis	Operationalization of demand	New organizational arrangements	Embedding of new organizational arrangements
Nutrient Management Support Service (NMSS)	2	++	+	+/-
Dairy Commodity Board (DCB)	3	++	+/-	++
Bioconnect	4	++	++	+/-
Innovation intermediaries	5	+/-	++	+
InnoFac	6	+/-	+	++
Dairy Farming Academy (DFA)	7	+/-	+	++

++ = high contribution, + = contribution, +/- = partial contribution

Table 1.3: Discussion to which cases contribute

Yin (2003: 13-14) presents two reasons for doing case studies, both of which fit the context in which this thesis has been developed:

- I. A case study investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. A case-study approach is considered an apt research strategy when 'a 'how' or 'why' question is being asked about a contemporary set of events, over which the investigator has little or no control' (Yin, 2003: 9). Because of its exploratory nature, this thesis has dealt mostly with 'how' questions.
- 2. A case study copes with the technically distinctive situation in which there will be many more variables of interest than data points, as one result relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as a result benefits from the prior development of theoretical propositions to guide data collection and analysis.

The thesis is based on five single case studies (NMSS, DCB¹⁶, Bioconnect, InnoFac and DFA, see Table 1.4), and one multiple case study in which various innovation intermediaries are studied.

For the case studies reported in this thesis, the principal research methods used were in-depth semi-structured interviews and surveys using a closed questionnaire. Furthermore, systematic observation was undertaken during stakeholder meetings, as well as document analysis (i.e. business plans, project proposals, progress moni-

Case	Chapter of this thesis	Semi- structured interviews (number of respondents)	Closed questionnaires (number of respondents)	Observation (number of observations)	Document analysis
Nutrient Management Support Service (NMSS)	2	24	57	7	yes
Dairy Commodity Board (DCB)	3	26	50	Ι	yes
Bioconnect	4	23	483	6	yes
Innovation intermediaries	5	19	-		yes
InnoFac	6	44	-	-	yes
Dairy Farming Academy (DFA) *	7	23	178	3	yes

* In chapter 5 DFA is referred to as MVA.

Table 1.4: Methods used in the different case studies

toring reports, evaluation reports, and external and internal communications). Table 1.4 summarizes the methods used for the different case studies, and details are given in each chapter.

1.7 Research issues

This section offers a reflection on the case-study research approach, the methods used for data collection for this study, the quality and generalizability of the results, the focus of the research, and the style of the thesis.

I.7.I Reflection on methods

As regards the quality of the research, four quality tests exist (Yin, 2003), and these are applied to the thesis.

Construct validity concerns the establishment of correct operational measures for the concepts being studied. This quality test can be passed by using multiple sources of evidence, as has been the case for all the case studies reported in this thesis (Chapters 2 to 7), by means of multiple methods used for data collection, i.e. interviews, surveys, observations of real-life events, and document analysis.

Furthermore, a chain of evidence has been established, although this is implicit rather than explicit: this means that a reader can trace back the statements to the ori-

ginal data. Since most case studies reported in the thesis (Chapters 2, 3, 5, 6, and 7) have been documented previously in reports (De Grip and Leeuwis, 2003; Klerkx and Leeuwis, 2005; Klerkx, 2006; Klerkx et al., 2006b; Klerkx and Leeuwis, 2007), such material is available, as well as the transcripts of interviews and observed meetings, and the original recordings. A last quality measure is having key respondents review draft case study reports: this was done for the reports on which Chapters 2, 3, 5, 6, and 7 are based.

Internal validity concerns the degree to which the research methods are adequate to investigate the phenomenon under study. Yin (2003: 36) states: 'internal validity is only a concern for causal or (explanatory) case studies, in which an investigator is trying to determine whether event x led to event y. If the investigator incorrectly concludes that there is a causal relationship between x and y without knowing that some third factor - z - may have actually caused y, the research design has failed to deal with some threat to internal validity. Note that this logic is inapplicable to descriptive or exploratory studies (whether the studies are case studies, surveys, or experiments), which are not concerned with making causal claims.' The case studies presented in Chapters 2 to 7 are descriptive and exploratory, and not aimed at providing mono-causal explanations. To strengthen the internal validity of the cases, pattern matching has been applied through both theoretical and literal replication.

External validity concerns the establishment of the domain to which a study's findings can be generalized. It is a frequent criticism of case-study research that the results are not widely applicable. In response to this criticism, according to Yin, distinguishing between analytic generalization and statistical generalization makes sense. Case study research allows for analytical generalization rather than statistical generalization, because in analytic generalization 'previously developed theory is used as a template with which to compare the empirical results of the case study' (Yin, 2003: 32-33, see also Strauss and Corbin, 1998). Such comparison has been made in all the case studies presented in the thesis. Analytic generalization is supported by replication (i.e. two or more cases are shown to support the same theory). Replication has been evident amongst the several case studies, both within the multiple case study (i.e. among the different cases studied) presented in Chapter 5, and between this multiple case study and the other case studies presented in the thesis (Chapters 2, 3, 4, 6, and 7).

Finally, *reliability* refers to whether the same results would be obtained by a later investigator following the same procedures and conducting the same case studies again. For this, careful documentation is needed on data analysis. In most studies presented in this thesis, the level of detail is sometimes limited, but in the original reports all references are given (in the form of citations, as well as reference to text material studied). However, due to the dynamic context in which the studied organizations are embedded, the same questions may yield different answers.

Despite compliance with several of these quality tests, given the focus on the Dutch context, a number of issues need to be raised with regard to the interpretation of the results and their generalization to other countries. These include:

• Context biases

This refers to the applicability of the study in the context of agricultural R&D and KIBS systems in developing countries, in light of it being situated in the Western European context of industrialized countries, and in a country where full privatization of agricultural R&D and extension establishments has taken place (see Roseboom and Rutten, 1998; Levidow et al., 2002; Alston et al., 1998).

• Cultural biases

The Netherlands is a country where co-operative behavior in the agricultural sector has been dominant historically (Wielinga, 2001; Duysters et al., 2006) and where multi-actor negotiations aim for consensus, or as Boon et al. (forthcoming: 23) put it: 'a democratic, deliberative politico-economic tradition and governance culture that is supportive to discourse-based decision-making procedures'. This could be relevant for studies of processes such as network and knowledge brokerage in other contexts that are less characterized by a tendency towards co-operation and consensus. Educational backgrounds of clients are also relevant in this regard, as absorptive capacity is an important issue regarding knowledge acquisition for innovation. In The Netherlands, education levels of farmers are relatively high (see LEI-CBS, 2006: 28), but the situation may be different in other countries.

1.7.2 Reflections on focus

Another research issue that needs to be addressed concerns the focus of the research. For operational reasons, focus is essential to make a research project manageable, but it also has certain limitations. For this thesis, these limitations are particularly:

- The confinement to the R&D and KIBS domains, whereas agricultural education has also been an essential element within the OVO-triptych and has suffered from similar systems disintegration, as a reaction to which several new organizational arrangements matching demand and supply have emerged. Examples are the Green Knowledge Cooperation, establishing links between research and education, the Content Broker, connecting demand and supply for content to shape course material, the Junior Dairy Farming Academy, in which agricultural students learn from experienced dairy farmers, and the DLV Academy in which consultants from the KIBS firm, DLV, give classes in agricultural colleges and provide courses based on their experience in practice. See Kupper and Wals (2004), Van Bavel et al. (2006), and Kupper et al. (2006) for analyses of intermediary structures in the realm of agricultural education.
- The focus on farmers, R&D and KIBS providers and government, whereas much

innovation takes place in an agri-food chain environment (although some of the studied intermediary organizations do target the facilitation of innovation in the context of agri-food chains), and from an innovation systems perspectives several other parties are relevant to innovation, as well as elements other than knowledge and information (see Leeuwis and van den Ban, 2004; Klein Woolthuis et al., 2005; Hall et al. 2006).

1.7.3 Reflection on thesis style

This thesis consists of a collection of chapters written in the form of articles that are reproduced verbatim¹⁷. The reader will note that this causes some apparent inconsistencies with regard to the use of terminology. There are two main reasons for this:

- The articles do not necessarily represent the latest insights of the researchers, as would be the case in an integral thesis.
- Idiosyncrasies and jargon of the different journals to which the chapters were submitted as articles explain the use of different terminology.

The appendix provides an explanation of some apparent inconsistencies.

1.8 Outline of the thesis

The outline of the thesis is shown in Figure 1.1. In this figure, the different chapters are connected to the three research objectives outlined in section 1.5. The cases are organized according to the research question to which they principally contribute. However, there is a degree of cross-pollination as some of the case studies also contribute to research questions other than the one to which they principally contribute (see also Table 1.3).

Chapter 2 presents the results of a study of the Nutrient Management Support Service, a government induced and funded organization that aimed to stimulate demand for KIBS provision relating to nutrient management and to match demand and supply for KIBS provision relating to this topic. This chapter deals with the issue of stimulating knowledge exchange on a public interest theme through a system of private KIBS provision (i.e. public funding and private delivery through demandside financing by means of a voucher scheme) and critically reflects on the potentials and shortcomings of such a system. The principal research question to which this study aims to contribute is research question 1, but research questions 2 and 3 are also partially addressed.

Chapter 3 presents the results of a study of R&D planning by an organization (the Dairy Commodity Board) that uses levies imposed on farmers to fund R&D projects. Dairy farmers can submit queries for R&D and decide upon allocation of funds because their representatives constitute the decision board. This chapter deals with the issue of how demand is shaped in the multi-actor process of R&D planning, and how such a demand-driven system may contribute to farmer innovation. It critical-

ly reflects on the institutional and political factors at play in such a process and that co-determine the outcomes. The principal research question to which this study aims to contribute is research question 1.

Chapter 4 presents a study of R&D planning delegated to a network and guided by a science intermediary, Bioconnect, that has taken the form of a multiple goal boundary organization, acting as a bridge between several actors engaged in R&D planning networks for the organic sector (i.e. government, farmers, supply and processing industry, researchers, KIBS providers such as consultants) and facilitating knowledge exchange in the organic sector. Using principal-agent theory, this study analyzes how the delegation of research governance to networks guided by a multiple goal boundary organization takes place, and identifies several tensions in such a network delegation approach to R&D planning and its contribution to demand-driven R&D. The principal research question to which this study aims to contribute is research question 2, but research question 1 is also addressed.



Figure 1.1: Outline of the thesis

Chapter 5 presents a multiple case study describing several organizations that fulfill a role in matching demand and supply in the Dutch agricultural knowledge infrastructure. The chapter aims to provide insights into the reasons for establishing such organizations, and examines their setup in terms of organization, funding, coverage, focus, and function, in order to establish a typology. Furthermore, it examines their contributions to agricultural innovation and interaction in the agricultural knowledge infrastructure, and the bottlenecks they experience in their functioning. This feeds a critical discussion about the role of the government with regard to the establishment of such intermediary organizations. The principal research question to which this study aims to contribute is research question 2, but research question 3 is also addressed.

Chapter 6 presents the case study of InnoFac, a private firm aiming to act as a bridge between demand and supply for R&D and KIBS in all phases of the innovation process. This study aims to provide insights about how the supply side of the market for R&D and KIBS, as well as other actors supplying enabling factors for innovation such as policy makers and farmers' representatives, perceive the functioning of such a firm. The study highlights several issues about the embedding of such a firm within the R&D and KIBS market, and critically reflects on several institutional frictions associated with the setup, funding and mandate of such an intermediary organization.

In a similar vein, Chapter 7 addresses the case study of the Dairy Farming Academy, an organization that aims to facilitate peer-to-peer learning in the dairy sector and to link up farmers and farmer knowledge with other components of the agricultural knowledge infrastructure (such as KIBS, R&D, and education establishments). This study also looks at the embedding of such an organization in the knowledge infrastructure, and the type of tensions that emerge in relation to setup, funding and mandate. Both chapters principally address research question 3.

Finally, Chapter 8 integrates the results of the various chapters into a general discussion and ends with the main conclusions of the thesis.

Notes Chapter 1

- I In the Dutch context, this is often designated by the Dutch acronym, OVO-triptych (Onderzoek, Voorlichting, Onderwijs Research, Extension, Education). Here, the focus is on research and extension establishments.
- 2 AIS was inspired by the national systems of innovation approach (e.g. Lundvall, 1992).
- 3 In a similar vein, in the context of the Dutch agricultural sector, the use of the concept of 'open innovation' (Chesbrough, 2003) is also emerging (see Van Kleef, 2007; Vanhaverbeke et al., 2007; Stichting Innovatie Flowers&Food, 2007)
- 4 Several definitions of agricultural extension exist and are highly related to the objectives extension was seen to fulfill. For an overview see e.g. Coutts (1995), Garforth et al. (2003a: 2-4), Leeuwis and van den Ban (2004: 23-29). For a discussion of the different types of agricultural research (i.e. basic, applied, development research) see Barnes (2001: 666-669).
- 5 Other reform measures include administrative decentralization of public research and extension systems, and cost-recovery strategies (see e.g. Rivera, 1996; Carney, 1998; Marsh and Pannell, 2000).
- 6 The degree to which this co-creation does actually take place is another issue, however, and depends on the relationship between service providers and their clients.
- Whether goods are potentially suitable for provision in a market setting depends on their characteristics 7 in terms of their private or public good character (see e.g. Beynon et al., 1998; Carney, 1998; Hanson and Just, 2001; Katz and Barandun, 2002, for an elaborate description). Private goods are excludable (nonpaying consumers can be prevented from using the good) and are rivalrous or subtractable (the consumption of the good by one consumer diminishes its supply to other consumers). Public goods do not possess the aforementioned characteristics, i.e. they are non-excludable and non-subtractable. Many goods are neither fully private nor fully public, for example toll goods, which are excludable but non-subtractable. Common pool goods are subtractable but non-excludable; this does not encourage private supply because access cannot be restricted. The market is said to be the best mechanism for the distribution of private goods. However, there is also a grey area between private and public goods: e.g. education is a quasi-private good, since it gives the individual a benefit and it is both excludable and subtractable. However, for society as a whole it is important that everybody receives a good education. One can speak then from the 'merit good' argument to justify public provision (Beynon et al., 1998). An important notion in the qualification of goods as public, private, toll, and common goods is that such a qualification is not static, but dynamic. One has to consider the context (e.g. land as an amply or scarcely available good) and socio-cultural arrangements (e.g. land as a common good or a private good), technical features of the good (e.g. easily or difficultly duplicated and distributed), the stability or volatility of the value of the good, property rights regimes and their enforcement, and legislation, to be able to classify a good (Beynon et al., 1998; Leeuwis and van den Ban, 2004). Regarding the economic characteristics of 'extension goods', or rather 'information and education goods', Carney (1998: 44-45) lists the views of various authors on this theme. However, it appears hard to make unequivocal classifications of 'R&D and extension goods' in terms of private and public good character, a quandary that is inherent in the problem of capturing a non-tangible, non-physical good such as knowledge in terms of a tradable good (see e.g. Athreye, 1998; Fernie et al., 2003).
- 8 In other Dutch sectors also, a shift towards demand-driven working has been a topic of much (policy) debate and academic attention, for example in health care (see e.g. Daenen et al., 2001; Rijckmans et al., 2002; Van der Kraan, 2006; Van Wijk, 2007).
- 9 As a result, according to Just et al. (2003), the better informed farmers usually have the best consultants. Fosstenløkken et al. (2003) state that this is also most beneficial to consultants in the light of consultants' own knowledge development.
- 10 The category of micro, small and medium-sized enterprises is made up of enterprises that employ fewer than 250 persons and have an annual turnover not exceeding 50 million euro, and/or an annual balance sheet total not exceeding 43 million euro (European Commission, 2005).
- II 'Mode I' science is disciplinary, homogeneous, hierarchic and stable, based on academic quality control, and accountable to science, whereas 'mode 2' science is application-oriented, trans-disciplinary, heteroge-

neous, heterarchic and variable, based on a wide set of quality criteria and accountable to society (Gibbons et al., 1994, cited by Smits, 2002). Science would need to renew its 'social contract with society', and shift from producing 'reliable knowledge' to 'socially robust knowledge' that is contextualized (Gibbons, 1999). This implies that knowledge is also valid outside the laboratory, that validity is achieved through involving an extended group of experts, including lay experts, and that society participates in its creation, thereby reducing its contestability.

- 12 This definition of institutional change is based on a pragmatic definition of 'institutions', in which 'institutions' refers to the 'combined environment of 'rules of the game' (see North, 1990) and physical organizations and the interplay of the two' (Hall et al., 2001: 784).
- 13 Many of these studies are of quite recent date.
- 14 Although this framework has been developed in the context of science intermediaries such as research councils, who generally provide brokerage between government and science/R&D providers, rather than intermediaries who provide brokerage between several innovation system actors relevant to a certain innovation, it offers a comprehensive starting point.
- 15 See Van der Meulen and Rip (1998) for a description of science intermediaries.
- 16 In the DCB case study, two other commodity boards in addition to DCB were studied for reference purposes. However, because of the focus on DCB it is best regarded a single case study.
- 17 Except for words such as 'paper' and 'article' which refer to the work being discussed and which have been changed to 'chapter'.

2

Hands off but strings attached

The contradictions of policy-induced demand-driven agricultural extension

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Abstract

Although many governments have privatized their agricultural extension services, there is widespread agreement that the public sector still needs to play a role in the 'agricultural knowledge market' in order to prevent market failure and other undesirable phenomena. However, appropriate mechanisms for intervention in the agricultural knowledge market are still in their infancy. This chapter discusses the case of the Nutrient Management Support Service (NMSS), a government-funded support service in The Netherlands designed to optimize the fit between the demand and supply of 'agricultural knowledge products' that reduce nutrient emissions into the environment. The activities of the support service were four-fold: (I) distributing vouchers to farmers, (2) establishing mechanisms for quality control, (3) facilitating the articulation of end-users' needs, and (4) improving market transparency. We analyze the extent to which the NMSS has succeeded in supporting a demand-driven knowledge market for nutrient management issues. We question some of the conceptual and practical assumptions underlying this style of intervention. In addition, we argue that the notion of demand requires considerable refinement before it can be useful for guiding state involvement in demand-driven extension.

2.1 Introduction

We begin this chapter by describing the thinking that underlies the current trend toward privatizing agricultural extension services. In so doing, we underscore the continuing need for state involvement in the 'agricultural knowledge market' - a market that emerged as a consequence of extension service privatization - and specify several possible routes for relevant state intervention. Subsequently, we introduce the Nutrient Management Support Service (NMSS), which combines several strategies for improving the functioning of the Dutch agricultural knowledge market. We then present a case study as a way to explore the dynamics of these strategies and assess the actual contribution of liaison services towards enhancing demand-driven extension service provisioning. The experiences documented through our case study expose several practical and conceptual tensions between public policy making in the Western European agricultural context and the idea of management support through a demand-driven agricultural knowledge market.

2.2 Privatization of extension: New roles for the state

2.2.1 Assumed benefits of privatization

Since the 1980s, political debate over the role of the state in the provisioning of goods has focused on the privatization of state services (Umali and Schwartz, 1994; Kuhry et al., 2002; Rivera, 2000; Kakabadse and Kakabadse, 2001). With privatization, certain goods formerly provided by the public sector are now delivered by the private sector, and the market, predominantly, acts as the mechanism for coordinating and distributing these goods.¹⁸ For many, privatization is seen as an improvement over the state system, which, they feel, suffers from excessive bureaucracy, rigidity, inefficiency, and low quality output. Public services, critics believe, need to be more flexible, responsive, de-regulated, re-engineered, and focused on quality of service (Kakabadse and Kakabadse, 2001). Advocates of privatization stress the considerable efficiencies that can be gained, stating that private ownership stimulates both greater allocation efficiency (i.e., when funds - including public funds - are channeled through private companies they are more likely to be used where they have the greatest impact) and greater cost efficiency (i.e., as little as possible is spent on organizational maintenance). They feel that competition between companies will ensure constant improvements in the quality and diversification of goods, because attracting and maintaining clients is essential for maintaining a company's viability (Kuhry et al., 2002).

Over the past 20 years, privatization programs have considerably reduced the participation of public providers in national economies (Megginson and Netter, cited in Kuhry et al., 2002). This also applies to the financing and provisioning of agricultural extension services (Rivera, 1991; Feder et al., 1999; Anderson and Van Crowder, 2000; Rivera, 2000). Budgetary constraints, due to decreasing tax revenues, have

reduced the role of the state in agricultural extension (Beynon et al., 1998; Katz and Barandun, 2002). Furthermore, general dissatisfaction with the efficiency and effectiveness of public extension services has led to a redefinition of the role of the state in the provisioning of those services that could be provided through the marketplace as private or toll goods. Public agricultural extension, many felt, did not serve the needs of rural people and embodied paternalistic and unilateralist attitudes. Beynon et al. (1998) refer to this poor performance as 'state failure.' In Latin America, Berdegué (2002) found that state failure in public extension services was characterized by corruption, clientelism, and excessive bureaucracy. In industrialized countries, and in The Netherlands and Germany particularly, the increasing divergence between the interests of the state and those of farmers has caused tensions (Tacken, 1998; Leeuwis, 2000; Wielinga, 2000; Hoffman et al., 2000). Extension workers were confronted with contradictory expectations from their employer, on the one hand, and from their clients, on the other. Privatization was expected to resolve this loyalty conflict. In addition to the increased efficiency in terms both of cost and of allocation, the main benefits of a privatized extension service are said to be increased provider accountability, a demand-driven character, increased end-user participation, and an emphasis on benefits and results (Rivera, 2000; Berdegué, 2002; Katz and Barandun, 2002; Rivera et al., 2002).

2.2.2 Counteracting market failure

In systems where agricultural extension services have been privatized, farmers become clients, sponsors, and stakeholders rather than mere beneficiaries (Neuchâtel Group, 1999; Katz and Barandun, 2002). These systems, furthermore, are considered to function as agricultural knowledge markets (Leeuwis, 2000), since extension service provisioning deals with the exchange of (technical, economic, or social) knowledge.¹⁹ Through this shift to agricultural knowledge markets, it is felt that extension service provisioning has become demand or client-driven, as opposed to supply or provider-driven.

Yet, despite the fact that the shift to agricultural knowledge markets has had positive and desirable consequences (Rivera et al., 2002), as outlined in the previous section, advocates also agree that privatization should not be considered a panacea (Beynon et al., 1998; Katz and Barandun, 2002). Privatization may lead to underinvestment by agricultural research and extension in knowledge that serves the 'public good' (Wolf et al., 2001; Hanson and Just, 2001). It has been observed, for example, that both resource-poor groups and public interests (e.g., environmental issues) tend to be insufficiently addressed by private extension service providers, since the benefits are not easily appropriated (Bennett, 1996; Carney, 1998; Kidd et al, 2000; Rivera, 2000; Hanson and Just, 2001). Moreover, farmers are often unwilling to financially support public interest issues when they do not result in a direct and private benefit. Farmers, generally, are only willing to pay for services they feel add to their profitability (Tacken, 1998; Katz and Barandun, 2002). In addition to the risks of exclusion and substitution (i.e., weaker groups are excluded, and public interest
themes are substituted by private themes), several authors have identified other risks with regard to the overall functioning of the agricultural knowledge or innovation system (Bennett, 1996; Bebbington and Sotomayor, 1998; Anderson and Van Crowder, 2000; Kidd et al., 2000; Leeuwis, 2000). These system risks include:

- A decrease in the information openly exchanged on a free-of-charge basis among various actors within the (national) agricultural knowledge system.
- An increase in discontinuity and a lack of concerted action by the various interested players in the knowledge system as a result of short-term contracts and competition.
- Domination by wealthier farmers or commissioners (e.g., government or agriindustry) in determining extension services.
- The system may become accountable to large commissioners of contracts rather than end-users.
- Little room for maneuvering or space for learning within rigid output-oriented contracts.
- High transaction costs for realizing desirable interventions and services.
- An increase in the opportunities for corruption and patronage.
- Information may be biased in favor of certain agricultural inputs.
- A tendency towards 'package deals' whereby the delivery of different kinds of services by a single provider may endanger the provision of independent advice.
- A focus on ad hoc individual advice and technology transfer instead of on longterm support and instruction on improved agricultural practices.
- A focus on ready-made, easily applicable, and modifiable 'knowledge products,' rather than space for the articulation of needs and knowledge development.

To counteract such exclusion, substitution, and system risks, many critics deem continued state involvement in the provisioning, financing, and/or regulation of extension services necessary and justified (Bennett, 1996; Hanson and Just, 2001; Barnes, 2001). The state must decide on the public interests for which it will continue to be responsible (i.e., it must determine the social relevance of the provisioning of goods).²⁰ An issue of public interest arises in situations where the state is concerned that certain interests are insufficiently addressed without state intervention (WRR, 2000). The state must consider whether a good can be distributed satisfactorily through the market, or whether the provisioning of the good through the market causes a market failure that demands continued intervention. Such market failures may include underinvestment, negative externalities, information asymmetry, unequal access, and high transaction costs (for detailed analyses in the case of extension service provisioning see Beynon et al., 1998; Carney, 1998; Hanson and Just, 2001).²¹

The present thinking is that extension service provisioning should be pluralistic with mixed funding and undertaken by both public and private parties.²² In this way, a complete and complementary range of extension services can emerge (Carney, 1998; Neuchâtel Group, 1999; Katz and Barandun, 2002; Rivera et al., 2002) in

order to address the needs of an increasingly diversified agricultural sector (Smits, 2002). Within such a pluralistic system, state intervention can be aimed at promoting the public interest and assuring social welfare by ensuring the delivery of specific services to specific audiences (Carney, 1998; WRR, 2000; Katz and Barandun, 2002; Garforth et al., 2003a), by exercising control over the quality of private extension service provisioning (Currle et al., 2002), or both. In many instances, the state still funds some extension activities on a 'public funding, private delivery' basis (Zijp, 1998; Garforth et al., 2003a). This essentially means that the state becomes a client in the agricultural knowledge market (Leeuwis, 2000; Wielinga, 2000). At the same time, the state can resort to other 'safeguarding instruments' in order to exert influence on the nature and quality of services delivered by private extension organizations. Three such safeguarding instruments exist: (I) promoting competition between different providers, (2) setting legal rules and contracts, and (3) promoting institutional responsibility and product quality (WRR, 2000). Thus, the state becomes essentially a client, a market supervisor, or both. These new roles may incur substantial (transaction) costs, which may, initially at least, downplay the assumed cost reduction benefits of privatization (Feder et al., 1999; De A. David et al., 2000; Rivera et al., 2002).

2.2.3 Supply-side funding versus demand-side financing through voucher systems Several authors have examined various combinations of public and private funding and/or extension service provisioning (also referred to as delivery), considering the objectives for which certain combinations are most suitable (see for example, Beynon et al, 1998; Carney, 1998; Feder et al., 1999; Katz and Barandun, 2002). For the purposes of this chapter, we look at the combination of public funding and private provisioning. Public funds for extension service provisioning can be channeled to end-users either indirectly or directly (Katz and Barandun, 2002).

The indirect approach - supply-side financing - consists of outsourcing or contracting-out service provisioning to private companies who execute a service mandate for the state. Rivera et al. (2002) advocate contracting-out extension service provisioning. They anticipate the main benefits to be threefold: (1) increased operational efficiency and cost effectiveness, (2) increased provider plurality, and (3) increased provider accountability. Pre-conditions for the proper functioning of contracting-out mechanisms include: training and capacity building of extension providers, active farmer involvement, and clear-cut procedures and conditions. It has been argued, however, that such supply-side mechanisms can be especially sensitive to the system risks mentioned in the previous section (Bebbington and Sotomayor, 1998; Leeuwis, 2000; Kakabadse and Kakabadse, 2001).

The direct approach - demand-side financing - consists of giving funds directly to the end-users of extension services, either in the form of vouchers that represent a certain monetary value or through the reimbursement of investments after proof of the transaction (between the extension service provider and client) has been provided. In this way, the state remains at a relative distance. Voucher systems display a number of strengths and weaknesses (Bebbington and Sotomayor, 1998; Gibson, 1999; Kidd et al., 2000; Berdegué and Marchant, 2002; Katz and Barandun, 2002). A key strength is that they can be used for market development, since users can try out a service without any risk. Vouchers may also create access to goods or services for people who previously did not have sufficient purchasing power. Voucher systems facilitate a relationship of accountability between the service provider and the client. Because demand-side financing creates an incentive for the client to analyze his/her situation and articulate his/her own needs, the client is thereby empowered. Demand-side financing, furthermore, encourages competition between different service providers, and this can increase the need to innovate in service provisioning.

For the voucher system to work properly, certain pre-conditions are required to counter the weaknesses found in the system. The literature identifies the following pre-conditions in relation to users and providers. Potential users of services must learn to identify and articulate their needs, negotiate with service providers, and judge and control service quality. Service providers, on the other hand, must have the right skills and knowledge to provide the required services. This requires capacity building on both sides. The possibility of having a competitive market is ruled out if there are insufficient private extension service providers (Bebbington and Sotomayor, 1998). In order to ensure the longevity of demand-side, financed extension systems, a financial contribution from the end-user is required. Making a financial contribution implies a willingness to pay, but this is usually only the case for advisory services that are highly personalized and in the private interest (Groot, 1998; Tacken, 1998; Beynon et al. 1998; Hanson and Just, 2001). When services provided through a voucher scheme are predominantly in the public interest, it is unlikely that they will be privately funded when the public funding ends. Newly formed institutions may collapse after the voucher scheme is withdrawn (cf. Gibson, 1999). The administration of publicly funded demand-side financed extension systems may be complex and costly. Monitoring and control are necessary in order to prevent fraud (see for example, Bebbington and Sotomayor, 1998; Berdegué and Marchant, 2002). Criteria for selecting goods that may be purchased with vouchers must be transparent and situation-specific, and there must be well-established, clear rules and procedures for use of the vouchers.

2.3 The Nutrient Management Support Service as an attempt to foster publicly financed demand-driven extension service provisioning

This section introduces the Nutrient Management Support Service (Steunpunt Mineralen in Dutch) and the policy context in which it emerged. The NMSS combined a range of strategies designed to enhance demand-driven extension on the topic of nutrient management, including simultaneous supply-side and demandside financing (by way of vouchers), activities geared towards establishing mechanisms for quality control, facilitation of the articulation of needs, and the improvement of market transparency.

2.3.1 Nutrient management as a theme of public interest

Nutrient management surfaced as a public interest theme in the 1980s after it became clear that the Dutch agricultural policy of ever increasing production, promoted by public extension since the 1950s, was having detrimental effects on the environment (Kessels and Proost, 1995). Nutrient management can be conceptualized as a bookkeeping system that records nutrient flows on the farm. The quantity of certain nutrients - nitrogen, phosphorus, potassium - that enter the farm in manure, fertilizer, and feeds is compared with the quantity leaving the farm as products or residues. By means of a calculation, the quantities of nutrients remaining in the farming system and those emitted into the environment can be determined. Nutrient management can be approached in two ways - as a management tool and as a regulating mechanism (Stolzenbach and Leeuwis, 1996).²³ Since 1984, the reduction of nutrient emissions has been a principal policy concern of the Ministry of Agriculture (LNV), and in 1988 LNV introduced nutrient management as a regulating mechanism (RIVM, 2002; CBS, 2002). This meant that farmers would have to pay a fine if their nutrient balance showed a level of nutrient emission surpassing the norms. Even before its launch in 1988, the Nutrient Management Administration System (known as MINAS) was the subject of contentious debate. Farmers did not share the ideas upon which the system was based, and the system was perceived as a showcase of vagueness and inconsistency (Kessels and Proost, 1995; RIVM, 2002). The policy goal of MINAS was not, however, to collect fines, but rather to encourage farmers to improve their nutrient management so that emission surpluses would decrease and fines would not have to be paid at all (RIVM, 2002). From the policy viewpoint, MINAS was intended to serve both public interests (better groundwater quality) and private interests (cost savings through better nutrient management). MINAS set the goals and in the main left implementation to the farmer.²⁴

In order to advance knowledge development and exchange on the topic of nutrient management, the Dutch government spent about €68 million of European Union funds on the so-called 'nitrate projects'.²⁵ These nitrate projects, which were contracted-out to various research and extension organizations, studied learning tools that might integrate nutrient management into overall farm management as an essential component. Interactive research projects, demonstration projects, and extension pilot studies were carried out. NMSS had the specific task of disseminating the insights gained in these nitrate projects to all farmers obliged to calculate their nutrient balances.

2.3.2 The aims and methods of the NMSS

The two principal aims of the NMSS were to improve the nutrient management knowledge of individual farmers and to stimulate demand-driven extension service

provisioning. In order to operationalize their approach, NMSS sought to facilitate various learning paths and forms of knowledge exchange (i.e., farmer study groups with a peer discussion leader, individual farmers' purchase and application of products such as books and computer programs, and farmers' use of a personal advisor). Furthermore, NMSS aspired to promote a clearer division of roles between different actors in the agricultural knowledge and information system - research projects, the government, farmers' organizations, environmental lobby organizations, extension service providers, and clients (NMSS, 2001).

The NMSS formula consisted of four elements: (I) vouchers, (2) a quality system to judge and select so-called knowledge products (encompassing various forms of extension service provisioning)²⁶, (3) study groups, and (4) a website that could be used for comparison and selection of extension service providers ('knowledge providers' in the terminology of the project)²⁷ and their knowledge products. These elements became operational in January 2002.

The voucher system designed to create an incentive for farmers to purchase knowledge about nutrient management

Each voucher represented a value of €250; they were distributed, regardless of the gravity of the nutrient management problem, to approximately 65,000 farmers who were obliged to comply with the nutrient emission norms. Farmers first received an application form, on completion and submission of which they obtained a voucher from NMSS. The voucher could be used to purchase a knowledge product that was approved by NMSS. Each farmer had to pay 15% of the purchase price him/herself. Knowledge providers sent the vouchers to LASER, a quasi-autonomous executive agency of the Ministry of Agriculture responsible for paying out subsidies (Kickert, 2001) in order to get payment for the goods or services delivered.

The quality certification system designed to improve product quality

The quality certification system was intended to have a catalyzing effect on the market for knowledge products about nutrient management. Experts made an inventory and selected knowledge products on the basis of several criteria. ²⁸ The overarching criterion was that knowledge products should go beyond merely advising farmers on how to comply with the nutrient emission norms; they should enlarge and develop knowledge on the subject. Furthermore, products that sold 25 times or more were assessed in terms of client satisfaction. The quality of products was judged on criteria such as: compliance with expectations, innovativeness and applicability of the product, and long-term effect on farm management. It was intended that the results of both the expert and client quality assessments would be used to select 'preferred products,' to give potential users insight into the differences in product quality. This latter was directly related to NMSS's aim of promoting a transparent knowledge market and thus preventing market failure in the form of information asymmetry and adverse selection (cf. Beynon et al., 1998).

The study groups designed to facilitate the articulation of needs

Study groups are a form of horizontal knowledge exchange (Leeuwis and Van den Ban, 2004) in which farmers can share problems and solutions with each other. NMSS's budget made provision for 200 study groups. NMSS attributed to these groups an important role in the articulation of needs, as they ensured that farmers defined relevant questions before approaching an advisor or buying a product, and therefore they spent their vouchers more efficiently (sometimes jointly). Study group leaders were recruited from among the farmers themselves and were trained in managing group dynamics and needs identification processes.

The website designed to improve market transparency

The fourth element was the creation of a web-based databank containing descriptions of all the knowledge products that could be purchased with a voucher. Because the farmer could easily access this web-based 'store' to look for a suitable product, it was therefore an instrument to increase market supply transparency. Knowledge products were categorized by NMSS according to the sector for which they were created (dairy farming, pig raising, arable farming, horticulture, etc.) and type of product (written course material, personal advice, computer software, books, lectures, etc.). To facilitate farmers who did not, or could not, have recourse to the Internet, a leaflet was also produced. This, however, was done in the initial stages of the project when very few products had been certified, and it was not updated.

In summary, we see that the Nutrient Management Support Service initiative in The Netherlands combined two mechanisms of public financing and private delivery of extension. Contracting-out (supply-side financing) was used to administer the NMSS project as a whole, and a voucher scheme (demand-side financing) was used to provide end-users with the means to purchase goods and/or services. In addition, the NMSS made use of several safeguarding instruments (e.g., promoting competition, quality control, information) in order to further enhance the functioning of the knowledge market.

2.4 Experiences with the Nutrient Management Support Service

This section reports on a study that was carried out to assess the contribution of the NMSS approach to demand-driven extension provisioning (De Grip et al., 2003). The purpose of this study was not to determine the extent to which nutrient management policy objectives were realized, but rather to understand the dynamics that emerged in association with the various elements of the NMSS approach and to derive lessons for future interventions. Thus, NMSS provides the context for a discussion on the benefits and limitations of publicly financed and privately delivered extension service provisioning.

2.4.1 Research approach and methods

The main question that guided our inquiry was the extent to which the four elements of the NMSS contributed to supporting a demand-driven agricultural knowledge market in relation to the public interest theme of nutrient management. First, we conducted eight open interviews with actors directly involved in the NMSS project and 16 semi-structured, in-depth interviews with more distant actors (three knowledge providers, four policy makers, two study group leaders, and seven farmers). The interviews were geared towards identifying respondent practices, perceptions, and evaluations regarding the NMSS experiment. Second, we engaged in participant observation at seven NMSS-related meetings. Third, we conducted a semi-structured telephone survey, based on insights from the previous qualitative round, using 57 respondents (18 knowledge providers, eight study group leaders (farmers themselves) and 31 farmers from across the country). The 39 farmers were randomly selected from project lists derived from a grouping process that created four categories according to whether or not, and how, they used the voucher.²⁹ The survey was used to further validate or reject preliminary findings from the first round of interviews and to fill in gaps in our understanding. It was not designed to arrive at general statements. Additionally, to support our analysis we made use of the results of other preparatory and evaluative studies related to the NMSS project (De Wit et al., 2001; De Wit and Van Diepen, 2002; Oerlemans et al., 2002; Jacobs and De Wit, 2003; Geerling-Eiff et al., 2004).

2.4.2 Main findings regarding the four elements of the NMSS formula

The voucher system designed to encourage farmers to actively acquire knowledge on nutrient management

In March 2003, when the application procedure closed, 35,440 farmers of the eligible 65,000 had applied for and received a voucher (NMSS, 2003). On closure of the project in December 2003, 24,946 vouchers had been redeemed (Geerling-Eiff et al., 2004). The farmers' main motivation in applying for the voucher appeared to be the financial benefit (a 'gift' or 'discount' of €250 from the normal price of the product). This finding is confirmed by a more comprehensive survey (n=1,228), commissioned by NMSS, focusing on client satisfaction in which 86% perceived the voucher as a gift or discount (Jacobs and De Wit, 2003). Most farmers said they did not have a nutrient management problem on their farm (85%, n=39), and consequently felt no need to purchase knowledge on the topic of nutrient management. Jacobs and De Wit's (2003) survey shows that 70% of farmers were confident that they complied with the MINAS norms, and 75% claimed to have acquired knowledge on nutrient management (n=1,228). This finding is supported by other studies (e.g., Oerlemans et al., 2002)³⁰ and stands in sharp contrast to the government's view that most farmers have serious nutrient emission problems. An additional finding was that knowledge providers were encouraged by the possibility of obtaining vouchers. All knowledge providers indicated that they had actively informed their network of clients about the voucher application so that the vouchers could be spent on the services offered by them. Farmers spent vouchers mostly on personal advice (76%, n=39) and in existing client-service provider relationships (81%, n=38). Jacobs and De Wit's (2003) survey supports this finding, stating that 72% of farmers (n=1,228) spent their vouchers within established relationships.

The quality certification system designed to improve product quality

A total of 350 knowledge products were eventually offered through NMSS by April 2003. With respect to the influence of the quality certification system on product development and quality, 29% of the knowledge providers (n=18) indicated that all the services that they offered through NMSS were new. An equal number of providers offered only services that they already provided, while 37% indicated that they offered both new and existing products. In addition, 35% of the providers were of the opinion that the quality of their products had improved as a result of the efforts made to comply with the certification criteria. The same percentage argued that the quality of their products was already good and that no adaptation was necessary. Almost all knowledge providers (16 out of 18) agreed that it was not difficult to get their products accepted by NMSS. A client satisfaction assessment regarding specific products did take place (Jacobs and De Wit, 2003) but, due to time constraints, did not result in the communication of a preferred products list for farmers. However, the idea of making client evaluations of specific products available to other farmers through some kind of 'consumer test' was welcomed by 34% of the respondents in the categories 'knowledge provider' and 'farmer' (from both the in-depth interview and the telephone survey round, n=69). By contrast, 36% did not expect such a test to be useful. The more critical respondents argued that such a system would involve a lot of bureaucracy and that market dynamics and internal company procedures already provided sufficient mechanisms for evaluating quality and improving product quality. According to our own findings, farmers, on average, were satisfied with the knowledge product they purchased (evaluated as 6.9 on a scale of I to IO, n=IG) and said that it fit fairly well with their individual situations (evaluated as 6.8 on a scale from 1 to 10, n=16). There was no difference in this respect between those who spent the voucher individually or in a group. Jacobs and De Wit's (2003) study shows even higher satisfaction rates (7.5 on a scale from 1 to 10, n=1,228).

The study groups designed to improve the articulation of needs

The NMSS study groups (161 by December 2003) were organized and facilitated by peer farmers. Of the group leaders interviewed (a total of ten, two in the in-depth interview round and eight in the telephone survey round), seven indicated that they themselves were members of an existing study group and that they had informed other members about the possibility of forming an NMSS study group. From interviews and participant observation, it became apparent that group leaders found participant recruitment from outside their existing network rather difficult. According

to the respondents, key advantages of the free-of-charge study groups were that the accumulation of group members' vouchers resulted in a greater budget for the purchase of knowledge products and that farmers in groups were able to learn a lot from one another. Some knowledge providers indicated, however, that in general less exchange of farm-specific data occurred in groups as compared to individual advisory meetings. Study group leaders indicated that study group meetings were not used to articulate questions and needs. On the contrary, a hired advisor was already present and his time paid for by voucher, from the first study group meeting onward in the case of six of the ten groups in the study. Only three study group leaders mentioned that they had consulted the group about the choice of an advisor beforehand; often it was the group leader who made the choice (thereby drawing predominantly from his/her own networks). Although the main thrust of the program was designed beforehand, the majority of group leaders (70%, n=8) and participating farmers (60%, n=31) indicated that there was sufficient flexibility to adapt the content to reflect the desires and questions of participants. Participant observation and interviews suggest that meetings took the form of 'interactive lectures,' with an average of four sessions per study group. Participants greatly appreciated having a peer farmer as study group leader because of the limited distance in personal and/or cultural terms between themselves and the group leader.

The website designed to improve market transparency

With respect to the website, the fourth element of the NMSS formula, it became clear that it was not used widely for the selection of knowledge products, despite having had 25,992 hits by March 2003 (Jacobs and De Wit, 2003). Of the 19 farmers questioned, only four respondents (remarkably none of whom had spent the voucher) had looked at the website, whereas the remaining 15 had not. The four respondents who visited the site had only a vague memory of it and were unable to recall anything specific. Jacobs and De Wit's study also showed that more than half of the farmers (54%, n=1,228) did not use the website. In addition, a large majority of our farmer respondents (n=39) recalled having seen the leaflet prepared for farmers who did not have access to the Internet, but again had only vague memories of it. Only two respondents could recall specific details. None had chosen a product on the basis of the leaflet.

2.5 Reflective observations on the functioning of the NMSS

In this section we present some additional analytical observations regarding the NMSS approach, emphasizing striking experiences, strengths, and weaknesses.

2.5.1 Creating incentives for knowledge providers in particular

An initial and unexpected observation was that, contrary to project expectations, the NMSS approach encouraged knowledge providers, rather than farmers, to act.

According to the philosophy of the project, the voucher was primarily designed to make involvement in the sphere of nutrient management more attractive to farmers and to stimulate demand-driven extension. Eventually, 24,946 farmers spent the voucher, and a considerable percentage reported a 'learning impact' (in terms of problem perception, motivation, and new insights), so one can conclude that farmers did indeed become encouraged to some degree (though whether or not the impact was sufficient is debatable). It is notable that the motivation of farmers to purchase knowledge products on nutrient management was in many instances indirect. Most farmers indicated that the services eligible for voucher purchase were offered within an existing client-provider relationship. Knowledge providers made considerable efforts to design and adapt knowledge products on nutrient management and were very active in informing their clients about the possibility of applying for the voucher and spending it with them. In retrospect, this is quite understandable, since knowledge providers had a clear financial incentive - they would be paid for the services delivered. This is consistent with earlier experiences elsewhere that document the suitability of voucher systems for market development (Gibson, 1999). In the context of the public interest theme of nutrient management in The Netherlands, the fact that knowledge providers became motivated to act can be seen as a significant achievement, especially given that several earlier studies found that the service provisioning network surrounding farmers (including private consultants, accountants, and veterinarians among others) did little to encourage farmers to take nutrient management seriously (Oerlemans et al, 2002; Ketelaars and Leeuwis, 2002).

2.5.2 Existing relationships versus spot market transactions

Despite NMSS's considerable efforts to create a transparent knowledge market, we see that the large majority of vouchers were spent in familiar networks, including both study groups and existing advisor/client relationships. Clearly, farmers did not act as 'critical consumers' - that is to say, they did not undertake extensive product, price, and provider comparisons (e.g., on the NMSS website) - before engaging in a transaction. Explanations for this may include the fact that knowledge providers often took the initiative, farmers' preferred media use (see Wolf et al., 2001; Gielen et al., 2003), the (lack of) awareness of the website, the short time horizon of the project, and the fact that the list of preferred products based on client satisfaction measurements never materialized. Furthermore, a knowledge product can be seen as a service good, in the sense that it is intangible and thus implies difficulties in ex ante evaluation (i.e., prior to consumption) (King and Hill, 1997; Coulter and Coulter, 2003). This difficulty with an ex ante evaluation of knowledge products was indicated by 80% of the farmers in the 2003 survey of Jacobs and De Wit (n=1,228). Furthermore, we feel that an overriding factor in this respect is the nature of advising activities - that simply switching to another knowledge provider entails considerable transaction costs. More generally, Havila and Wilkinson (2002) argue that business relationships have a tendency to be long lasting, and that over the long term the parties involved adapt to one another and invest in the relationship, leading to increased commitment (see also Iacobucci and Howard, 1999). Bendapudi and Berry refer to 'relation specific investments,' which '... are investments the partner makes in the relationship that are not easily portable to other relationships' (1997, citing Williamson, 1981). This implies that breaking off an existing relationship may destroy capital, whereas in the case of new relationships considerable investment is needed. Agricultural advisors and their clients generally need to invest a lot of time and effort in order to become familiar with each others' context, personal characteristics, preferences, beliefs, aspirations, and competencies, and to develop the relationship of trust that, according to Van den Ban and Hawkins (1996), is essential to advisory relationships. In view of such transaction costs, it is not surprising that farmers spent vouchers in existing relationships.

Another relevant observation in this context is that both the NMSS project itself and its chief executing agency were new players in the agricultural domain and had not yet established a credible position in the agricultural knowledge network. A study by De Wit and Diepen (2002) tellingly pointed out that a considerable number of farmers had thrown away the voucher application form because they thought it was advertising from an unknown sender. Given the relatively short time horizon of the project and the fact that NMSS was time-bound as opposed to a permanent facilitator of the knowledge market, it is highly questionable whether the goal of establishing a credible position in the knowledge market was attained.

2.5.3 The influence of the politicized context

As was indicated briefly, the government's nutrient management policy was a contested and politically sensitive issue. It is beyond the scope of this chapter to explain the historical intricacies and sensitivities. Suffice it to say that, at the time of the NMSS project, there was a profound distrust between the farming sector and the Ministry of Agriculture. This distrust went beyond the nutrient management policy to include the way in which recent crises (e.g., swine fever, foot and mouth disease) had been dealt with, the enormous administrative duties forced on farmers, contradictory policies, and the overall (lack of) vision for the future of Dutch agriculture. The study by Oerlemans et al. (2002), for example, showed that dairy farmers' trust in the Ministry was extremely low. Of a representative sample (n=153) of dairy farmers, 93% indicated that they did not trust the intentions of the government, while 67% responded that they did not agree with the aims of the nutrient management policy. The same study showed that nutrient management ranked ninth in a list of ten themes farmers found to be of more than average interest³¹, illustrating that it was not of high importance. The baseline study upon which the NMSS strategy was based showed that 89% of a sample of 2,260 farmers indicated that the government did not consider farmers' interests in setting MINAS norms (De Wit et al., 2001). From a communications point of view, NMSS's exclusive focus on and identification with nutrient management was to some extent a barrier to farmers becoming motivated to act, since: (a) the term 'nutrient management' had negative connotations for many farmers; (b) relationships between the government and farmers were damaged, particularly on the nutrient management issue; and (c) it was unclear whether the policy would stand in the European court (eventually it did not). At the same time, there were other themes that farmers did find interesting (such as pasture management, animal feeding, etc.) that could have served as an entry point for discussing nutrient management issues in a broader context.

2.5.4 A lack of knowledge on nutrient management?

The previous point indicates that for emotive reasons many farmers did not have a positive or active interest in nutrient management (see also Stolzenbach and Leeuwis, 1996). In addition, our interviews showed that most farmers thought they did not have a nutrient management problem. One year earlier, a larger study (Oerlemans et al., 2002) with a representative sample (n=153) found that 76% of dairy farmers did not consider themselves as having a problem with nutrient management. In the same study, the great majority of dairy farmers (80%) indicated that they already knew how to meet the norms, and 75% were confident that they would indeed meet the norms in 2003 (Oerlemans et al., 2002). The NMSS baseline study (De Wit et al., 2001) showed that 82% of the farmers (n=2,260) said that they did not need knowledge on nutrient management. As indicated earlier, this contrasts sharply with the view of the government. On the basis of all this, we can conclude that there was very little active demand for knowledge about nutrient management. We can also question the validity of the prevailing policy assumption that a lack of technical and managerial knowledge was a key obstacle to achieving compliance with the nutrient management policies. Farmers seem to be downplaying or perhaps denying nutrient management problems. At the same time, they seem to be confident that they have sufficient knowledge and capacities to deal with any nutrient management problem they might have. Even if it is assumed that many farmers have a nutrient management problem (as defined by the government), the evidence indicates that there is widespread unwillingness among farmers to actively consider improving nutrient management and/or to apply available knowledge in the near future. In this connection, it is relevant to note that, in 2001, 58% of dairy farmers (n=153) were of the opinion that nutrient management policies and norms would continue to change (Oerlemans et al., 2002), indicating that many farmers were postponing their efforts. All in all, it is not the lack of knowledge that seems to be a key obstacle, but rather the lack of certainty and agreement regarding the policy, tense relationships, and lack of trust between the government and farmers that together result in negative attitudes towards nutrient management.

2.5.5 The limited learning capacity of the project

It is interesting to note that in the course of the NMSS project the implementers developed a good understanding of some of the key difficulties encountered. Shortly after receiving the project grant, for example, the NMSS organization commissioned a baseline study (De Wit et al., 2001) from which they concluded that a lack of knowledge on nutrient management was not the key problem and that farmers had deve-

loped, metaphorically speaking, an allergy to nutrient management and MINAS because of the perceived vagueness of the system. At several stages, NMSS made proposals to change the focus and strategy of the project. However, the Ministry was not in favor of making fundamental changes to the project and, according to the implementers, emphasized the necessity of concentrating on the original goals and targets. This limited capacity to learn and change direction is reflected in the risks mentioned in connection with the privatization of extension and was aggravated in this case by the short time horizon of the project (i.e., two years). Indeed, it would have been difficult in practical terms to change the direction of the project, even if the contract or the paymaster (i.e., the government) had allowed for it.

2.6 Conceptual reflections on publicly funded demand-driven extension

We have seen how the Dutch Ministry of Agriculture attempted by various means to steer the agricultural knowledge market so as to foster demand-driven service delivery with respect of nutrient management. In this section, we draw some overall conceptual and practical lessons with regard to this endeavor.

2.6.1 The need to unpack the notion of demand

The wish to make publicly funded research and extension more demand-driven is an important element in general policy discourses about privatization, and it was a key objective of NMSS. In most literature (including NMSS project documents), 'demand-driven' refers to finding a good fit between the knowledge and information desired by farmers and the services delivered by extension service providers. It is often contrasted with top-down approaches. In the case of the NMSS, however, it was quite clear that most of the farmers involved did not at the time have an active desire to learn more about nutrient management. Despite the demand-driven rhetoric, the NMSS project in many ways resembled a classic attempt to realize government policy, and it would be inaccurate to suggest that the project was based on farmer needs. One could argue that the notion of demand-driven is altogether misleading and misplaced in the context of publicly funded extension in present-day Western European agriculture, since there is generally friction between the interests of the government and those of the farmers. Nowadays, Western European governments are focusing on reaching societal goals with respect to ecology and the environment, which often run counter, at least in part, to the immediate economic interests of individual farmers. Thus, one could say that governments are inclined almost by definition to fund extension activities only for issues in which farmers do not have an autonomous interest. It is worth noting here that the extension service providers' loyalty is torn between serving the client and serving the government. This dilemma was expected to be resolved through privatization, but it has at best only been partially resolved, since many extension service providers (e.g., those involved in NMSS) still end up being paid by both farmers and the government. In discussions about privatized extension, and also in the case of NMSS, we believe that two meanings of demand have been confused. The first meaning is demand in the economic sense - whether or not there is sufficient purchasing power to obtain certain services as a condition for creating an interaction between market players. The second meaning is substantive - the interest that clients have in certain services and in the contents of these services and the questions that clients pose. In the NMSS project discourse, for example, it was suggested that farmers' 'substantive needs' should be the driving force for formulating their 'economic demand.' We found that such substantive needs clearly did not exist and, consequently, the most important measure of the project (vouchers) was primarily about stimulating economic demand and not about articulating substantive needs.

In view of this confusion, the notions of demand and demand-driven need to be refined. On the basis of the NMSS experience, we suggest that four aspects need to be distinguished in any consideration of demand-driven extension with respect to public interest themes:

1. Catalyzing farmers and the extension service or knowledge providers to act through the stimulation of economic demand

In essence, the idea is to create incentives for people to engage in activities that otherwise would not be undertaken. This study found that NMSS was able to create incentives knowledge providers and, to a lesser extent, farmers. Even though a considerable number of farmers spent the voucher, evidence suggests that only a minority of them engaged in activities that they would not otherwise have undertaken.

2. Awareness building regarding a public issue

Participation in 'new' activities may or may not lead to increased awareness and acceptance of public issues and to defining an existing situation as problematic. Much extension literature suggests that actual experience of a problem is a crucial condition for becoming actively involved in learning and problem solving. Moreover, it is clear that policy instruments other than extension (e.g., laws, subsidies, fines) may contribute to the creation of problem awareness (Leeuwis and Van den Ban, 2004). An evaluative study of all nitrate projects (Geerling-Eiff et al., 2004) indicated that it was legislation more than any other factor that catalyzed farmers to tackle the nutrient management issue; but, since the legislation was not clear, farmers had difficulty assessing what problems had to be solved in order to comply with the norms.

3. Articulation of substantive needs regarding a public issue

It is more likely that people will search for underlying processes and gaps in understanding and formulate substantive needs, if they are actually experiencing a problem. The case of the NMSS and the experience of study groups designed to facilitate the articulation of needs in particular, suggests that needs articulation requires interaction between service providers and farmers (see also Van den Ban and Hawkins, 1996). In other words, supply and demand cannot be seen as totally independent categories in discussions about extension goods or knowledge products.

4. Demand-driven service delivery in the substantive sense

When substantive needs have become clear, they may or may not result in a demand-driven delivery of services. The extent to which this happens is primarily dependent on the transparency of the service market, and/or on the empathy, flexibility, and expertise of a chosen service provider. Since demand-driven in the substantive sense depends greatly on the quality of interaction between the service provider and client, it is notoriously difficult to assess and control. In the case of NMSS, we have only a crude indication of quality in the sense that most farmers were generally satisfied with the services delivered. This indicates that providers act in a responsible way regarding the quality of their services.

In essence, we argue that fostering demand-driven extension with respect to public interest themes requires the concerted support of all four aspects. With each, a range of different strategies and methods may be relevant (see for example, Leeuwis and Van den Ban, 2004). In the literature, much attention has been given to the transition to demand-driven extension by means of contracting-out and channeling funds into the hands of the end-users. However, this addresses only the first aspect mentioned above. Much more conceptual and practical attention should be dedicated to the process of formulating and meeting substantive needs. It is clear that this may create considerable complexities and contradictions when there are tensions between public interests, as defined by a government, and the private interests of farmers. However, even in cases where no such tension is apparent (e.g., when both farmers and government give priority to increased production), we think that critical reflection on the quality of the needs articulation process may be justified.

2.6.2 Moving beyond classic knowledge products

In the case study presented, we see that the knowledge products offered through NMSS are classic extension services such as individual technical advice and group meetings designed to facilitate horizontal knowledge exchange. This situation is not unique to The Netherlands (see for example, Bebbington and Sotomayor, 1998; see also Katz and Barandun, 2002 for an extensive review of several case studies). Although such services can be of use when the purpose is to stimulate change, it is significant to note that recent insights from innovation studies suggest that different forms of interventions, designed to communicate new concepts or policies, might also be needed in order to support innovation. These studies have found that successful innovations appeared to be based on the effective integration of problem perceptions, knowledge and experience of scientists, clients, intermediaries, and other

parties involved. This has led to considerable critiques on the prevailing linear model of innovation. The linear model of innovation mistakenly assumes that innovations are developed by scientists, disseminated through extension, and then put into practice by farmers (Kline and Rosenberg, 1986; Röling, 1994; Rip, 1995). Moreover, innovations are no longer looked on as consisting only of new technical arrangements, but also of new social and organizational arrangements, such as new rules, perceptions, agreements, and social relationships (Smits, 2000; Geels, 2002; Leeuwis and Van den Ban, 2004). This implies that there are always many different stakeholders involved and that innovation is a collective phenomenon in which social dilemmas and tensions are likely to come to the fore. In line with these conceptual changes, many authors have emphasized that additional services are required in order to foster new forms of coordinated action among stakeholders, including services such as the facilitation of interactive design trajectories, network building, social learning, organization building, and conflict management (see for example, Röling and Wagemakers, 1998; Ison and Russell, 2000; Leeuwis and Van den Ban, 2004). In this light, it is relevant to note that a principal finding from our case study - that lack of technical knowledge is a minor part of the problem - calls into question the relevance of classic extension services. At the same time, there seems to be a clear need for the improvement of social relationships, greater mutual understanding, and the design of more acceptable policy measures. However, the facilitation services required for this are not addressed by the knowledge market created through NMSS, but are clearly relevant from an innovation perspective. More generally, we may conclude that the idea of creating a knowledge market focuses attention, albeit unintentionally, on the delivery of knowledge and information products that can be marketed to individuals and small groups, rather than alternative kinds of services. Paradoxically, such a focus reinforces the linear model of innovation and once again suggests a clear separation between those who supply knowledge and those who demand it. As has been argued elsewhere, this is perhaps effective in a case of already tested and available advice and innovations that coincide with private interests and possess sufficient private good characteristics (i.e., high excludability and subtractability).³² It is not effective in a situation where policy and/or technological innovations are contested and/or must be (re-)designed (Leeuwis, 2000). Most importantly, the idea of an agricultural knowledge market suggests, incorrectly, that innovation depends primarily on the distribution of knowledge. In view of new, more recent innovation theories, it can be said instead that the primary process is fostering integration and agreement in a network of actors.

2.6.3 The functioning of the knowledge market

The NMSS experience suggests that the creation of a knowledge market that will work without some form of market failure presents a considerable challenge. Even when we assume an articulated substantive need for knowledge products, adequate economic demand (financial resources and willingness to pay), sufficient competitors and supply of services, and a high degree of market transparency, both our case study and the literature on the nature of extension and consultancy work indicate that considerable transaction costs need to be overcome when switching from one service provider to another. Thus, it is an illusion to think that the knowledge market would start to function 'properly' (i.e., like a spot market) if only farmers could get used to their new role as critical consumers (see for example, Rivera et al., 2002; Katz and Barandun, 2002), or if the supply were clearly understood through a website or other media.

2.7 Conclusion: The role of the state in a privatized extension system

On the assumption that privatization as a phenomenon is here to stay, the question of how governments can optimize their role as a client, or a supervisor, or both, in the agricultural knowledge market remains relevant. At this point, we can draw conclusions regarding the role of NMSS-like institutions, combining both demand-side funding (the voucher scheme) and the supply-side contracting-out of safeguarding instruments designed to improve the functioning of the market by means of quality control, articulation of needs, and transparency.

A first conclusion based on this case study is that, when the purpose is to encourage individual farmers to act on a public interest issue through a voucher system, a clear and relatively stable public policy is very important. Obvious as this may seem, neither condition was met in this case - there was neither a clear nor a stable policy. In our view, vouchers may be especially relevant when farmers cannot be easily motivated by other means, such as regulations, subsidies, and fines (i.e., when a public interest issue cannot be brought in line with private incentives or disincentives), or when such conventional policy instruments (see Van Woerkum, 1990) are so complex that they cannot be made effective without extension services. Additional lessons derived from the case are that a government voucher system is not likely to be successful if the policy is highly contested and controversial, and/or if the relationship between the government (sender) and the prospective audience (receiver) is damaged to such an extent that any communication is likely to fail. The exception would be if the voucher system were to address the relationship itself and had the objective of restoring it. In such situations, problems other than lack of knowledge and availability of services need to be addressed and resolved.

Second, although from a theoretical point of view NMSS-like institutions may play useful public interest roles (something that was - albeit with reservations - recognized by most respondents), it is clear from the NMSS experience that for a one time project with a limited life span it may be difficult to gain the trust and respect of actors in the agricultural knowledge network. More time is also needed for experimenting with and improving the various elements necessary to facilitate the development of the knowledge market. This was also observed by Berdegué and Marchant (2002) who stated that, after 25 years of experimentation with privatized extension systems in Chile, much still needed to be learned. Given the ongoing need to address old and new public interest issues, it may be more effective and efficient for governments to build more permanent institutions to facilitate the development of the agricultural knowledge market.

A third conclusion is that an NMSS-like institution will often need to have a broader focus than that of distributing technical knowledge to farmers. As outlined in the previous section, innovation is likely to require new kinds of facilitation services, involving a broader range of stakeholders (e.g., intermediaries, agri-industry, policy makers). Therefore, an NMSS-like institution will have to flexibly define its services and activities in relation to a specific public interest issue, depending on a careful diagnosis of both the problematic situation and the landscape of services already available.

Fourth, we have seen that creating incentives, awareness building, and the articulation of needs are important pre-requisites for achieving demand-driven extension (in the substantive sense) on public interest issues. NMSS-like institutions will have to pay considerable attention to developing models, strategies, and support activities. In line with Bebbington and Sotomayor's (1998) observations, we concur that subsidized demand-driven extension does not always reflect farmer needs.

Finally, we question whether it is useful to improve product quality and market transparency through the certification of clearly described products and the subsequent distribution of detailed product information (as was done in this case) when we take into account the following factors: (a) specific substantive needs are likely to be diverse, (b) the meeting of such needs depends to a large extent on the quality of the interaction between client and provider, and (c) relational aspects play an important role in extension service provider-farmer contacts. The kind of dynamics and mechanisms needed to guarantee satisfaction cannot be easily captured in (and may well conflict with) a predefined and anonymous written product description. As an alternative, it may make more sense to develop mechanisms through which specific persons can be certified, or to improve market transparency through price comparisons and information about client satisfaction with regard to specific service providers, or both.

Notes Chapter 2

- 18 The definition of goods as employed in this chapter encompasses not only physically tangible goods, but also services.
- 19 Note that in this chapter the concept of knowledge is not more thoroughly discussed. The focus of this chapter is on the provisioning of services in which the purposeful exchange of knowledge is an essential feature.
- 20 This applies not only to the provisioning of public goods, which due to their low excludability and subtractability are unlikely to provide sufficient incentives for private provision, but also to toll and private goods, in line with the 'merit good' argument. This means that the state should safeguard the provisioning of goods that are in the public interest, despite their possible private or toll good character. The merit good argument is the basis for the political discussion on the need for continued state involvement in extension service provision.
- 21 See Beynon et al. (1998: 22-24) and Carney (1998: 44-45) for elaborate descriptions of market failure specifically related to 'extension goods'.
- 22 Agricultural extension systems provided by a government service have traditionally been financed to a large degree through public funding (e.g., general taxes, specific taxes or levies on agricultural produce, donor country grants, multilateral institution grants) (Beynon et al., 1998; Carney, 1998; Van den Ban, 2000; Katz and Barandun, 2002). Private funding sources for extension service provisioning include: farmers' personal resources, producer organizations, processing, marketing and export enterprises (in agricultural chains or in a regime of contract growing), and agricultural input supply companies (though often the farmer pays indirectly, since advice is included in the price of the input). Extension services are also provided by diverse organizations, both public and private, for-profit as well as not-for-profit (Katz and Barandun, 2002). Public institutions include national extension organizations, local extension units, commodity boards, public universities and research institutions, and international development organizations. Private, profit-oriented actors include consultancy companies, processing and marketing enterprises, input supply firms, traders, and private universities and research institutions. Private, not-for-profit organizations include NGOs and religious organizations. Producer organizations also provide extension services.
- 23 For a more extensive description of the mineral balance as a nutrient management and learning tool, see Kessels and Proost (1995) and Stolzenbach and Leeuwis (1996).
- 24 The MINAS system collapsed towards the end of 2003 (some six months after completion of our research) when the European court decided that it was not in line with European nitrate regulations.
- 25 These projects were driven by the idea that there was a lack of knowledge and an insufficient flow of knowledge in the agricultural knowledge system, making it difficult for farmers to comply with MINAS standards.
- 26 The term 'knowledge product' was part of NMSS project jargon and indicates various forms of extension service provisioning, in which the purposeful exchange of knowledge is an essential feature.
- 27 The terms 'knowledge provider' and 'extension service provider' both refer to those involved in providing extension services, in which the purposeful exchange of knowledge is an essential feature.
- 28 The knowledge product should lead to an improvement in nutrient management, should include an advisory trajectory that goes beyond indicating merely how one can comply with MINAS norms, and should be correctly described according to the standards of NMSS. Therefore, for example, the analysis of soil samples was not included on the list of approved knowledge products.
- 29 The sample consisted of seven farmers who did not apply for the voucher, eight farmers who applied for it but had not yet spent it at the point of selection (two had spent it by the time they were interviewed), eight farmers who applied for the voucher and spent the voucher individually, and eight farmers who spent the voucher in an NMSS study group. The study group leaders and knowledge providers were also randomly selected, the latter having been pre-divided into four categories in order to maximize diversity: advisory organizations (such as the privatized extension service, DLV (which stands for Dienst Landbouw

Voorlichting - meaning Agricultural Extension Service), product-related knowledge providers (such as feed industry advisors), accountancy-related knowledge providers, and nitrate projects (research projects).

- 30 Oerlemans et al. (2002: 29) found that, out of a representative sample of dairy farmers (n=153), 76% indicated that they did not have a nutrient emission problem on their farm, while 73% were confident that they would meet the nutrient emission norms set for 2003.
- 31 In the 'great interest' category the scores were: animal health: 79%; milking: 72%; feeding of dairy cattle: 68%; grassland management: 67%; economics and administration: 38%; labor planning: 37%; breeding and animal administration: 31%; nutrient management: 22%; and machinery set-up: 13%.
- 32 See Carney (1998), Beynon et al. (1998), and Hanson and Just (2001) for an analysis of extension as an economic good.

3

Institutionalizing end-user demand steering in agricultural R&D

Farmer levy funding of R&D in The Netherlands

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Abstract

The purpose of this chapter is to critically examine the institutionalization of demand-driven modes of working in the R&D planning process and reveal possible weaknesses, through an analysis of a system of collective R&D funding by farmers. The findings indicate that, although end-users have the opportunity to raise issues that lead to R&D, queries are influenced by several actors in the R&D planning process in such a way that they do not adequately reflect farmers' innovation needs. Conclusions are that more emphasis is required on joint demand articulation and involvement of end-users and other stakeholders in the innovation process, and on the institutional development of R&D funding organizations in order to adopt a more inclusive view on innovation.

3.1 Introduction

As a result of worldwide reform measures in the provisioning and funding of agricultural R&D, with an emphasis on the privatization of public agricultural R&D establishments (see Byerlee et al., 2002), in many industrialized countries governments have withdrawn from the provisioning of R&D through state companies. Much attention has been paid to the potentially positive and/or negative effects of alternative systems of funding and provisioning of agricultural R&D, in terms of efficiency, effectiveness, accountability, and content (e.g. Byerlee, 1998; Huffman and Just, 1999a). A key issue in this discussion is the premise that separating funding from provisioning of R&D makes service provision demand driven, because in a market setting services are contracted and several providers compete for contracts, and this enhances provider performance and orientation towards clients' wishes.

As some kinds of R&D merit continued public funding (Pardey et al., 1989; Alston et al., 1998; Huffman and Just, 1999b), governments continue to fund programs and/or projects by means of contracting out. Often, in industrialized countries this concerns public funding of basic research and applied agricultural research on those issues that are deemed to be of public interest (Levidow et al., 2002). R&D provisioning on production issues often relies on private funding. An important source of private R&D funding is collective funding through compulsory levies imposed on farmers. In such systems of farmer levy funding, farmers become, as a collective, direct clients of providers of agricultural R&D. This empowers farmers to take full control of the R&D process, and therefore the ultimate degree of participation as outlined in many 'participation ladders' will be attained (Sperling and Ashby, 2001; Johnson et al., 2003).

In this chapter, the system of farmer levy funding as a means of fully empowering producers to control the R&D agenda, i.e. make it fit with their needs, is critically examined. Section 3.2 reviews the literature on farmer levy funding and positions such funding within an innovation systems framework. In section 3.3, views on R&D planning are briefly reviewed. Section 3.4 introduces the case of the Dutch Dairy Commodity Board and the methods they use. Section 3.5 provides an analysis of how the process of R&D planning and subsequent R&D execution takes place. On the basis of this analysis, some critical reflections are offered in section 3.6 with regard to the institutionalization and operationalization of end-user needs in demand-driven R&D systems. The chapter concludes by stating in section 3.7 that, whereas the system theoretically has institutionalized end-user demand steering, in practice such steering is not fully operationalized.

3.2 Farmer levy funding as a way of institutionalizing end-user demand steering in agricultural R&D systems

Funding R&D through farmer levies resembles contractual research planning: placing significant control of the resources available for financing R&D in the hands of stakeholders, thereby creating the means to exert a demand pull on the system (Stewart, 1995; Sperling and Ashby, 2001). Several authors advocate the involvement of, and control by, end-users in the governance, priority setting, execution, and financial support of agricultural R&D as an instrument to improve the effectiveness of the R&D process (Alston et al., 1998; Sperling and Ashby, 2001; Byerlee et al., 2002; Johnson et al., 2003). In a farmer levy funding system, both allocational efficiency and organizational efficiency should increase (Kangasniemi, 2002). Levy funding ensures allocational efficiency in that the principle of 'the user pays' is put into practice. 'Free riding' is mitigated because research information is transformed from a public good into an industry or club good (Brennan and Mullen, 2002; Huffman and Just, 1999b). A principal advantage of farmer levy funding in this sense is also that farmers as a collective are capable of financing agricultural R&D, whereas for individual farmers this would be too costly (Martin and Scott, 2000; Barnes, 2001). Levy funding ensures organizational efficiency in that farmers can exert influence on the organization and content of agricultural R&D with their demand pull. Because of the large number of levy payers, producers are usually represented through boards with decision-making authority. These boards need to be part of strong farmer organizations that can raise commitment to the levies amongst their constituencies and effectively represent producers' interests and negotiate with other stakeholders such as government (Sperling and Ashby, 2001).

The combination of demand pull and farmer representation on R&D planning boards means that funding R&D through farmer levies is generally considered to be an effective way to institutionalize end-user involvement in R&D planning. In this regard, Röling et al. (2004: 217) state that: 'Farmers in industrial countries have a well organized institutional influence on decisions about agricultural research... (and) are perfectly capable of telling researchers what they need.' The situation is strikingly different in many developing countries, where end-user steering of R&D planning is insufficiently institutionalized (Clark, 2002; Van de Fliert and Braun, 2002; Sumberg, 2005). Hall et al. (2001) state that, in the debate on farmer involvement in agricultural R&D, the focus has shifted too much to participatory methods rather than concentrating on the underlying institutional issues. Biggs and Smith (1998: 245) argue in this respect: 'the main determinants of outcomes lie not with the choice of method but with the institutions and protagonists in which those choices are made.' Following Hall et al.'s pragmatic definition, 'institutions' refers to the 'combined environment of 'rules of the game' and physical organizations and the interplay of the two' (Hall et al., 2001: 784).

The focus on institutions and protagonists is a key issue in the innovation systems

approach that has gained ground in the literature on agricultural R&D and the dissemination of R&D results to farmers, through for example the Agricultural Knowledge and Information Systems approach (Engel, 1995), the National Systems of Innovation approach (Lundvall, 1992, applied by e.g. Biggs and Smith, 1998; Hall et al., 2001; Clark, 2002; Sumberg, 2005), or 'looser' systems approaches (Lacy, 1996; Thrupp and Altieri, 2001). As (levy funded) R&D aims to contribute to farmer innovation, such a systems perspective to innovation is relevant when studying it. In this context, a comprehensive definition of innovation such as the one coined by Bessant and Tidd (2007: 12, referring to Rothwell and Gardiner, 1985) is appropriate: 'Innovation does not necessarily imply the commercialization of only a major advance in the technological state of the art (a radical innovation) but it includes also the utilization of even small-scale changes in technological know-how (an improvement or incremental innovation).' With regard to the organization of innovation, Smits' (2002: 865) definition applies: '...a successful combination of hardware, software and orgware, viewed from a societal and/or economic point of view. Hardware relates to the material equipment (mostly) involved and software concerns the knowledge in terms of manuals, software, digital content, tacit knowledge involved in the innovation. Orgware refers to the organizational and institutional conditions that influence the development of an invention into an innovation and the actual functioning of an innovation.'

Systems approaches to innovation emphasize that actors in the R&D process are involved in networks that operate within certain institutional contexts concerning the rules and norms that govern them as a social process of learning, and their cooperative performance is a key determinant of the impact of innovations (Biggs and Smith, 1998; Leeuwis and Van den Ban, 2004; Smits and Kuhlmann, 2004). Hence, to make end-user demand steering effective, the institutional setting through which the R&D process is governed has to accommodate it (Lacy, 1996; Van de Fliert and Braun, 2002; Probst and Hagmann, 2003). In the context of an innovation systems approach, Hall et al. (2003) pose challenges with regard to analyzing R&D planning: (1) the way in which institutional learning has led to new stakeholder-driven ways of setting technical research priorities must be analyzed, (2) since the innovation systems framework recognizes that priorities and agendas are contested and negotiated, analytical attention has to be given to actor interaction and dynamics in this process.

In light of these challenges, the case of farmer levy R&D funding is interesting, because it is an R&D planning system that has often formally incorporated endusers in setting R&D priorities. An analysis of this system would give insights into how stakeholder-driven ways of setting technical research priorities function, and how actor interaction and dynamics take place in the process. Such insights may contribute to institutional development in (public) agricultural R&D systems that have the objective of becoming more demand driven.

3.3 Influences of the institutional context on the process of R&D project planning

R&D project planning is defined by Capo et al. (2001: 119) as 'a systematic and integrated management approach to identifying and preparing a plan to resolve a 'problem' identified within the broad field of agriculture.' Basic steps in research project planning are proposal generation, proposal refining and modification, and project selection for funding (Daniel et al., 2003). In the context of the farmer levy funding system, these steps are called here: generation of R&D queries, filtering of R&D queries, and decision making on fund allocation. In the economic discipline, R&D project planning is often seen as largely a-political and a-contextual because quantitative ex ante analysis allows for making choices on the basis of objective information (Alston et al., 1995; Kelley et al., 1995; Byerlee, 2000; Smith, 2001). Studies that focus on the institutional context of R&D argue, however, that it is a systemic process determined by norms, values and interests of the actors involved and a political process (Lacy, 1996; Van de Fliert and Braun, 2002; Davenport et al., 2003; Hall et al., 2003; Ekboir, 2003; Probst and Hagmann, 2003). Norms, values, and interests can influence the different steps of the R&D planning process in several phases:

1. R&D query generation

The choice of method of query generation is already a non-neutral factor in the kind of queries that are generated. In top-down approaches, researchers and/or policy makers often determine the issues for R&D, assisted by brainstorming sessions with experts, market studies, and studies of user perceptions (Verstegen et al., 2000). In bottom-up approaches, in which end-users determine the R&D issues and that are often used in systems of farmer levy R&D funding, advisory panels can be used to elicit stakeholder views (Middendorf and Busch, 1997), and R&D queries may also be generated during stakeholder meetings (Teixeira et al., 2004).

2. R&D query filtering (i.e. prioritization)

In the economic approach, priority setting is usually seen as an optimization problem solved by quantitative economic analysis (Alston et al., 1995; Kelley et al., 1995; Smith, 2001). However, its value for impact assessment is increasingly criticized, because too many factors have the potential to influence the final use of research output (Stewart, 1995; Ekboir, 2003; Douthwaite et al., 2003), and these methods also often ignore the institutional context in which research takes place. They are often more politically important than managerially useful: despite their goal of delivering objective information, the information they yield is often used strategically in the policy arena (Cabral-Cardoso, 1996; Hall et al., 2003). In the institutional context of farmer levy funding, a political model that stresses processes of consultation and bargaining amongst stakeholder groups prevails (Brennan and Mullen, 2002; Kangasniemi, 2002). Such an approach carries a

number of risks: in the context of farmer levy funding, unequal distribution of power in the prioritization process is seen as an important risk. This can influence the research strategy, the kind of farmers that are served (e.g. bias towards wealthier, better informed farmers), and the regions that are served (Brennan and Mullen, 2002; Sperling and Ashby, 2001; Kangasniemi, 2002).

3. Decision making on fund allocation

Ultimate decision making on fund allocation for R&D lies often with decisionmaking boards supported by committees and/or R&D coordinators (Brennan and Mullen, 2002). The responsibility of such R&D coordinators is to be informed about recent trends and to form a liaison between researchers and the board that takes fund allocation decisions, ensuring that proposals address the board's needs (Daniel et al., 2003). In this respect, Woodhead (2000: 524) argues that 'proposals are developed, critiqued, and approved by different groups of people with specific roles created by the division of the decision-making process.' These roles are: decision approvers (those ultimately sanctioning decisions and allocating funds), decision takers (those meeting regularly with the teams developing the proposals, ensuring only quality proposals go to the decision approvers), decision shapers (those developing proposals and having their work approved, rejected, or delayed for modifications by decision takers and decision approvers), and, lastly, decision influencers (those affecting decision shaping, taking, and approval, i.e. internal and external people who formally or informally influence the development of proposals). This role division shows that, although the ultimate decision about fund allocation is made on the basis of fully developed proposals, in the preceding process several (implicit) decisions have already been made.

3.4 R&D planning in a system of farmer levy funding: the case of DCB

In The Netherlands, commodity boards govern the system of farmer levy R&D funding. These commodity boards are special, public-law bodies, installed by government, that have the authority to enforce levies to execute tasks that cannot be carried out by individual private companies in sectors with a very varied composition, many small companies, and a very flat hierarchy (SER, 2004). Their mandate is to contribute to knowledge development and innovation (by means of R&D), help to improve management processes, carry out promotional activities, act as a link to government, and set rules for the entire sector where necessary. As acceptance of levies is key to effective functioning of commodity boards (Brennan and Mullen, 2002), their performance is monitored every five years. For the dairy sector, the process is governed by the Dairy Commodity Board (DCB), on which this chapter focuses. Besides DCB, the Horticulture Commodity Board (HCB) and the Arable Farming Commodity Board (AFCB) are also considered in this study. Decisionmaking authorities within the commodity boards consist of representatives of relevant organizations within the sectors they represent. In the case of DCB, the so-called Dairy Farming Committee (DFC) is composed of farmers' representatives from the Dutch Farmers' Organization (LTO), dairy industry representatives from the Dutch Dairy Organization, and representatives from labor unions. Within HCB and AFCB, similar decision-making authorities exist but, because of the diversity of crops they represent, these have sub-committees also. The DFC is assisted by a secretary and two R&D coordinators. HCB and AFCB also employ R&D coordinators.

3.4.1 Goal and method

Because the systems of farmer levy R&D funding in The Netherlands have a setup in which end-user demand steering is institutionalized, an analysis of their functioning may contribute to thinking on how to institutionalize end-user demand steering in other systems of R&D planning. Although the study considers three commodity boards, the focus is on DCB. Hence, the study is best seen as a single case study, justified by the fact that it may be considered a representative or typical case (Yin, 2003). The main question that guided the study was: How does the procedure that DCB follows for R&D planning institutionalize end-user involvement and how are the demands of end-users effectuated throughout the R&D planning process? This question was triggered by dissatisfaction on the part of DCB with regard to the impact of the R&D activities they fund. To get a complete picture, besides analyzing the R&D planning process, the study also included views on the subsequent process of the execution of R&D activities. The goal was to reveal tensions in the setup of the R&D planning and execution process that may explain this unsatisfactory impact. To this end, key actors that played a role in these steps within DCB were interviewed in-depth; this revealed the rationales of different actors for acting in a certain way, as well as their perceptions of the process (cf. Emans, 2002).

Snowball or chain sampling was used to obtain respondents (Patton, 1990). With regard to the R&D queries generation step, this involved interviewing those responsible for the collection of these queries, i.e. people handling the R&D and innovation portfolio in the Dutch Farmers' Organization, LTO. In addition, researchers, the DCB R&D coordinators, and the DFC were interviewed about this step. With regard to the R&D queries filtering step, principally researchers and DCB R&D coordinators were asked to express their views, and also the DFC. With regard to the decision making on funding allocation step, principally the DFC was interviewed, and also the DCB R&D coordinators. To form a complete image of the whole process of executing the R&D activities and disseminating these results to levy payers, all respondents were asked about these three steps, and additionally three communication officers from the research institutes were interviewed. The interviews were tape recorded and fully transcribed to capture subtleties in the qualitative data (Emans, 2002). Transcripts were analyzed applying principles of grounded theory (Strauss

and Corbin, 1998). Furthermore, reflection sessions took place with representatives of the DFC, researchers, and R&D coordinators. A total of four portfolio managers, the DCB secretary and the two DCB R&D coordinators, eight DFC members, six researchers, and three communication officers were interviewed. To complement our analysis, relevant policy documents (such as the DCB R&D program for 2003-2006, the assessments by researchers of R&D queries) and minutes of meetings were analyzed, and systematic observation was performed during the annual prioritization meeting. To analyze the perspective of the levy payers, a small survey was carried out amongst 50 dairy farmers. Because of the limited sample size, this survey was designed to fill gaps in knowledge rather than to make valid statements about the whole population of dairy farmers. To complement the levy payers' perspective, a recent survey amongst 226 dairy farmers on the acceptance of DCB activities (Schmidt et al., 2005) was used. To provide a mirror to the DCB case, three HCB R&D coordinators and the AFCB R&D coordinator were also interviewed about the R&D planning and execution procedure within their organizations.

3.5 Results

In this section we highlight important issues that emerged from our data, following several stages in the R&D planning and execution process within DCB (see Table 3.1).

Step	Activities
Generation of R&D queries	 LTO portfolio managers, R&D providers, and individual farmers forward R&D queries DCB R&D coordinators gather R&D queries and forward these to an R&D provider
Filtering of R&D queries	 Researchers assess R&D queries and write an advice on rejection or acceptance DCB R&D coordinators forward these advices to a prioritization committee Prioritization committee prioritizes the R&D queries Terms of references are set for prioritized R&D queries and sent to selected R&D providers R&D providers elaborate concept proposals
Decision making on fund allocation	 Concept proposals are assessed by DCB R&D coordinators and a preliminary advice is attached to each proposal Funding for proposals is awarded or rejected by the DFC Projects are contracted out
R&D execution	 R&D providers develop a detailed research plan Research is executed by R&D providers
Dissemination of R&D output	• R&D results are made public through research reports, articles in farming magazines, leaflets, and direct communication to intermediary parties (during or after the research)

Table 3.1: R&D planning and execution process within DCB, five steps

3.5.1 The generation of R&D queries: a focus on operational issues

As Table 3.1 shows, R&D queries are generated in several ways and gathered once a year. According to respondents, the R&D queries that producers forward are generally on operational issues, i.e. problems that producers experience on a day-to-day basis. Respondents indicate that queries are generally not articulated at the high levels of specificity and abstractness required to guide R&D planning. The same occurs at HCB and AFCB. They are generally not assessed by submitters on whether they involve issues that have already had extensive research attention or are the subject of current research. The fact that the same queries are put forward repeatedly has made DCB aware that R&D results do not reach the levy payers. There are exceptions to the generally felt deficient quality of queries. One of the LTO R&D and innovation portfolio managers organizes a meeting in which a group of farmers articulate their queries and compare these against existing knowledge. HCB makes use of permanent crop-specific organizational structures that articulate R&D queries. Notwithstanding their perceived higher quality, most of these better articulated queries also deal with operational issues.

Given the perceived poor quality of the queries submitted, direct query submission is felt to be fulfilling a sensory function about which topics are current amongst dairy farmers, rather than giving direct input for R&D proposals. Furthermore, it is seen as a means to achieve a sense of democracy in the R&D planning process that is considered important for maintaining acceptance of levies (cf. Brennan and Mullen, 2002). However, instead of focusing on operational issues, the DFC has the ambition to focus on more long-term oriented R&D that is not necessarily directly related to current issues and may not be directly relevant to all farmers, but possibly only for the more innovative farmers. This may cause tensions amongst levy payers as to how levies are spent: levy payers prefer direct results, as also has been noted at HCB.

3.5.2 The filtering of R&D queries: steering at different levels

Queries are sent out to R&D providers for assessment. Researchers from appropriate disciplines assess queries on the basis of whether there has been past research on the theme, whether there is ongoing research, whether relevant insights from abroad can be adapted to local conditions, or whether there is a need for new research. Main assessment criteria of researchers are whether queries address gaps in scientific knowledge, whether they match their research interests, whether queries are well articulated, and whether queries are aimed at strategic issues rather than operational (optimization) issues. If researchers have any doubts during assessment, they usually ask colleagues for advice. Generally, those that have submitted the query are not involved during assessment, e.g. providing additional information or further joint articulation. This contrasts with assessment procedures within HCB and AFCB, in which farmer structures, organized according to crop or region, assess the queries. Researchers are then involved after prioritization.

Assessed queries and concept proposals are prioritized by a committee consisting of

some DFC members, and some LTO research and innovation portfolio managers. Respondents indicate two main prioritization criteria. One criterion is compliance with the long-term R&D program (2003-2006) (DCB, 2002) established by DCB on the basis of the LTO future vision. The other criterion is compliance with personal criteria of committee members based on their experience as dairy farmers, and what they consider important for their constituencies in their capacity as LTO representatives and policy makers. For the observed meeting, a note was circulated to attendees beforehand, in which the priorities specified in the R&D program were applied to the submitted queries and concept proposals, to support the committee in decision making. This may thus be considered as a form of a priori steering. Despite this preparation, through observation during the meeting it became clear that equal attention was not paid to all clusters of queries. Furthermore, in the meeting some committee members acted in a dominant way, and this precluded other members from providing input into the prioritization discussion. No facilitating methods were deployed to mitigate such dominance.

The prioritized R&D queries and concept proposals are developed into full research proposals by R&D providers. Full proposals are assessed by the DCB R&D coordinators, who then formulate a preliminary advice. This preliminary advice is based on R&D coordinators' knowledge of the topic and sound judgment, sometimes complemented with expert information from R&D coordinators from other commodity boards, from knowledgeable dairy farmers, or researchers. The DCB R&D coordinators furthermore consider the R&D program, relevancy for the dairy sector in terms of loss reduction or efficiency gain, the cost-benefit ratio of the research, and whether the research is relevant for a majority of the levy payers. With regard to the cost-benefit ratio, DCB R&D coordinators critically examine whether experimental research is needed, or whether extensive literature research and desk studies suffice to solve a query. R&D coordinators and researchers state that there is continuing negotiation about the required type and size of research projects: the DFC wants small projects, whereas researchers prefer large comprehensive projects to assure scientific validity and to have certainty with regard to filled project portfolios. DCB internal documents furthermore indicate that similar research already financed by other parties (such as the Ministry of Agriculture) is a reason to reject certain proposals. Also, when knowledge is sufficiently available, when the proposal involves knowledge and/or technology transfer rather than R&D, or when it concerns participation in private (non-collective) R&D investments, proposals are rejected. Overall, most proposals concern production-technical research, and far fewer concern management research, social science research, or economic research.

Contrary to the procedure followed by HCB, DCB does not give a formal role to 'normal' dairy farmers in the fine-tuning of research proposals (despite it being mentioned in their research program - DCB, 2002). Within HCB, each crop has a permanent research guidance committee that, in cooperation with the HCB R&D coordinators, fine-tunes the full proposals and is involved when the project is actually executed. Within DCB, such a permanent research guidance committee does not exist, although individual research proposals and projects may possess one. This participation has had a positive outcome, as both researchers and R&D coordinators have noted. They state that early involvement of farmers helps to delineate research issues more sharply and improve focus, and that the practical feasibility of certain ideas is immediately checked. However, such involvement may in certain cases be incompatible with innovative vanguard research, as researchers indicate.

3.5.3 Decision making on fund allocation

Full proposals are forwarded with the preliminary advice to the DFC for a decision on fund allocation. DFC members perceive the following as basic tasks in the fund allocation process: to know which issues are at play in the dairy sector, to represent the interests of the levy payers, and to stimulate future development of the dairy sector. They also state that they have to prevent R&D providers' interests prevailing in setting the direction of levy-funded R&D, a task perception that has also been mooted by AFCB (AFCB, internal unpublished document, 2001). In the decision-making process, the preliminary advice is strategically important for both the developers of the proposals and the decision makers. The R&D coordinators know how decisions are taken and guide proposal developers in framing a proposal that has a high chance of acceptance. The members of the DFC state that they rely significantly on the preliminary advice, since it reveals the deliberations as to why a proposal should be (conditionally) accepted or rejected. DCB R&D coordinators sometimes deliberately use the preliminary advice to stimulate discussion, by posing certain questions or comparing proposals against earlier decisions. Committee members indicate that the goal of the fund allocation discussion is to arrive at consensus. In this discussion, no use is made of lists with criteria that have to be fulfilled to approve or reject proposals; members state that they base their decision on their own experience as farmers and policy makers. In addition, criteria that also play a role in the filtering process, such as cost-benefit ratio, unicity, and applicability of research, prevail. A number of tensions arise in the fund allocation process. An earlier mentioned tension is that decision-making bodies within DCB wish to fund future-oriented R&D that supports innovation, whereas the queries forwarded by the levy payers are often on operational/optimization issues. Another tension that arises is whether DCB should allocate funds to many small projects, or concentrate on a number of large, strategic projects. Both types of project are considered important, but there is no budget earmarking for either type. It is argued that small projects (often in response to certain queries forwarded by farmers) are needed to remain accountable towards the constituency. Both HCB and AFCB differentiate between funds destined for research on operational issues and funds destined for future-oriented research on strategic issues.

3.5.4 What happens after fund allocation?

In DCB's present system, after approval of a proposal, a detailed project plan has to be drawn up, in which the research team, research goal and methods, and expected results have to be described. In addition, a communication plan has to be drawn up, in which dissemination of results is discussed. After fund allocation, the DFC is not involved in research projects: it is only informed through yearly progress reports. The DCB R&D coordinators have, in the eyes of researchers, a quite distanced position. They only participate on some guidance committees of research projects that match with their personal expertise. R&D coordinators state that they find it difficult to fulfill the guidance task, because they have to represent the interests of the DFC. In the event of guidance committees containing normal dairy farmers in addition to experts, this is perceived by researchers as positive: it facilitates the adaptation of the research to real circumstances. Occasionally, other parties in the agricultural supply chain are also involved in research projects, such as input suppliers. To facilitate adaptation of research to real circumstances, HCB always makes use of normal growers on the research guidance committees and also co-finances research together with private companies. Research for DCB is generally carried out on experimental farms, and far less on regular farms.

The direct-use value of research differs: some research yields recommendations that may be directly applied by farmers, other research yields results that may be used to influence policy making, or that may stimulate thinking about alternative and/or innovative ways of dairy farming. Similar observations are also made by HCB. Depending on the setup of the R&D project and the communication plan, farmers are sometimes informed about ongoing projects, but this is not standard practice. The survey amongst 226 dairy farmers about the functioning of DCB (Schmidt et al., 2005) reveals that improved information about DCB activities is desired by 60% of the respondents.

R&D results are disseminated through a number of media. Reports have to be made publicly available and can be acquired through the R&D provider at reproduction cost. Researchers and communication staff state that the primary goal of a research report is accountability towards the financier, rather than informing dairy farmers. Popular research summaries are published in farmer magazines, although researchers and communication staff see this as a way of familiarizing farmers with certain topics rather than thoroughly informing them. Sometimes, providers of knowledge intensive business services (KIBS) such as veterinarians, accountants, and consultants are actively involved in the dissemination of research recommendations, and farmer study groups are also used. This is not standard practice however. DCB furthermore subsidizes presentations of research at farmer study group meetings and excursions to experimental farms. Nonetheless, it is felt that research does not reach the farmers. Various reasons are put forward for this: there is an overload of information in which the farmer has to find his/her way, and it requires a pressing need and initiative on the part of the farmer to acquire relevant information. Since a public agricultural extension service no longer exists, it is not automatically delivered to the farm (without charge). Present policy is that, although DCB subsidizes some forms of knowledge transfer, the levy payer is (financially) responsible for acquiring knowledge that stems from research funded by DCB. This contrasts

with the desire expressed by levy payers that DCB should more actively communicate research and transfer knowledge (Schmidt et al., 2005). Fifty percent of surveyed dairy farmers (n=50) feel that their queries are not sufficiently answered by levyfinanced research and that there is insufficient transfer of research results to farmers. However, this does not mean that the research activities are not supported: 90% of the surveyed farmers (n=50) consider it important that DCB finances research. The survey by Schmidt et al. (2005) concluded similarly: it found that 80% of those surveyed (n=226) support the overall work of DCB.

3.6 Discussion: weaknesses in levy-funded demand-driven R&D systems

End-user demand steering of, and involvement in, R&D planning has been institutionalized to a certain degree in the procedures used by DCB (and HCB and AFCB). Dairy farmers have the opportunity to express their R&D queries, and they constitute the boards with decision-making authority. However, the results also indicate that end-user demand steering can be merely emblematic and does not automatically increase the applicability of R&D and make a contribution to farmer innovation. Röling et al.'s (2004) statement that producers in Western industrialized countries have sufficient opportunity to express their needs ought to be refined. In this section we address a number of weaknesses in such a contractual research planning system; our conclusions have conceptual and practical relevance for operationalizing demand-driven R&D.

3.6.1 The influence of the institutional setting on shaping demand

In line with findings of others (Lacy, 1996; Stewart, 1995; Woodhead, 2000), the results suggest that in a demand-driven R&D planning system there is not a single overall demand: several actors exercise demand and shape demand, and this can eventually distort the demands of end-users. As the results show, the institutional setting is a determining factor, as in each step of the R&D planning process an assessment takes place in which the norms, values, and interests of the actors who are involved in that step prevail. Although end-users have the opportunity to express their queries, these may be later overruled by other actors in the R&D query filtering chain, mainly researchers and persons at policy level within DCB. Interaction between end-users and other relevant stakeholders (such as input suppliers, KIBS providers, the dairy industry) with the researchers that assess the queries, and the R&D coordinators that guide the proposal assessment procedure, only takes place incidentally even if seen as highly beneficial. In prioritization and decision making on fund allocation also there is no direct feedback with end-users, and there appears to be insufficient attention paid to certain conditions for fairness in the prioritization process (i.e. publicity, relevance, the possibility to appeal, enforcement, see Martin et al., 2002). Following Woodhead (2000), end-users and other relevant stakeholders are not given sufficient opportunity to act as decision shapers. Although the system of contractual research planning enhances client orientation among researchers, this orientation is towards the direct commissioner rather than the enduser, because the DFC and the R&D coordinators assess proposal quality, assign funds, and assess whether research outputs meet the preset requirements. The system of contractual research planning creates the attainment of the maximum degree of participation 'by proxy'; however, the extent to which this reflects end-users' needs depends on the '…intermediaries' abilities to aggregate needs and wants of diverse farmer constituencies and comprehend local priorities' (Sperling and Ashby, 2001: 176; see also Davenport et al., 2003). As this case has shown, when normal farmers are represented by farmers active at policy level, the norms, values, and interests that are formulated at policy level can guide the process. These are often aimed more at desired future situations, than at dealing with issues that are currently prevalent in farmers' lifeworlds.

The tendency to overrule end-users' demands is legitimized by the stance that the demands they express are inadequate because they are insufficiently specified to guide R&D proposal formulation and too much focused on everyday operational issues rather than contributing to inducing strategic innovations. Such a scope is typical of farmer levy-funded research (cf. Gelb and Kislev, 1982; Alston et al., 1998; Brennan and Mullen, 2002), but conflicts with a desire of DFC for future-oriented, radical innovation projects rather than incremental improvements of existing systems (although exceptions do exist). Despite this being a legitimate stance, no approach has been designed to articulate such vanguard projects with end-users and other stakeholders. The results suggest that on the one hand a 'reverse participation problem' takes place, which according to Sperling and Ashby (2001: 177) implies that 'if farmers' groups fail to consult with researchers when defining their agendas, a research strategy may emerge that has limited potential for technological progress, precisely because the subjects selected may not be amenable to technical investigation.' However, on the other hand an 'inadequate participation problem' emerges because end-users are not sufficiently considered in demand articulation and the subsequent innovation process, and this results in limited end-user ownership of this process. To create such ownership, early involvement of normal farmers and other relevant stakeholders is essential (Johnson et al., 2003; Snapp et al., 2003) as well as continued involvement, although it should be decided on a case-by-case basis how best to operationalize such involvement. Some areas of innovation lend themselves better to participatory development than others (cf. Sumberg et al., 2003), and different types of innovation (e.g. incremental, radical) call for particular competences on the part of participating end-users (Lettl, 2007). Furthermore, to mitigate power inequalities and transcend the different cognitive and cultural worlds of participating stakeholders, an independent facilitator should guide the process and fulfill an intermediary role as a 'knowledge broker' (cf. Sperling and Ashby, 2001; Hargadon, 2002).

3.6.2 The need to broaden the view on innovation

The results show that (historically derived) policy choices to focus on R&D and task divisions in the R&D planning process often cause the norms and values of scientists to prevail over those of end-users, despite the fact that some form of countervailing power is exercised by the DFC and the R&D coordinators. In this way, the range of solutions to the queries farmers forward is often narrowed down right away to production-technical R&D. Other types of R&D, such as management oriented, social science, and economic R&D seem to be underrepresented. Furthermore, R&D might not be the most adequate and/or desired way of tackling farmers' queries. This focus is in line with observations by others that often innovation is seen to equate to conducting production-technical R&D projects, whereas innovation needs to be seen much more broadly in terms of an interactive design or product development process (Leeuwis, 1999; Tekelenburg, 2001; Hall et al., 2003; Sumberg and Reece, 2004). Viewing innovation as a complex, interactive process in which there is a large amount of co-evolution of scientific, technological and societal systems, in which cause and effect are often difficult to distinguish, requires deliberate efforts to create effective linkages between hardware, software, and orgware (Smits, 2002; see also Geels, 2002).

An important implication of taking a broad view on innovation is that, in addition to farmers having the means to exercise demand in the economic sense through contractual research planning, they must also be enabled to create adequate substantive demand for R&D and other activities that can support farmer innovation. Such substantive demand articulation is about the concretization of latent and/or incipient needs to guide knowledge and technology development (Kodama, 1995; Sumberg and Reece, 2004). Boon et al. (forthcoming) define it as: 'an iterative, inherently creative process in which stakeholders try to unravel preferences for and address what they perceive as important characteristics of an emerging innovation." For demand articulation, a dialogue between end-users and producers of knowledge and information, as well as other relevant stakeholders, should take place throughout the innovation process (Douthwaite et al., 2001). As this study has shown, such interaction is currently lacking. The dialogue needed for demand articulation does generally not take place in the case of DCB. Instead, end-users' demands are often disqualified and overruled. Besides stakeholders being involved to make a contribution in terms of articulating knowledge demands and adding knowledge to the process, an innovation systems perspective suggests that they should also be involved in joint identification of other enabling or constraining factors to innovation and in joint action to capitalize upon possibilities and remove impediments that may be, e.g., of a legislative, infrastructural, policy, and cultural nature (cf. Douthwaite et al., 2001; Klein Woolthuis et al., 2005).

Although stakeholder involvement can be an effective way to effectuate end-user demand in innovation processes, a relevant issue both in the context of DCB and in the general context of R&D targeted at farmers is the scaling out (innovation spread within the same stakeholder groups) of innovations to the broader body of end-
users, as not all end-users can be directly involved, as well as the scaling up (an institutional expansion to other stakeholders key to building an enabling environment for change such as government, industry) (see Douthwaite et al., 2003). In the current situation, DCB has made the choice to focus on funding R&D, the results of which have to be made publicly available, but leaves to farmers themselves many of the subsequent steps in relation to the diffusion, adaptation of R&D results to farmers' realities, and implementation. As our survey results and those of Schmidt et al. (2005) suggest, many levy payers are not well informed about this. Whereas some of these R&D results will be acquired and implemented by farmers who have the knowledge and skills to interpret them and/or will eventually trickle down to farmers through KIBS providers such as veterinarians and consultants, the lack of a default intermediary such as an agricultural extension service (which in The Netherlands and many other countries has been privatized, as a result of which a pluralistic array of KIBS providers have emerged who work on a private funding/private delivery basis) implies that impact is likely to remain limited unless the financier of the research (in this case DCB) takes responsibility for this. In addition to forging linkages more actively with these KIBS providers to disseminate existing knowledge, other activities, such as the formation of multi-stakeholder platforms and peer-to-peer (inter-firm) networks, facilitating access to sources of knowledge and capacity building amongst farmers for knowledge and information acquisition should therefore receive structural attention and/or funding. This would imply broadening the mandate of funding R&D to funding different forms of 'innovation intermediation' (see Howells, 2006; Klerkx and Leeuwis, forthcoming), which is about connecting those involved in 'knowledge search' and those concerned with 'knowledge use' (Clark 2002; see also Garforth et al., 2003a; Phillipson et al., 2004; Sulaiman et al., 2005). Such innovation intermediation should concern not only radical innovations, but also incremental innovations, as these are closer to farmers' everyday realities.

3.7 Conclusion

The chapter has shown that the institutional arrangement of contractual research planning, in the context of farmer levy funding of R&D, does not automatically successfully grant end-users and other relevant stakeholders real participation and control in innovation processes. Although some assumed benefits of involving stakeholders as mentioned by Sperling and Ashby (2001), such as representativeness and democracy, are realized to a certain degree, because of a lack of sustained interaction between researchers, end-users, and other relevant stakeholders other assumed benefits such as relevance, ownership, research insights, and equity are not fully achieved. A number of theoretical and practical implications can be drawn from the analysis.

A first conclusion is that systems of contractual research planning, although see-

mingly well designed for operationalizing end-user demand steering, in practice are heavily influenced by the institutional settings in which these function. These institutional settings, in which several actors act on the basis of their values, norms, interests, and interdependencies shape the political process of R&D planning. Pursuance of the desire to grant end-users real power and influence in these processes, i.e. to empower them as decision shapers and decision makers, requires a careful analysis of the position of the different actors, and a synchronization of the different norms, values, and incentive systems in a joint and sustained process of demand articulation. Adequate participatory methods are essential to guide such a process, but these must not become a panacea that rules out the institutional and political aspects of the process.

A second conclusion is that the scope and role of organizations that aim to support farmer innovation (with levy funds or other types of public and/or private funding) can be too restricted to realize their objective. R&D is not always the most apt way to resolve a certain query. Organizations that govern funding of R&D need to reflect on whether they should shift from developing science and technology capacity, to innovation capacity (cf. Hall, 2005; Sumberg and Reece, 2004). This would imply a change of scope in respect of innovation, of mandate, and of capacities. Nevertheless, it has to be realized that R&D funding remains of great importance, because not many other sources of funding for production-oriented agricultural R&D exist. This calls for a critical examination of the innovation needs existing amongst levy paying farmers in the short, medium and long term, and the designation of funds for several kinds of services to support innovation.

In the discussion about making R&D more demand driven and fitting farmers' needs with regard to innovation, the focus is often on institutional change in (public) R&D establishments (e.g. Hall et al., 2003; Heemskerk et al., 2003; Sumberg, 2005; Gandarillas et al., 2007). Institutional change refers to 'the evolution and dynamic interplay between 'rules and norms' and organizations, usually associated with the need to perform a new task or to perform an existing one differently' (Hall et al., 2001: 785). This chapter has shown that in a system in which a financier can exercise great influence on the way R&D is executed, and can make R&D institutions more responsive to the needs of end-users, the financier itself also has to undergo a process of institutional change to be sufficiently responsive to the needs of end-users.

4

Delegation of research governance to networks

Experiences with a multiple goal boundary organization in organic agricultural research

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Abstract

The delegation of research governance to networks is increasingly seen as a potential way to resolve the paradox in research funding, because it would reduce the direct influence of the state on funding policies, respect the independence of scientific institutions, foster 'vigorous' scientific institutions, and ensure scientists' strong commitment to user interests. Expanding the bilateral view of principal-agent theory to the multilateral context of delegation to networks, the chapter identifies several tensions that emerge in the different arenas of research governance and relates these to the positions and roles of actor groups in the network.

4.1 Introduction

The delegation of research governance to networks and the development of innovation agency functions for research intermediaries (compare with Gulbrandsen, 2005) create new roles for the different actors groups involved: government, scientists, intermediary organizations, and users of research all have to go through an institutional learning process. Although delegating research governance to networks may relieve several of the classical tensions that have been identified by studies using principal-agent theory (such as adverse selection and moral hazard), it brings with it its own particular set of tensions.

This chapter analyzes a system of delegation of research governance to networks in the Dutch agricultural sector, in which the intermediary organization has adopted the role of a multiple goal boundary organization that, apart from forming a bridge between government and scientists, also intermediates at several other interfaces. The aim of the chapter is to focus on the different arenas in research governance (i.e. the policy arena, the selection arena, and the control arena - Braun, 1998) and the related problems as identified by principal-agent theory in order to identify tensions in each arena for the different actor groups. Furthermore, it critically examines the new roles research intermediaries need to undertake in such systems of delegation, in which they have to balance the needs of several principals and agents.

4.2 Delegation of agricultural research governance to networks

Analogous to developments in other economic sectors (see Braun, 2003), the wave of 'new public management' has given rise to the emergence of contractual arrangements in agricultural research, such as systems of output-financing and competitive grant systems (Hubbard, 1995; Huffman and Just, 1999b; Levidow et al., 2002). In the current situation of contractual research arrangements and privatized agricultural research establishments, a market setting has emerged in which government agencies or industry partners acts as clients (Holt, 1998; Leeuwis, 2000; Levidow et al., 2002). This chapter focuses predominantly on government as a client. With regard to the institutional constitutions of research establishments and how they relate to their clients, Wilts (2000) distinguishes knowledge seekers (having a constitution that guarantees their access to necessary action resources and warrants their independence in identifying organizational goals and priorities), research contractors (organizations constituted by formalized and externally acknowledged autonomy, yet dependent upon the successful marketing of research results to gain full access to necessary action resources), service providers (typically lacking a constitution that warrants their institutional autonomy, and strongly dependent on funding decisions by their principals to gain access to necessary action resources). In the context of privatized agricultural research establishments, especially those dedicated to applied research have become research contractors and/or service providers. In

the context of this chapter, use of the term 'research governance' rather than the broader term 'science governance' seems hence more appropriate.

A growing body of literature analyzes the relationship between the client (government) and research establishments (either knowledge seekers, research contractors or service providers), often intermediated by coordinating bodies such as research councils (Van der Meulen and Rip, 1998; Braun, 1998; Gulbrandsen, 2005; Kassam et al., 2004), from the perspective of a principal-agent relationship (e.g. Guston, 1996; Huffman and Just, 2000; Braun and Guston, 2003). Principal-agent theory refers to economic transactions in which delegation takes place (Guston, 1996). Braun and Guston (2003: 303, referring to Coleman, 1990) define it as 'a specific social relationship, that is, delegation, in which two actors are involved in an exchange of resources. The principal is the actor who disposes of a number of resources but 'not those of the appropriate kind to realize the interests (for example, has money but not the appropriate skills).' He or she then needs the agent, who accepts these appropriate resources and is willing to further the interests of the principal.'

Utilizing principal-agent theory, Braun (2003) observes a number of fundamental problems for policy makers in research governance: 1) getting scientists to do what politics wants (problem of responsiveness); 2) being sure that they choose the best scientists (problem of adverse selection); 3) being sure that scientists do their best to solve the problems and tasks delegated to them and that they avoid 'shirking' behavior (moral hazard); and 4) knowing what to do (decision-making and priority-setting problem). With regard to the first three problems, Gulbrandsen (2005) uses the three research governance arenas identified by Braun (1998), i.e. the policy arena, the selection arena, and the control arena, and relates these to phases in the research planning procedure. On the fundamental level and long-term time horizon (policy arena) the problem of responsiveness is particularly relevant (i.e. goal conflicts), in the pre-contract phase (the selection arena) the adverse selection problem is particularly relevant.

As Braun (1998), among others (Stewart, 1995; Lacy, 1996; Davenport et al., 2003), points out, these arenas are the scene of negotiation between different configurations of actors. Funding and governance policies of research and corresponding delegation models and actor configurations have implications for the kind of negotiations that take place, and the way in which, and the degree to which, these problems relating to the principal-agent relationship manifest themselves (see Braun, 2003: 318 for an overview; see also Huffman and Just, 2000; Van der Meulen, 2003). Whereas delegation problems are often viewed from the principal's perspective, the current context of contracting also presents problems for the agent, i.e. researchers, such as discontinuity of resources, incompatibility of skills or personal goals with the principal's requirements, and inappropriate or frustrating operating conditions and/or performance measures (Morris, 2003: 366).

In addition to recognizing this two-way perspective in the principal-agent relations-

hip, the position of an intermediary organization and the involvement of other actors that constitute third parties ³⁴, such as users and industry, means that the theory must be expanded to include configurations other than merely bilateral principal-agent relationships (Braun, 2003; Van der Meulen, 2003; Morris, 2003). This is especially relevant in the present context of science, in which pleas for a more context-sensitive science voiced through approaches such as post-normal science (Funtowicz and Ravetz, 1993), mode 2 science (Gibbons et al., 1994) and the Triple Helix approach (Etzkowitz and Leydesdorff, 2000), have given rise to a shift from delegation by contract based on 'new public management' to 'delegation to networks' (Braun, 2003)³⁵. Braun argues in this respect (2003: 305): 'Delegation to networks is the recognition that government has no serious means or instruments to guide the unpredictable process of discovery and innovation. The delegation of the 'right to decide and act' in funding policy to 'inter-systemic networks' is the consequence of this thinking.'

In line with the idea of delegation to networks, and following developments in the industrial innovation literatures (e.g., Lundvall, 1992; Niosi et al., 1993), there is a growing literature on (agricultural) research governance that analyzes it from an 'innovation systems' perspective (Jacob, 2005; Hall et al., 2006). This literature emphasizes the roles multiple actors play in innovation and the importance of the institutional context on the cooperation between several actors (Hall et al., 2001; Ekboir, 2003); this implies that 'research is now seen as one of the many 'stakeholders' within a 'chain-link' or 'network' innovation system' (Sumberg, 2005: 4). In such systems thinking there is an important role for intermediaries who connect the demand side and the supply side for knowledge (Hall et al., 2006; McNie, 2007) and act as a bridge between the different worlds. Because innovation systems thinking conceptualizes knowledge production as a process of co-evolution and co-production (Smits, 2002; Geels, 2004), a strict delineation in demand and supply categories cannot be understood as 'conceptually discrete or fully coherent' (Sarewitz and Pielke, 2007: 7) but, as these authors continue, 'while notions of 'supply' and 'demand' may embody considerable complexity, they also represent something real and recognizable: on the one hand, people conducting research that has been justified in terms of particular societal outcomes, and on the other, people making decisions aimed at contributing to those outcomes' (see also McNie, 2007). Clark (2002) conceptualizes the demand side as those involved in knowledge search and the supply side as those concerned with knowledge use.

4.3 Changing roles for research councils in systems of delegation to networks: the emergence of 'multiple goal boundary organizations'

As a result of the delegation of research governance to networks, intermediary organizations such as research councils see their role changing from being a 'lieutenant' of government in the form of a delegated principal (with varying configurations for delegation of authority, funds and monitoring rights, see Van der Meulen, 2003: 325), to becoming broader 'boundary organizations' (Braun and Guston, 2003). Originally, the concept of boundary organization focused principally on the sciencepolicy boundary (Guston, 1999; Raman, 2005). In this regard, Cash et al. (2003: 8090) state that boundary organizations are 'organizations mandated to act as intermediaries between the arenas of science and policy', with three features: (i) they involve specialized roles within the organization for managing the boundary, (ii) they have clear lines of responsibility and accountability to distinct social arenas on opposite sides of the boundary, and (iii) they provide a forum in which information can be co-produced by actors from different sides of the boundary through the use of 'boundary objects'. However, as Waterton (2005: 443) argues, such a focus on a single boundary may be too narrow: 'Studies on boundary objects and boundary institutions may help us to understand certain relatively 'managed' aspects of the science-policy boundary. However, such studies perhaps tend to underplay the highly diverse nature of the boundaries that contemporary scientists appear to be establishing in partnership with funding and policy bodies. This wider picture, it would seem, may be an important dimension to incorporate into accounts of boundary work.'

With the increasing focus on the involvement of users of research in the research planning and execution process, such a wider picture is becoming particularly relevant. In the context of delegation to networks, boundary organizations become more than mediators between science and policy, fulfilling broader roles in connecting demand and supply for knowledge (Hellström and Jacob, 2003; Raman, 2005; Jacob, 2005), acting at several boundaries and fulfilling several bridging functions. This may imply that research councils adopt an 'innovation agency function' Gulbrandsen (2005), and become what Howells (2006) more generally has labeled as 'innovation intermediaries' ³⁶ that encompass intermediation functions that go beyond those of being a mere funding allocation body standing between government and science, but include a host of functions within a multi-stakeholder setting including third parties such as users and industries (which may include foresight, problem diagnosis, demand articulation, multi-stakeholder agenda setting, network brokerage, gatekeeping and a host of other functions - see Smits and Kuhlmann, 2004; Van der Meulen et al., 2005; Howells, 2006).

Although there appears to be an observable rise in the number and diversity of intermediary organizations acting at the research-policy-user interface (Waterton, 2005; Van der Meulen et al., 2005), the literature on such organizations is according to Van der Meulen et al. (2005: 2) 'theoretically fragmented and fairly practical' and according to Howells (2006: 715) it is 'a burgeoning, yet surprisingly disparate, field'. In the context of agriculture, the concept of the boundary organization as a mediating agent linking different actor groups has been explored by, for example, Cash (2001) who sees agricultural extension as a boundary organization linking different levels within the innovation system (i.e. farmers, scientists, policy makers), Carr and Wilkinson (2005) who explore it in the context of producer initiated R&D groups and integrated catchment management committees, and Dalrymple (2006) who explores it at the global level of the Consultative Group on International Agricultural Research. Although not using the term boundary organization, similar analyses have been performed with regard to commodity boards and producers' organizations as intermediary organizations in farmer-funded R&D (see e.g. Brennan and Mullen, 2002; Kangasniemi, 2002).

4.4 Exploring tensions in delegation to networks

On the premise that research councils adopt an innovation agency function and hence become multiple goal boundary organizations in systems of delegation to networks, the previous observation - that principal-agent theory needs to be expanded to include other configurations - calls for empirical research of such configurations. From the viewpoint of principal-agent theories, outcomes from conceptual and early empirical analysis appear to be positive. Braun (2003: 320) concludes that, in a situation in which research is governed through systems of delegation to networks, this is '...at least in theory, the most adequate way of dealing with the paradox in science/research policies: reducing the direct influence of the state in funding policies, respect for the independence of scientific institutions, fostering of 'vigorous' scientific institutions, and a strong commitment of scientists to user interests.' Van der Meulen (2003: 326) found support for the hypothesis that, in such a system, the intermediary may become more than just a proxy for government because 'an intermediary can improve its strategic position by focusing on third party interests as a proxy or alternative for the interests and objectives of both principal and agent. If the intermediary is able to manage the relationship with the third party successfully, then it might even use the control over critical resources to develop its own role.'

Despite these apparent benefits from delegation to networks, with user involvement and new roles for research councils, applying principal-agent theory Gulbrandsen (2005) found a number of tensions for 'new style' research councils in such new ways of working (i.e. as multiple goal boundary organizations); these tensions relate to the selection of users with the right competencies for acting successfully in configurations of delegation to networks, and different kinds of monitoring systems attached to different expectations of groups involved in the network that may act as principals (the degree to which would, however, depend on their enforcement rights as Van der Meulen (2003) argues). Furthermore, as Shove and Rip (2000) and Davenport et al. (2003) point out, the user is not a homogeneous but a heterogeneous entity, and this entails difficulties as regards effective representation of users' interests.

The goal of this chapter is to describe experience with, and reveal tensions in, such a system of delegation of research governance to networks mediated by a multiple goal boundary organization-type research council. It hopes to contribute to theory with empirical insights on the functioning of delegation to networks and boundary organizations. With regard to the former, Morris (2003: 369) states that, when users become more involved in scientific decision making, 'it will be interesting to map the terms of engagement of the agents with this new element in the science-policy relationship'. In this regard, Braun (2003) indicates that functional differentiation is a primary source of tensions. With regard to the latter, the most important question regarding boundary organizations is whether they work, and this calls for more evaluative research (Waterton, 2005; McNie, 2007). The chapter fits within a line of earlier empirical studies on the development of research councils that has been described using terms such as 'tensions', 'friction', and 'problems without solutions' as Gulbrandsen indicates (2005: 200).

4.5 Case selection and research method

This chapter documents experiences of a multiple goal boundary organization in The Netherlands, called Bioconnect, through which government has operationalized the delegation of agricultural research for the organic agricultural sector to networks. Although mostly not centered around principal-agent theory, a broad agricultural literature exists about experiences with user (i.e. farmer) involvement in research planning and/or execution. Several authors advocate the involvement of, and control by, users in the governance, priority setting, execution and financial support of agricultural R&D as an instrument to improve the effectiveness and relevance of research by creating democracy and ownership (Middendorf and Busch, 1997; Sperling and Ashby, 2001; Van de Fliert and Braun, 2002; Johnson et al., 2003). The degree to which farmers can really co-decide differs: sometimes they have a consultative or advisory role (Middendorf and Busch, 1997; Teixeira et al., 2004), and sometimes they are directly involved in the policy arena (Roth et al., 2003). When farmers fund research with their own money, through commodity related levies, their representatives constitute the boards with decision making power (Brennan and Mullen, 2002; Kangasniemi, 2002) and act as principals vis-à-vis researchers. While for private-collective funds farmers hence are involved in decision making, this is less automatically the case when public funds are involved, but under the current influence of demand-driven approaches to agricultural research they are increasingly considered to participate in decision making (Heemskerk et al., 2003).

In its research council function, Bioconnect is involved as a facilitator in research planning, funding, and monitoring, but also has a role as a broader innovation intermediary, guiding applied participatory research to support farmer innovation (by performing knowledge brokerage, connecting and interpreting the different cognitive worlds (Hargadon, 2002), and functioning as a gatekeeper, bringing information into the network (Simmons and Walker, 2000)). It also acts as an information portal or information broker between research contractors/service providers and users to stimulate dissemination and uptake of research results (through its Bio-knowledge unit) (see Figure 4.1). The focus of this chapter is principally on the research council function.

Whereas the Dutch agricultural science system used to be characterized by considerable user influence on research planning of publicly financed research through institutional representation (Röling, 1990), this diminished after privatization of public research establishments (Janssen and Braunschweig, 2003); Bioconnect forms part of recent government efforts to renew user involvement by involving users directly in research governance. As research regarding public concerns about the environment, animal welfare, food safety and land use often needs continued public funding in the absence of private investment (Barnes, 2001; Levidow et al., 2002; Janssen and Braunschweig, 2003), the organic agricultural sector receives considerable public funding for applied research because, as it does not use artificial external inputs (such as fertilizer and pesticides), it fits well with the government policy of stimulating sustainable agriculture. Through Bioconnect, the Ministry of Agriculture, Nature and Food Quality (henceforth referred to as government) has delegated decision-making authority to end-users of research (farmers and supply and processing companies in the agri-food chain), who are brought directly into the policy arenas in which research planning negotiation takes places. These arenas are organized according to the different agricultural sub-sectors (such as dairy production, arable farming, poultry farming, glasshouse horticulture). These sub-sectoral networks, called product workgroups (PWG), also monitor research progress. Often, prior to the establishment of Bioconnect, PWGs were informally involved in informing researchers about their needs, articulating demand for research, and consulting researchers during research, but through Bioconnect this has become (re-)institutionalized.

Within themes established by government, each earmarked with a certain budget, the PWGs can decide which particular topics they want researched. As Figure 4.1 shows, because of the involvement of large actor groups (among users and researchers), several levels of delegation exist. The farmer and industry representatives are expected to propose topics based on a broadly shared demand from their constituencies. Farmers and industry actors from these constituencies also play a role on research guidance committees. The task of the PWG theme coordinators is to feed the researchers within their institutes with information from the PWG to guide proposal development and make sure that proposals correspond with guidelines set by the funding agency, i.e. government. Within the PWG, a so-called knowledge manager fulfils the role of facilitator, streamlining the flows of information coming from the different system components and mediating between the different actor groups involved. These knowledge managers embody Bioconnect management, which manages the Bioconnect network.

Within Bioconnect, no competitive grant system is employed. Funds are assigned to two research institutes active in organic agricultural research (WUR and LBI), but research is contracted on the basis of selected proposals. This implies that, in terms of principal-agent theory, the problem of adverse selection is principally about decision-making and priority-setting problems rather than about the problem of selecting the best scientists. Proposals are not selected through pure scientific assessment by peer review, but rather by user and funding body review. Government sees Bioconnect as an experiment to see whether this form of delegation of research governance to networks and proposal selection by users can be used for other areas of publicly funded applied agricultural research. In many ways, Bioconnect appears to offer a solution to the paradox in research funding policy outlined by Braun (2003).

The chapter draws on both quantitative and qualitative methods of data collection. To gather insights about the relationship of the different actor groups (i.e. users, researchers, intermediary, and government) directly involved at the different decision-making levels of Bioconnect, twenty-three actors involved at the PWG level were interviewed using semi-structured interviews. These twenty-three actors consisted of four farmers, four theme coordinators, three consultants, four industry representatives, two advocacy organizations' representatives, two ministry representatives, and four Bioconnect management staff (three knowledge managers and a general manager). Three PWGs were studied: glasshouse horticulture, arable farming, and pig raising. The interviews were fully tape recorded and fully transcribed to permit detailed coding (Strauss and Corbin, 1998; Emans, 2002). To gather insights about the course of affairs at the Knowledge Committee (KC) level and the Organic Agriculture Cluster Management Board at the Ministry of Agriculture, Nature and Food Quality, observation took place during their meetings. Observations also took place at two PWG meetings, as well as at a meeting of the Bioconnect facilitators (i.e. knowledge managers in Bioconnect terminology) and the representatives/cluster managers of the researchers (theme coordinators in Bioconnect terminology). In addition, several documents, such as meeting minutes, policy documents, and internal evaluations were analyzed. Thus, triangulation of data ensured validity (Yin, 2003).

To assess the degree to which Bioconnect contributes to successfully positioning users as principals vis-à-vis researchers and ensures that research is better tailored to users demands, a survey was held amongst the constituencies of those active as representatives in Bioconnect, i.e. amongst 422 organic farmers (of a total of 1,039 organically certified farmers), 31 researchers, and 30 actors from supply and processing industries in the organic agri-food chain. A detailed presentation of the interview and survey results can be found in Klerkx and Leeuwis (2007).



Figure 4.1: Schematic representation of the Bioconnect network (with decision making authority; # without decision making authority, i.e. advisory role)*

4.6 Results: tensions at the different levels within Bioconnect

This section describes the different tensions that emerged at the different levels within Bioconnect in the light of principal-agent relationships. Often principal-agent relationships are simplified for analytical purposes, whereas in reality there are many layers or webs of principals and agents, and an individual at the same time in one respect will act as a principal (i.e. client), and in other respects as an agent (i.e. provider of a good or service) (cf. Morris, 2003; Von Hippel, 2005).Because Bioconnect has a purposefully mounted network structure, there are multiple principal-agent relationships. Analogous to Gulbrandsen's (2005) work, where applicable, observed tensions will be related to the policy arena (goal conflicts), the selection arena (adverse selection), and the control arena (moral hazard/monitoring tensions), and reported from the perspective of the principal actor groups involved.

4.6.1 Tensions experienced by users (farmers, industry, and advocacy groups)

An important tension that emerges in the policy arena relates to goal conflicts between the commissioner (government) and the delegated commissioner (users). This tension manifests itself at two levels:

• At government policy level

Whereas farmers prefer research on technical issues that will yield solutions to operational problems in the short term (as is common in user-driven research - see Gelb and Kislev, 1982; Simmons and Walker, 2000), government wants research aimed at the long term and focusing on issues that affect the broader performance of the organic agri-food chain. Farmers sometimes even see this focus on the broader agri-food chain as a threat, because industry queries 'compete' with farmer queries.

• At PWG level

The prevalence of such a short-term focus on operational issues is also due to a lack of countervailing power on the part of the industry actors involved, whose participation has been included partly to achieve a broader scope. In the interviews, industry actors indicated that they are not very interested in participating in the PWG, because they feel their topics are not addressed sufficiently. Furthermore, they generally have the resources to tackle issues themselves. As a result they are often absent from PWG meetings. The same holds true for some civil society representatives, especially general consumer representatives, whereas more specialized advocacy organizations (such as animal welfare organizations) do try to influence the matters under consideration.

Several tensions emerge in the selection arena:

• Mitigating power inequalities is sometimes difficult; this results in those with the loudest voice having their wishes realized.

- Regarding representation of constituencies, there are mixed views. Interview respondents indicate that they gather queries for research through various formal and informal channels, but given the heterogeneity in the sector they find it sometimes difficult to articulate a clear collective voice. They state that the queries they pose in the PWG meetings are driven by both collective and private interests. The constituency appears nevertheless satisfied: of the farmer survey respondents, 87% (n=422) indicate that farmers principally determine research issues. However, in contrast to the perceived lower participation of industry actors in the PWG as indicated by the interview respondents, survey results indicate that 83% (n=25) of industry respondents feel that industry principally determines research issues.
- Despite the mediation of knowledge managers and continuous adaptation of pro-• posal formats, farmers and industry actors have difficulty grasping the matters under consideration. The degree of abstractness needed to keep demand articulation and proposal assessment manageable (there is no time for in-depth discussion of farmers' problems, although this is what farmers appreciate most), results in farmers and industry actors not always being able to fully understand what is actually being discussed. Furthermore, in contrast to PWGs' previously informal nature, their integration into Bioconnect has caused a shift to formal written reporting, as this is a requirement of the funding agency (i.e. government). As a result there is a considerable amount of reading required, for which most farmers and industry actors have neither the time nor the motivation. The consequence is that the user group (i.e. the demand side) in the PWG is often less informed than the supply side (embodied by the theme coordinator). To resolve this information asymmetry, theme coordinators adopt the role of 'pilots in the information sea', which, besides creating order, is also perceived by some users and consultants as steering towards satisfying the researchers' interests.
- Another tension concerns the role of the knowledge committee as an advisory committee that checks compliance of prioritized research proposals with long-term programs and budgetary requirements. As PWG members have to draw up and prioritize proposals within a given thematic framework and assigned budget, they do not understand the function of an intermediary layer, and even see it as patronizing. This tension is also felt in a more general way: many PWG members do not know the exact position and mandate of the PWG in the broader Bioconnect network, neither do they apprehend the whole Bioconnect structure. In this sense, it is relevant to note that in the broader constituencies there is the recognition that, although users determine the research issues, government eventually decides: 22.5 % of farmers (n=422) and 26.7% of industry actors (n=30) see government as most influential. In contrast, most researchers see farmers and industry as most influential (71%, n=31), but nevertheless 61.3% (n=30) consider government as their direct commissioner.

A tension emerging in the control arena, which is similar to the information asymmetry tension that emerges in the selection arena, is that users often do not have the time, motivation and/or skills to properly monitor research progress that is reported using certain written formats, despite these formats being adapted to users' needs. A tension at a more practical level is that, because users are involved in a semi-professional way, they want to be remunerated adequately for their time, which may be considerable (compare with Dorward et al., 2003). These demands are particularly expressed at the PWG level, where participation offers fewer direct tangible benefits.

4.6.2 Tensions experienced by researchers

In the policy arena, theme coordinators experience a number of goal conflicts:

- As researchers are more inclined towards long-term strategic thinking, they find the scope of users often too short-sighted and directed towards satisfying private interests rather than considering public interests as well. At the PWG level, theme coordinators try to balance the several interests by addressing the long-term concerns.
- Theme coordinators note that the researchers they manage do not complement Bioconnect's focus on participatory and interactive research. In the words of Morris (2003: 366), there is 'incompatibility of skills or personal goals with the principal's requirements'. However, they also observe that a process of learningby-doing has taken place with regard to interacting and cooperating with users.

In the selection arena, perceived tensions include:

- The difficulty of managing abstractness versus detail; as noted above, efforts to maintain information manageable for users is sometimes perceived as undesired steering. At the same time, besides having to manage the content of proposals, theme coordinators also have to manage the embedding of projects within current and future research programs a fact that is often overlooked by other PWG members.
- Balancing the predilection of PWG user members for short, quickly yielding, small and cheap projects (as PWG members often regard the budget as if it were their own money) with requirements for achieving scientific rigor.
- Although there is no competitive grant system, the current contractual system has over the years developed a proportional assignment of funds to both research contractors, WUR and LBI. This entails the risk of 'forced adverse selection': because LBI has a more limited budget assignment, sometimes WUR is awarded the project although LBI may have more expertise (WUR then sometimes sub-contracts LBI, though). Theme coordinators perceive also that there is a lot of political negotiation outside the PWGs that affects decision making on project formulation and funding, and hampers synergic cooperation.

In the control area, the following tensions emerge:

• The different principals involved in Bioconnect (i.e. the 'master principal', gover-

nment, and its 'delegated principal', PWG) have different monitoring requirements that are difficult to reconcile because they serve different purposes. Farmers want to be clearly informed about the practical implications of intermediate research results, whereas government needs to have detailed information on research setup and progress in terms of compliance with time, budget, and output requirements. Theme coordinators feel that on the one hand government has delegated authority to users, but on the other hand tries to regain control by intensifying monitoring through detailed reporting formats, with a resultant increase of bureaucracy and paperwork. Analogous to the user groups, theme coordinators also do not fully apprehend the Bioconnect structure, and hence do not understand the necessity for some procedures (e.g. the earlier mentioned knowledge committee). This corresponds with observations by Morris (2003: 366) about 'inappropriate or frustrating operating conditions and/or performance measures.'

4.6.3 Tensions experienced by policy makers

As regards policy makers, mainly tensions at the level of the policy arena and the control arena are reported. With regard to goal conflicts, this concerns the previously mentioned tension between a more long-term, strategic focus (i.e. a better balance with short-term concerns), and a more integrated agri-chain approach. With regard to monitoring conflicts, policy makers have delegated decision-making authority and monitoring rights to the PWG, but nevertheless have to remain accountable to parliament because public funds are involved. This requires certain reporting standards that are perceived by theme coordinators, users, and Bioconnect management as 'bureaucratizing'.

Another more general tension that could be observed and that transcends the different arenas is that government in its role of master principal, in line with observations by Morris (2003,) is not necessarily a monolithic entity that acts unequivocally as a unified principal. In the case of Bioconnect, the different directorates were involved in an ongoing negotiation about who should contribute to which budget, and this caused confusion in the Bioconnect network right down to the PWG level. Furthermore, some people working at the Ministry of Agriculture, Nature and Food Quality were not very convinced about the desirability of the new way of research agenda setting that grants more power to the user.

4.6.4 Tensions experienced by Bioconnect management

The Bioconnect management (i.e. the knowledge managers and their superiors) perceived the following tensions at the policy arena level:

• Neutrality conflicts, i.e. knowledge managers are not seen as impartial actors, but as spokespersons for certain principals and/or agents. Although knowledge managers indicate that they bring policy information into the PWG from a neutral stand, this is nevertheless perceived by some PWG members as imposing a preferred research strategy from the point of view of government or the knowled-

ge managers' employer, Biologica, which has a long tradition as an advocacy organization for organic agriculture.

• Although Bioconnect, being a new organization rather than an established research council, does not have to undergo an institutional change process itself towards developing the innovation agency function of a multiple goal boundary organization (compare with Gulbrandsen, 2005), it does have to establish certain workable and accepted procedures. This is a process of trial-and-error and implies inducing and guiding institutional change among other actors. Because Bioconnect has far reaching consequences for the resource position, power position, modes of working, and operational autonomy of the actors involved, it sometimes meets considerable skepticism and resistance.

A tension at play in both the selection and control area is the function ambiguity of the knowledge manager vis-à-vis the theme coordinator. Whereas knowledge managers are supposed to facilitate discussion in the PWG, by structuring the discussion, mitigating power inequalities and dominant behavior of individual members, fulfilling a mediating role as a knowledge broker between cognitive domains and a gatekeeping role introducing relevant external knowledge, often these roles are fulfilled by the theme coordinators. This leaves knowledge managers performing a mere secretarial role, especially when knowledge managers lack detailed knowledge of the technical subject under discussion. Observation revealed that coordinators and managers continually discussed the scope of their tasks and coordinated their actions and that they would have to continue doing so in the future.

4.6.5 Tensions experienced by consultants

Similar to policy makers and theme coordinators, the consultants that participate in the PWGs have an advisory position and no decision-making authority. The main tension perceived by consultants is that they in fact are excluded from the policy, selection, and control arena. Despite being an integral part of the PWG to which they contribute with their broad view on farmers' problems and research queries, and having a traditional role as 'boundary spanners' between farmers and research (compare with Cash, 2001), they cannot co-decide, and contrary to actors from the research ambit they gain no direct benefit from participating as they cannot directly submit proposals. When an advisory component needs to be integrated within a research project, consultants have to be subcontracted by a research contractor. Furthermore, although Bioconnect sees an important role for consultants as bridges between science and users, their input is sometimes interpreted by Bioconnect management as not being genuine constructive input but merely strategic (in order to obtain contracts). There is an administrative separation in two strands of funding (one for research and one for consultancy), whereas, in the interactive projects, research and consultancy often closely cooperate.

4.7 Discussion

The chapter focused on tensions that arise in a system of delegation of research governance to networks and discussed these tensions as they relate to different actors in the network. It should be noted, however, that several positive aspects of user involvement, such as a higher sense of democracy and higher research relevance and applicability (cf. Middendorf and Busch 1997; Sperling and Ashby, 2001), have also emerged from the data. In this concluding section, the tensions as perceived by the different actor groups are synthesized and related to the different arenas and corresponding problems as addressed by principal-agent theory. Furthermore, it addresses the tensions associated with the functioning of a new style research council in its role of network facilitator and its structural position.

At the policy arena level, a principal tension appears to be that, within an network approach, multiple principals need to negotiate an agreed joint goal to forward a shared query to the agent. Whereas within a bilateral relationship goal conflicts concern mainly government's desired trajectory versus researchers' interests (cf Braun, 2003), in a situation in which there are multilateral relationships, i.e. both amongst principals and between principals and agents, there is more potential for goal conflicts. At the PWG level, this could be observed in several respects: farmer interests versus agri-industry interest, short-term focus versus long-term focus, and user interest versus government interest. The first two conflicts could result in users not seeing a need to participate because there are no apparent direct private benefits, as was the case with industry actors in Bioconnect (compare with Shove and Rip, 2000) and as can be observed in the call for better remuneration for time invested. The third conflict, perceived as an annoyance but a relatively minor problem within Bioconnect, could, however, become a more serious problem in a situation in which private interests are less aligned with public interests, i.e. when in a system of user demand-driven research within a given framework the micro prioritization criteria of users do not correspond with macro priorities of government.

At the selection arena level, several problems relating to adverse selection seem to be at play in systems of delegation to networks. The findings confirm the observation of Davenport et al. (2003: 247) that there is no such a thing as 'generic users' who 'represent all of the facets of their sectors equitably and with equal voice.' It appears difficult to establish a single collective query that satisfies the diverse needs. Furthermore, the results suggest, analogous to Gulbrandsen's (2005) observations, that poor user competencies or little user involvement can increase adverse selection due to information asymmetries and can increase moral hazard when theme coordinators (i.e. researchers) in their role of guides through the wealth of information are inclined towards satisfying their self-interest by steering the discussion in a favorable direction. A tension that emerged in this regard is that the facilitators, i.e. the knowledge managers, were overruled by the theme coordinators who sometimes actually played a more active role as facilitators of the discussion and as gatekeepers bringing in external information. This suggests that facilitators, besides having the necessary process skills, should also be sufficiently versed with regard to technical knowledge, and that users should be sufficiently trained to act in the various arenas (compare with Jacob, 2005^{37}).

At the control arena level, the findings of the chapter correspond with findings elsewhere (Morris, 2003; Gulbrandsen, 2005) that the involvement of different principals that have different needs with regard to monitoring output (i.e. for accounting, accountability, information purposes) increases bureaucratic requirements as it appears hard to integrate the needs of all principals within a single format. In this regard it is an interesting paradox that farmers and industry actors especially complain about formalization of the PWG and an increasing amount of information they need to assess, but that at the same time this increases their insights into the process of research agenda setting and execution, which results in a call for even more information, which in turn calls for more information processing capacities (in terms of competencies and time).

Overall, with regard to the paradox in science funding and the solution that delegation to networks could provide, the study indicates that despite incorporating a strong commitment to users' interests, delegation systems also allow government to continue exercising a great deal of direct influence as it determines the macro priorities within which users can maneuver. Furthermore, although researchers that are active in the negotiation arenas within such a system may be very committed to user interests, this does not mean that their constituencies (i.e. the researchers they manage or represent) act in the same way and effectively embed user interests in their research. However, the results suggest that introducing a network delegation model can help induce institutional change towards mode 2 or post-normal science ways of working, because interaction of researchers with users is built into the system and is a prerequisite for obtaining funding. Despite the reluctance of some researchers, it does install a learning process in relation to more interactive ways of working.

As regards the structural position of the intermediary, in its capacity as a multiple goal boundary organization, it is present in all ambits of the research process and the dissemination of research results, and hence it has a pivotal position. At the same time it constantly has to justify and defend that position since it has to balance the different interests, and gain the trust, of the stakeholders for whom it mediates, and on whom it depends for its resources (in terms of social capital and operating funds - see Pollock et al, 2004). As part of this balancing act, Bioconnect general management had to make a considerable effort to convince research contractors of the need to integrate research agenda setting in a single multi-actor platform, and to balance the strategic interests of the different research contractors. Furthermore, it had to urge government to achieve cohesion amongst the different directorates with regard to budgets and macro priorities, and with regard to adapting their monitoring system to the network delegation system. Also, Bioconnect has to pay considerable attention to motivating and supporting users to ensure successful participation in the network. The structural position of such a multiple goal boun-

dary organization hence seems to depend on the degree to which it succeeds in promoting institutional learning with regard to the new roles of the several actors involved, and in coming to sufficient goal convergence.

4.8 Conclusion

The chapter has demonstrated a case in which government became a 'facilitator of self-organized networks' by supporting a multiple goal boundary organization and delegating responsibility to this organization to govern the research agenda setting, funding and research execution process, i.e. for matching demand and supply for knowledge. As the chapter has shown, despite delegation of research governance to networks being seen as a solution to several problems identified by principal-agent theory, various tensions emerge in such a system that attenuate the claim that it is the most adequate way of dealing with the paradox in research policies.

A first issue is whether one can speak of 'self-organized networks' when they are convoked for an externally induced goal, and within a preset operational framework. Van der Meulen (2003: 326) stated in this regard that 'in research systems, industries and users nowadays often act as a third party, not in that they can enforce specific behaviour as courts can do, but by acting as a reference for defining objectives and performance'. The case shows that even when they can enforce specific behavior, when their mandate is limited this can be perceived as being patronizing. Furthermore, the specific behavior the delegated principal wants to enforce amongst the agents can conflict with the desired behavior the master principal wants to enforce.

A second issue related to this is that network delegation may in one way reduce the direct influence of the state in funding policies, but when there is no coherent institutional change in government so that it becomes fully oriented towards new ways of funding research, the functioning of the network can be frustrated in other ways, e.g. by incoherent funding and control mechanisms.

A third issue is that, due to many contrasting monitoring systems and a primacy that is conferred on users, scientific institutions can lose a certain degree of independence, and may become service providers instead of research contractors. This bears a strong relation to the fourth issue, that although the network delegation system can inculcate a strong commitment on the part of scientists to users' interest, the problems exist that a) it is hard to distill a single unequivocal user interest and forward a clear demand, and b) there is a risk that either the user's voice is molded too much by the researcher, or that conversely the researcher's voice is denied or distrusted, with the resultant risks for scientific rigor.

From these conclusions it can be deduced that the optimization of network delegation systems requires capacity building amongst the actors involved to be able to effectively operate in the various arenas (i.e. reducing the information asymmetries), synchronization of the different expectations of different actor groups involved in the network with regard to the goals at macro (government) and at micro (users) level and related monitoring output (i.e. pay sufficient attention to mutually understandable 'boundary objects'), and awareness building about the private investments network participants have to make and the collective benefits they yield. That this may incur, at least initially, substantial costs, would contrast with Braun's (2003) finding that delegation to networks incurs decreasing monitoring costs and low decision-making costs. This may be so at government level, but these savings may be a result of a shift of costs to the intermediary level (in turn funded by government) and to the level of network participants. Furthermore, the chapter indicates that although government as a master principal may delegate responsibilities to a network and a corresponding boundary organization, it must be recognized that government is not external to the network but an essential part of it. Such recognition would need to broadly permeate government bodies.

Notes Chapter 4

- 33 Although not explicitly mentioned by Gulbrandsen (2005) the decision-making and priority-setting problem would in our view fit in the selection arena,
- 34 While Van der Meulen (2003) refers to users as 'third parties', Braun and Guston (2003) refer to users as 'fourth parties'. Taking into account that in the bilateral view on delegation government as principal, researchers as agents, and the research council as intermediary can be considered as first, second, and third parties, the latter designation appears to be more appropriate in this context.
- 35 See McNie (2007: 22-25) for an elaborate overview of different approaches.
- 36 Howells (2006: 720) defines an innovation intermediary as 'An organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties. Such intermediary activities include: helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between, bodies or organizations that are already collaborating; and helping find advice, funding and support for the innovation outcomes of such collaborations.'
- 37 Jacob (2005) comments on a course for public sector managers. Likewise, at the end of the fieldwork period for this chapter, Bioconnect management organized a course targeted at PWG members.

5

Matching demand and supply in the agricultural knowledge infrastructure

Experiences with innovation intermediaries

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Abstract

The privatization of agricultural research and extension establishments worldwide has led to the development of a market for services designed to support agricultural innovation. However, due to market and systemic failures, both supply side and demand side parties in this market have experienced constraints in effecting transactions and establishing the necessary relationships to engage in demand-driven innovation processes. To mitigate these constraints, a field of intermediary organizations has emerged to assist agricultural entrepreneurs to articulate demand, forge linkages with those that can provide innovation support services, and manage innovation processes. This chapter aims to give an overview of the different kinds of socalled innovation intermediaries that have emerged in The Netherlands and to report on their contributions and the tensions that are being experienced with regard to their functioning. The chapter concludes with a discussion in which it is argued that the state should play a role as a 'market facilitator', by funding such innovation intermediaries.

5.1 Introduction

In recent years, the agricultural sector in industrialized countries has become organized along demand-driven production chains that operate on competitive global markets (Hendrikse and Bijman, 2002). This poses several challenges to agricultural producers with regard to choosing appropriate business strategies (e.g. specialization, diversification, or scale increase - Zilbermann et al., 1998; Van Huylenbroeck and Durand, 2003), and meeting product quality, food safety, sustainability and animal welfare standards (De Wilt et al., 2001). In face of these challenges, policy discourse and scientific literature now focus attention on entrepreneurship development (Lans et al., 2004; Phillipson et al., 2004). Knudson et al. (2004, p. 1333) define entrepreneurship as 'the personalized drive and capability to commercialize a product, service, process, or business idea'. Current literature emphasizes that this requires an active attitude towards innovation (Gielen et al., 2003; De Lauwere, 2005). The acquisition of knowledge and information from external sources and their internalization in the entrepreneurial routine is an important skill in entrepreneurship (Gielen et al., 2003). However, agricultural enterprises confront certain difficulties in this regard, much like other small and medium enterprises (SMEs) (Senker and Faulkner, 2001; De Groot, 2003). The purpose of this chapter is to give an overview of so-called innovation intermediaries that have emerged to assist agricultural entrepreneurs with innovation in the context of a market-based agricultural knowledge infrastructure and to report on the contributions of these intermediaries and tensions that are being experienced with regard to their functioning. This analysis starts by outlining current views and developments with regard to agricultural innovation. Then, constraints with regard to innovation and the support of innovation for both the demand and the supply side in the current agricultural knowledge infrastructure are presented. A discussion on the role of intermediary organizations established to mitigate these constraints is followed by an analysis of the contributions of, and tensions experienced by, such organizations in the Dutch agricultural sector. The chapter concludes with a number of policy recommendations regarding the role the state should fulfil as a 'market facilitator', by funding such innovation intermediaries.

5.2 Changes and challenges in the support of agricultural innovation

It has become widely recognized that innovation is not a linear process in which technological knowledge is generated by science and subsequently transferred to end-users (Smits and Kuhlmann, 2004). Innovation systems thinking has also gained ground in the agricultural innovation literature, through approaches such as Agricultural Knowledge and Information Systems (Röling, 1990; Engel, 1995), National Systems of Innovation (Lundvall, 1992, applied by e.g. Biggs and Smith, 1998; Hall et al., 2001; Sumberg, 2005), or 'looser' systems approaches (Lacy, 1996;

Thrupp and Altieri, 2001). These approaches emphasize that organizations do not innovate in isolation but in the context of a system. In the innovation systems perspective, production and exchange of (technical) knowledge are not the only prerequisites for innovation; several additional factors play a key role, such as policy, legislation, infrastructure, funding, and market developments (Klein Woolthuis et al., 2005). System approaches have contributed to current thinking about the role of agricultural research (and extension as well), characterized by Sumberg (2005, p. 4) as 'a re-conceptualization of research as part of increasingly complex, interactive and learning based systems, the bounds of which are moving outward ... research is now seen as one of the many 'stakeholders' within a 'chain-link' or 'network' innovation system'.

With regard to the supporting knowledge infrastructure, agricultural innovation systems in industrialized countries recently have experienced two major changes that affect the formation of such innovation networks.

1. The changing structure of agriculture

A shift from homogenous production to diversification of products and specialization of producers results in 'dispersion of professional interests and aptitudes' (Janssen and Braunschweig, 2003, p. 47). This development will have 'an enormous impact on the content, organization and institutionalization of the agricultural knowledge infrastructure and more in particular on the interface between the users and producers of knowledge' (Smits, 2002, p. 868).

2. The privatization of public agricultural research and extension systems (e.g. Carney, 1995; Wolf, 1998; Byerlee et al., 2002)

With respect to this shift to a private system, some have coined the term 'agricultural knowledge market' (Leeuwis, 2000; Holt, 1998). Because knowledge for the support of agricultural innovation is typically embedded in intermediate products and services, we prefer to speak about a market in agricultural R&D and 'knowledge-intensive business services' (KIBS, see Den Hertog, 2000). In current knowledge infrastructures, agricultural entrepreneurs generally have become responsible for the acquisition of services to support innovation on issues that are seen as being in the private interest. Often, governments only continue funding activities that are related to public interest issues (Hanson and Just, 2001; Barnes, 2001).

Similar to SMEs, the challenges faced by both agricultural entrepreneurs and providers of agricultural R&D and KIBS with regard to innovation processes can be reduced to five categories:

 Adequately articulating demand previous to and during service provision SMEs often experience difficulties in defining strategic, organizational and technological deficiencies in their efforts to express clear demands to R&D and KIBS providers so that they get a product that meets their requirements. Conversely, service providers have to be responsive to clients' needs, i.e. they have to be 'demand driven' (Katz and Barandun, 2002; Byerlee et al., 2002). However, academic researchers in particular are often unaware of SMEs' innovation needs (Caputo et al., 2002; Pannekoek et al., 2005). 'Cognitive distance' between the different actors involved may cause coordination and learning problems during innovation processes (Nooteboom, 2000), and different norms and expectations with regard to desired output exist (Beesley, 2003; AWT, 2005).

2. Developing adequate resources and competences for innovation

Whereas the previous system to support innovation amongst agricultural entrepreneurs was largely supply driven and prescriptive, the current situation requires more initiative from entrepreneurs. This calls for competences with regard to knowledge and information acquisition and learning for innovation, i.e. sufficient absorptive capacity (Cohen and Levinthal, 1990). Such competences are often lacking in SMEs, i.e. there is a 'managerial gap' (Bessant and Rush, 1995; Just et al., 2003). SMEs also often lack resources such as the time and funds to invest in new knowledge and technology (Vos et al., 1998; Kaufmann and Tödtling, 2002; Caputo et al., 2002).

3. Dealing with market failures

In the increasingly heterogeneous market for agricultural R&D and KIBS, market failures such as information asymmetry and poor identifiability of service value can be discerned. This implies difficulties in ex ante evaluation (Hanson and Just, 2001; Just et al., 2003), i.e. there exists an 'information gap' (Bougrain and Haudeville, 2000; Just et al., 2003; Izushi, 2003). This complicates the search for and selection of suitable cooperation partners, especially with regard to accessing 'weak tie' networks that can offer opportunities and alternatives not available through 'strong tie' networks (Granovetter, 1985).

4. Financing the provision of agricultural R&D services and KIBS

Agricultural entrepreneurs now have to pay for services formerly provided free of charge and thus need to mobilize funds (Katz and Barandun, 2002; Garforth et al., 2003a). R&D and KIBS providers now have to compete for contracts with clients (such as agricultural entrepreneurs, industry, government) (Huffman and Just, 1999a; Levidow et al., 2002) in a market that is increasingly pluriform and also served by non-traditional, non-agricultural R&D and KIBS providers (Roseboom and Rutten, 1998; Phillipson et al, 2004). This need for procurement causes uncertainty and raises transaction costs for R&D and KIBS providers (Hubbard, 1995; Echeverría and Elliot, 2002).

5. Overcoming system failures

Because of increasing strategic interests, weakening institutional links and inhe-

rent cultural differences between actors, agricultural knowledge infrastructures have become more closed. This reduces the possibilities for establishing synergic linkages, increases the chance of redundancies and limits feedback between the different system components (Boehlje, 1998; Leeuwis, 2000; Lacy, 2001).

5.3 Roles of innovation intermediaries in (agricultural) innovation systems

In the context of these challenges, specialized intermediary organizations have emerged. The term 'intermediary' in the context of a knowledge system has been defined by Smedlund (2006, p.210) as 'an organization that functions in the midst of the users and producers of knowledge.' In the context of the changes in agricultural innovation systems, the term 'innovation intermediaries' coined by Howells (2006, p. 720) is more specific, and defined as 'an organization or body that acts an agent or broker in any aspect of the innovation process between two or more parties. Such intermediary activities include: helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between, bodies or organizations that are already collaborating; and helping find advice, funding and support for the innovation outcomes of such collaborations.'

There are ample experiences with such innovation intermediaries for the support of SMEs in the industrial sector (Howells, 2006). With regard to the agricultural sector, innovation intermediaries have been mentioned as possible solutions to uncertainties resulting from the transfer to R&D and KIBS markets (Enzing et al., 1998; Senker and Faulkner, 2001; Clark, 2002; De Groot, 2003; Garforth et al., 2003a; Sulaiman et al., 2005) and some empirical studies have been undertaken to describe them (Phillipson et al., 2004; Smits and Kuhlmann, 2004; Smallbone et al., 2003; Klerkx et al., 2006a; North and Smallbone, 2006). Figure 5.1 gives a schematic representation of the position of innovation intermediaries in the agricultural innovation system. The literature mentions a range of functions such innovation intermediaries should typically fulfil (see Howells, 2006, for an overview). In the context of supporting agricultural SMEs, R&D and KIBS in coping with constraints regarding innovation, the main functions can be captured under the headings 'demand articulation', 'network brokerage' and 'innovation process management'.

5.3.1 Demand articulation

Demand articulation is a key task for innovation intermediaries (Smits and Kuhlmann, 2004; Izushi, 2003; Bessant and Rush, 1995) because without clear demand it is difficult for knowledge system institutions to be client oriented (Coehoorn et al., 1991). Demand articulation is about clarifying both demand and supply, and establishing a dialogue between users and producers (Daenen et al., 2001). It comprises diagnosis and analysis of problems and articulation of (latent) needs (Kodama, 1995; Howells, 2006; Boon et al., in press).



Figure 5.1: The position of innovation intermediaries in the agricultural knowledge infrastructure

The role of innovation intermediaries is to facilitate the creative process in order to arrive at real needs and prevent blind spots in self-observation, creating a strategic innovation plan (Bessant and Rush, 1995; Vos, 2005). Both informal methods (based on tacit knowledge) and formal methods (based on an evaluation framework, see e.g. Vos, 2005) are used for demand articulation. Foresight studies can help to articulate future demands at higher system aggregation levels (Van der Meulen et al., 2003).

5.3.2 Network brokerage

With regard to the network brokerage function, Izushi (2003, p. 771) states: 'Where there is a wide gap between suppliers and users of technology in the process, there have to be appropriate intermediary agencies that connect them.' One aim of such a network brokerage function is to overcome market and system failures. Innovation intermediaries help close the information gap by creating transparency on supply of R&D and KIBS markets. They act as a channel and selection aid (Bessant and Rush, 1995) and make weak networks or external relations available to SMEs (Cooke and Wills, 1999). In the case of agricultural entrepreneurs, this also implies a shift away from traditional agricultural business support providers towards generic business support providers (Phillipson et al., 2004). They can also organize a platform or meeting place for various innovation systems actors (Smits and Kuhlmann, 2004; Howells, 2006). Innovation intermediaries can also help find and access sources for financing or subsidizing innovation activities (Kolodny et al., 2001; Kaufmann and Tödtling, 2002).

5.3.3 Innovation process management

If innovation is seen as a process of creating and managing effective linkages between different subsystems within an innovation system, then, for this process to progress, a continuous alignment of actors in innovation networks has to take place (Engel, 1995; Leeuwis, 1999; Smits and Kuhlmann, 2004). For network maintenance, Snow et al. (1992) identify two main brokering roles: a 'lead operator' who acts as an organizer and manager of the network, and a 'caretaker', who maintains the integrity of the network. Intermediary organizations can fulfil these roles during innovation processes. Also, to enhance communication between the actors involved, a facilitator is needed to fulfil an 'interface management' role (cf. Smits and Kuhlmann, 2004), bridging the cultural and cognitive differences between different 'knowledge domains'. This is often called 'knowledge brokerage' (Hargadon, 2002). Besides this knowledge brokerage role, innovation intermediaries fulfil a host of functions relating to the implementation, intellectual protection, and commercialization of innovation process outcomes (Howells, 2006). Innovation process management also includes optimizing the interaction between the innovation network and the broader innovation system (such as physical infrastructure, reward and incentive systems, funding, and legislation) (Klein Woolthuis et al., 2005).

5.3.4 The setup of innovation intermediaries

An important factor influencing the functioning of innovation intermediaries is their institutional structure (Van der Meulen et al., 2005); whether they are public or private organizations or public-private constructs, for-profit or not-for profit, new organizations or spin-offs of an existing organization, whether they are independent or not, and whether they are permanent or temporary. Other factors include the objectives of the organization, the way in which it is managed and functions, the way in which its performance is evaluated, and how it is perceived by its clients (Bessant and Rush, 1995; Kolodny et al., 2001). Financiers or shareholders of innovation intermediaries may want to realize different objectives through the organization (Huggins, 2000; Hanna and Walsh, 2002). This can negatively influence the organization's credibility with both entrepreneurs and the providers of R&D and KIBS with regard to having an impartial position in its brokerage role (Bessant and Rush, 1995; Laschewski et al., 2002). The credibility of innovation intermediaries' organizations forms part of six design requirements that Kolodny et al. (2001) have formulated. These are: (1) visibility and accessibility to SMEs, (2) credibility with SMEs, (3) access to appropriate sources of knowledge and information relevant to the innovation process, (4) credibility of the intermediary organization with these sources, (5) quick response to the requests of SMEs, and (6) complementarity to the weaknesses of the SMEs it serves. These design requirements are helpful in the analysis of innovation intermediaries.

5.4 Experiences with innovation intermediaries in Dutch agriculture

5.4.1 Aims and methods

The past ten years have seen the establishment of various innovation intermediaries in the Dutch agricultural sector. This section aims to explore the reasons for setting up these organizations, their setup and their experiences in carrying out their task in order to highlight a number of contributions and tensions. These contributions and tensions then feed a discussion about how innovation intermediaries can play a role in privatized research and extension systems, and the potential role of the state with regard to their establishment. The present chapter draws its data from several sources in its attempt to provide a broad view. The research is based on a set of qualitative case studies that involved semi-structured interviews with managers and consultants active in 20 innovation intermediaries. A total of 19 interviews were conducted. These were fully transcribed and analyzed in depth. Two of the innovation intermediaries were studied in more detail (InnoFac, MVA); these studies are reported elsewhere (see Klerkx and Leeuwis, forthcoming a and b). Given that many of the organizations are of very recent origin, or ceased to exist several years ago, in addition to practical constraints such as time and money, it proved difficult to do a client survey for each organization. To fill this gap, in addition to the information from the respondents, insights from evaluative studies of some of these organizations are incorporated (ERM, 2003; Arentsen and Janssen, 2003; KPMG, 2001; Van de Graaff and de Jong, 2002; Arnold et al., 2003; Bureau Bartels, 2004; Molenschot and Oostdijk, 2004; Beemer et al., 2005; Hoekstra, 2006; Oenema, 2006a), and policy documents such as business plans and progress reports of the organizations were studied. A summarizing characterization of some of the organizations was also used (Metselaar, 2004). This overview is not exhaustive, as over time other organizations have been identified or some have recently been established.

5.4.2 Reasons for the establishment of innovation intermediaries

Four major reasons for setting up innovation intermediaries in the Dutch agricultural sector could be identified:

- I. The dismantling of the extension service and regional applied research stations due to the rationalization and centralization of the privatized knowledge infrastructure was perceived by policy makers and farmer's organizations to be a threat to regional innovative capacity and the economic strength of agriculture. Innovation intermediaries are established to function as catalysts of innovation.
- 2. A need was perceived for impartial advice to agricultural entrepreneurs to articulate innovation needs and make a sensible choice in a diversifying market for R&D and KIBS services to support innovation. Also, capacity building to enable them to become 'critical clients' was a primary goal, because, within entrepreneurship-focused policy, the improvement of knowledge and information acquisition skills is considered essential (LNV, 2001; De Lauwere, 2005).
- 3. A need was perceived to reduce barriers originating from the increasingly closed nature of the market and strategic behaviour with regard to the sharing of knowledge and information between agricultural entrepreneurs and in the context of production chains. Stimulating innovation system interaction has become a key issue on policy agendas (LNV, 2001; Boerwinkel et al., 2005). This also includes removing institutional barriers such as incompatible norms and value systems, incentive systems, and legislation.
- 4. The providers of (formerly public) agricultural R&D and KIBS wished to establish (or renew) linkages with agricultural entrepreneurs and to install a mechanism to improve procurement and to develop projects with agricultural entrepreneurs, i.e. stimulate and create demand.

5.4.3 Types of innovation intermediaries

Table 5.1 provides a typology of the innovation intermediaries studied. These organizations differ with regard to their function, focus, coverage, funding and governance structure, and five types can be distinguished. In practice these are not mutually exclusive: some organizations are also hybrids of different types of innovation intermediaries with multiple aims and scopes. The fifth type, Internet-based portals and data bases, is not included in the further analysis. Table 5.2 specifies the type to which the organizations studied belong and gives information on their funding and governance structure. It also indicates, for each organization, the data sources used for the analysis. Table 5.3 synthesizes the Dutch and English names of the organizations and their acronyms as used in this study.

Түре		Function	Comments			
I.	Innovation consultants aimed at individual entrepreneurs	 Demand articulation Network brokerage Innovation process management 	 Connect agricultural entrepreneurs with relevant service providers (R&D and KIBS and 'hardware' suppliers) Publicly funded organizations limited to needs articulation and network brokerage Private organizations also fulfil innovation process management role 			
2	Innovation consultants aimed at collectives of entrepreneurs	 Demand articulation Network brokerage Innovation process management 	• Connect agricultural entrepreneurs with relevant service providers (R&D and KIBS and 'hardware' suppliers)			
3	Brokerage organizations that forge peer (inter-firm) networks	Demand articulationNetwork brokerage	 Aim to bring agricultural entrepreneurs together to exchange knowledge and experience at the interpersonal and group level, i.e. enterprise development through peer-to-peer learning Explicit objective is to involve actors from weak networks (surpassing regional and sectoral networks), i.e. break out of 'strong-tie networks', avoid lock-in, and stimulate 'new combinations' 			
4	Systemic instruments for the support of innovation at higher system level	 Demand articulation Network brokerage Foresight 	• Catalyst of innovation role, by e.g.: I. the management of interfaces between (sub)systems, 2. build- ing and organizing (innovation) systems, 3. providing a platform for learning and experimenting, 4. providing an infrastructure for strategic intelligence, and 5. stimulating demand articulation, and strategy and vision development. (Smits and Kuhlmann, 2004)			
5	Internet-based portals and databases that display knowledge and informa- tion relevant to farmers and related parties	• Network brokerage	 Portals differ with regard to their prospective audience: these may be all agricultural entrepreneurs or project -related audiences Rather passive brokerage role: portals create order in wealth of information sources and give an overview but do not serve as a selection aid (Rietbergen, 2004; Van Baalen et al., 2005) 			

Coverage	Funding	Legal form	Innovation focus		
 Regional Regional focus where coverage is national Both sub-sectorally and cross-sectorally oriented 	 Public funding through subsidies Public/private funding through subsidies and/or shareholding User fees 	 For-profit private firms Quasi-autonomous government agencies Non-profit foundations 	 Innovations within individual enterprises Generally incremental innovation Short time horizons 		
• National	 Public funding through subsidies Private collective funding through subsidies 	• Non-profit foundations	 Innovations relevant for groups of similar enterprises and in the context of a production chain Generally incremental innovation Short time horizons 		
NationalSub-sectorally oriented	 Public funding User fees	• Non-profit foundations	 Innovations relevant for groups of similar enterprises Generally incremental innovation Short time horizons 		
• National	 Public funding through subsidies Private collective funding through subsidies 	 Non-profit foundations Quasi-autonomous government agencies 	 Innovation at higher levels of system aggregation (entire production chain/ societal systems/policy systems) Generally radical innovation Medium to long time horizons 		
 National Sub-sectorally oriented with categorical subdivisions 	 Privately funded if targeted at all agricultural entrepreneurs Publicly funded if targeted at project-related audiences and other specific audiences 	 Private for-profit firms Part of publicly financed research and extension projects 	 Broad range of links for addressing both operational or tactical problems and strategic innovation issues Short time horizon 		

Table 5.1: A typology of innovation intermediaries in Dutch agriculture (source: own data, Smits and Kuhlmann, 2004; Van Baalen et al., 2005; Rietbergen, 2004)

Organization

Funding

Income generation

Core activities

Түре

AKC Noord-Holland*Public/PrivateSubsidy, Shareholders, Fee-for-serviceA, B, GAKC Flevoland*PrivateShareholders, Fee-for-serviceBAKC Zuid-Nederland*PrivateShareholdersAAKN Zuid-HollandPublicSubsidyA, BISW*PublicSubsidyA, B	C I
AKC Flevoland aPrivateShareholders, Fee-for-serviceBAKC Zuid-Nederland aPrivateShareholdersAAKN Zuid-HollandPublicSubsidyA, BISW aPublicSubsidyA, B	
AKC Zuid-Nederland*PrivateShareholdersAAKN Zuid-HollandPublicSubsidyA, BISW*PublicSubsidyA, B	I
AKN Zuid-HollandPublicSubsidyA, BISW ^a PublicSubsidyA, B	Ι
ISW ^a Public Subsidy A, B	Ι
	Ι
Syntens Agro Public Subsidy A, B	I
Stimuland ^b Public/Private Subsidy A, B, G	C I
LaMi Public Subsidy, Client contribution A, B,	F і
Agro&Co Public/Private Shareholders, Subsidy A, B	Ι
Food Valley Public Subsidy A, B	Ι
Innovation Link ^{<i>f</i>} Private Fee-for-service A, B, G Horti Solutions	C I
InnoFac Public/Private Shareholders, Fee-for-service A, B, G	C I-2
AKK ^f Public Subsidy, Client contribution A, B, G	C 2
GAT Private (collective) Subsidy, Fee-for-service A, B, G	C 2
MVA Public/Private Subsidy, Subscr. fee, Participation fee A, B, D	, F 2-3
TCA Public Subsidy, Participation fee A, B, D	, F 3
Poultry Centre Public/Private Shareholders, Fee-for-service B, D	I-3
Courage Public Subsidy A, E	4
SIGN Public Subsidy A, E	4
Agroportal Private Subscription Fee B	5

 $^{\circ}$ No longer in operation. $^{\circ}$ From 2005 onwards fee-for-service. c A= demand articulation, B= network brokerage, C= innovation process management, D= organization platforms, E= foresight, F=organization educational activities. d This respondent was involved in both organizations. $^{\circ}$ Was in start-up phase at the time of the study. f Focus is more on processing companies than on agricultural entrepreneurs. g See Klerkx and Leeuwis, forthcoming a. h See Klerkx and Leeuwis, forthcoming b

Scope	Num	ber of	Indicative budget		Data collection			
	staff (range)		-		Primary datasource		Secondary datasource	
	0-5	5-25	Sum in Euros	Year(s)	Interview	Businessplan/ progress report	Evaluations	
Regional/cross-sectoral	Х		205,000	Evalua- tions	Ι	WLTO, 1997	Molenschot and Oostdijk, 2004	
Regional/cross-sectoral	х		-	-	I	-	-	
Regional/cross-sectoral	Х		-	-	Ι	AKC Zuid-NL, 2000	-	
Regional/cross-sectoral	Х		750,000	99-02	\mathbf{I}^{d}	-	Arnold et al., 2003	
National/cross-sectoral	Х		1,101,470	2002	_ ^d	ISW, 2002	Van de Graaff and de Jong, 2002	
National/cross-sectoral		х	500,000	2005	2	Syntens, 2004	Bureau Bartels, 2004	
Regional/cross-sectoral		x	I,200,000	00-03	I		KPMG, 2001; Arentsen & Janssen, 2003	
Regional/cross-sectoral	Х	x	650,000	2003	Ι	-	ERM, 2003	
Regional/cross-sectoral			-	-	Ι	-	-	
National/cross-sectoral	х		-	-	Ι	-	-	
National/sub-sectoral	х		-	-	2			
Regional/cross-sectoral		x	650,000	2003	43 ^g	Van de Waart et al., 2003; InnoFac, 2004	-	
National/cross-sectoral	х	х	1,260,000	2005	Ι	AKK, 2006	Beemer et al., 2005	
Regional/sub-sectoral	х		-	-	Ι	-	-	
National/sub-sectoral		х	1,495,000	2006	23 ^h	Melkvee Academie, 2004; 2006	Hoekstra, 2006; Oenema, 2006ª	
National/sub-sectoral	Х		1,250,000	03-05	I	Van de Geijn et al., 03	-	
Regional/sub-sectoral	х		-	-	I	Tacken et al., 2004	-	
National/sub-sectoral	Х		-	-	I	De Vries, 2004	-	
National/sub-sectoral	Х		-	-	I		-	
National/cross-sectoral		х	-	-	I	-	-	

Table 5.2: Structure and activities of innovation intermediaries studied (source: own elaboration; Metselaar, 2004)
Organization	Full name in Dutch	Acronym	English Translation
AKC Noord Holland	Agrarisch Kenniscentrum Noord Holland	AKC-NH	Agricultural Knowledge Centre North Holland
AKC Flevoland	Agrarisch Kenniscentrum Flevoland	AKC-F	Agricultural Knowledge Centre Flevoland
AKC Zuid-Nederland	Agrarisch Kenniscentrum Zuid-Nederland	AKC-ZN	Agricultural Knowledge Centre South
AKN Zuid Holland	Agrarisch Kennisnetwerk Zuid-Holland	AKN-ZH	Agricultural Knowledge Network South Holland
ISW	Innovatiesteunpunt Wageningen	ISW	Innovation Support Centre Wageningen
Syntens Agro	Syntens Agro	-	Syntens Agro
Stimuland	Stimuland	-	Stimuland
LaMi	LaMi	-	LaMi
Agro&Co	Agro&Co	-	Agro&Co
Food Valley Innovation Link	Food Valley Innovation Link	FVIL	Food Valley Innovation Link
Horti Solutions	Horti Solutions	-	Horti Solutions
InnoFacª	InnoFac	-	InnoFac
AKK	Agro Keten Kennis	AKK	Agrichain Knowledge
GAT	Groeiservice Afdeling Technologie	GAT	Growers' Service Technology Department
MVA	Melkvee Academie	MVA	Dairy Farming Academy
TCA	Tuinbouwcluster Academie	TCA	Horticulture Cluster Academy
Poultry Centre	Poultry Centre	-	Poultry Centre
Courage	Courage	-	Courage
SIGN	Stichting Innovatie Glastuinbouw	SIGN	Greenhouse Horticulture Innovation Foundation
Agroportal	Agroportal	-	Agroportal

^a InnoFac is a pseudonym

Table 5.3 Synthesis of names of organizations studied

As Table 5.1 and Table 5.2 show, the various organizations studied are targeted at different levels of aggregation in the agricultural innovation system (individual entrepreneurs, collectives of entrepreneurs, heterogeneous networks of actors connected to production systems and chains), and differ with regard to the complexity of the innovations they wish to support (incremental or radical innovations). Some of them are specifically oriented towards a certain agricultural sub-sector (e.g. dairy farming, horticulture), whereas others are cross-sectoral and target all types of agricultural entrepreneurs in a certain region. Different methods of funding are used, but typically organizations are supported, at least in their start-up phase, through public, collective private (i.e. through commodity boards, producers' organizations) or public/private investments, and/or subsidies. In some cases, user fees are charged to agricultural entrepreneurs to partially or wholly recover the costs. Most organizations are non-profit oriented, with some exceptions (Horti Solutions, InnoFac, and shifts to for-profit working were anticipated for AKC-NH and Stimuland). Because of this non-profit objective, most organizations are quasi-autonomous government agencies or foundations. Typically, organizations are small (fewer than five staff members), but some larger organizations can also be observed (up to 25 staff members). To convey an idea of the cost of the organizations, an indicative budget is given for a number of them; reliable figures were not available and/or accessible for all organizations.

5.4.4 Reported contributions

Table 5.4 shows the contributions of intermediaries to facilitating innovation as mentioned by respondents or deduced from evaluative studies.

- 1. Impartiality in the demand articulation and network brokerage process
- Innovation intermediaries help to articulate innovation needs and create a strategic innovation plan without bias toward a preferred strategy or technology, but at the same time are critical and provide a mirror for self-reflection. They act in the pre-competitive stage with regard to contracting R&D and KIBS and, because they do not have a commercial interest in the provision of content oriented R&D and KIBS during the innovation process, clients are referred to the provider that best suits their needs. In the case of full or partial public financing of the intermediary organization, this may either be with, or without, a thematic framework being imposed by the financier. When there is no such thematic framework, the objective to be achieved is simply catalyzing innovation (AKC-NH, Syntens Agro, ISW, InnoFac). In the event of a thematic framework being imposed by financiers within which innovation intermediaries have to work, the aim is to see how farmers' needs and ambitions fit into these frameworks, rather than the other way around (Stimuland, LaMi, GAT, MVA, TCA).
- 2. Easy accessibility to agricultural entrepreneurs

Organizations are often regionally embedded and located at sites familiar to agricultural entrepreneurs such as (former) experimental stations (AKC-ZN, AKC-NH, InnoFac). Innovation intermediaries sometimes act pro-actively, creating demand by approaching entrepreneurs (Syntens Agro, LaMi.), or organize networking events (AKC-NH, InnoFac, MVA), or make use of existing organizational structures (GAT, TCA). Several organizations offer services free of charge, at least initially (Stimuland, LaMi, AKC-NH, Syntens Agro, ISW, GAT, Agro&Co), so entrepreneurs have less hesitation in giving it a try.

Contribution		Reported by Primary datasource	Reported by Secondary datasource
I	Impartiality in demand arti- culation and network broke- rage	ISW, AKC-NH, Syntens Agro, Stimuland, GAT, TCA, AKC-F, Agro&Co, LaMi, InnoFac, AKK, Horti Solutions	KPMG, 2001; ERM, 2003; Arentsen and Janssen, 2003; Van de Graaff and de Jong, 2002; Molenschot and Oostdijk, 2004; Hoekstra, 2006; Oenema, 2006a; Beemer et al., 2005
2	Easy accessibility to agricultural entrepreneurs	ISW, AKC-ZN, AKC-NH, Syntens Agro, Stimuland, GAT, AKC-F, LaMi, InnoFac,, MVA, TCA	ERM, 2003; Arentsen and Janssen, 2003; Van de Graaff and de Jong, 2002; Beemer et al., 2005; Arnold et al., 2003; Molenschot and Oostdijk, 2004
3	Make extensive (weak) networks of sources of knowledge (i.e. R&D, KIBS) and other resources available to agricultural entrepreneurs	ISW, AKC-NH, Syntens Agro, Poultry Centre, GAT, TCA, FVIL, MVA, InnoFac, AKK	Arentsen and Janssen, 2003; Van de Graaff and de Jong, 2002; Van der Geijn et al., 2003; Beemer et al., 2005
4	Cognitive and cultural proximity with both end-users and sources of knowledge	ISW, AKC-NH, GAT, MVA, TCA, InnoFac, LaMi, Stimuland, Horti Solutions, AKK	ERM, 2003; KPMG, 2001
5	Awareness raising and capacity building at both demand and supply side for cooperation in innovation processes	Stimuland, GAT, TCA, MVA, LaMi, InnoFac, AKK, ISW	KPMG, 2001; ERM, 2003; Van de Graaff and de Jong, 2002; Beemer et al., 2005; Molenschot and Oostdijk, 2004
6	Contribute to the develop- ment of radical and/or system innovations	SIGN, Courage, InnoFac, AKK	
7	Context sensitivity	LaMi. Stimuland, AKC-NH, InnoFac, Gat	ERM, 2003; Arentsen and Janssen, 2003; Van de Graaff and de Jong, 2002; Arnold et al., 2003
8	Fulfil a liaison function within the agricultural knowledge infrastructure	Stimuland, SIGN, Courage, MVA, LaMi, InnoFac, AKK	Van de Graaff and de Jong, 2002; Beemer et al., 2005; Arnold et al. 2003; Molenshot and Oostdijk, 2004

Table 5.4. Reported contributions to facilitating innovation

3. An extensive network amongst sources of knowledge and other resources This search and connection function of innovation intermediaries enables them

to forge linkages that entrepreneurs would not easily be able to make. This includes more than just the traditional R&D and KIBS providers to agriculture. Apart from forging linkages with sources of knowledge, other resources such as funding and policy support can also be mobilized. Depending on the complexity and novelty of the projected innovation, however, it may take considerable effort to form the right innovation configuration. To enhance this search process, some organizations have contact persons within R&D organizations who examine whether there is suitable expertise available (e.g. FVIL, AKC-ZN). Because of the preparatory work they do in demand articulation and network brokerage, innovation intermediaries can save procurement costs for R&D and KIBS providers. Type 3 and type 4 organizations (see Table 5.1) explicitly aim to form new peer networks inside the agricultural sector and connect these with actors outside the agricultural sector (e.g. TCA, MVA, Courage, SIGN).

- 4. Cognitive and cultural proximity with both end-users and sources of knowledge Agricultural entrepreneurs often want quick access to applicable knowledge; R&D providers have an interest in undertaking (publishable) research (AWT, 2005). They thus differ with regard to the time horizons of projects, and the desired output. Innovation intermediaries (types 1, 2 and 4) facilitate cooperation and synchronize expectations during innovation processes. The interface management role of innovation intermediaries is also useful in the interaction with other stakeholders during the innovation process. Respondents indicate that the involvement of innovation intermediaries in innovation processes avoids inertia and can accelerate the process by helping entrepreneurs maintain their focus and energy during the process.
- 5. Capacity building at both demand and supply side for cooperation in innovation processes

Innovation intermediaries contribute to capacity building in respect of pro-activeness towards innovation, the articulation of innovation needs, networking skills for the setup of innovation networks, and knowledge and information acquisition on the R&D and KIBS market. They also contribute to demand-driven working amongst R&D suppliers and KIBS. For most of the type I and 2 organizations, this capacity building is not an explicit aim (exceptions are LaMi and Stimuland), but for type 3 and 4 organizations it is.

6. Development of innovative concepts, exempted from market forces and current policy agendas

Type 4 organizations have been set up for this purpose. This provides the freedom to explore possibilities not tied to the current situation. Using the techniques of foresight and backcasting (see Van der Meulen et al., 2003), they develop innovative concepts in cooperation with relevant parties inside and outside the agricultural sector, and put these on the policy agenda. They also contribute to the formation of networks of actors to execute such innovation projects.

7. Context sensitivity

The regional approach of many innovation intermediaries (types 1 and 2) is appreciated by both clients and providers of R&D and KIBS, as respondents and evaluations indicate. Clients' situations are better understood, and (centralized) R&D institutions may (re-)establish linkages with regional realities. Such a regional approach in the setup of innovation intermediaries is presented by Isaksen and Remøe (2001) as a good practice policy lesson (see also Oughton et al., 2002).

8. Fulfilling a liaison function

Innovation intermediaries facilitate knowledge and information flows between the different subsystems of the innovation system, i.e. inform research and policy agendas. By informing policy makers, necessary changes in legislation and policy frameworks can also be made. This liaison role may be passive, as is often the case for type I and 2 organizations, because these are client focused rather than aimed at informing other subsystems. It can also be active, as is the case for type 3 and 4 organizations, which install mechanisms and organize activities designed to bring about interaction between actors from different subsystems.

5.4.5 Reported tensions

A number of tensions in the functioning of innovation intermediaries emerged from the interviews and could be deduced from evaluative studies (Table 5.5). These mainly have to do with tensions between the setup and financing structures of organizations and the objectives they want to realize, the perceived intangibility and invisibility of their activities in the course of the innovation process, and the position of innovation intermediaries vis-à-vis providers in the R&D and KIBS market.

1. Pressure from shareholders/financiers to realize their objectives

When providers of R&D and KIBS financially contribute as shareholders or financiers of type I innovation intermediaries (InnoFac, AKC-F, AKC-ZN), they (explicitly or implicitly) expect some form of return on investment. They want to be seen as 'preferred supplier' and show unwillingness to cooperate with other parties, hence forcing innovation intermediaries into the role of procurement instruments. Although most innovation intermediaries do not adhere to preferred suppliership, this can have negative effects on their perceived impartiality (especially amongst R&D and KIBS providers) and can hamper collaboration. Some organizations were intentionally set up as procurement instruments for the supply side (AKC-F, AKC-ZN), but these existed only for a short time. Innovation intermediaries also risk becoming, or being seen as, vehicles to realize policy objectives of financiers, as has been observed in the case of MVA,

Tension		Reported by Primary datasource	Reported by Secondary datasource
I	Shareholders/financiers exercise pressure to realize their objectives	ISW, AKC-ZN, AKC-NH, AKC-F, MVA, LaMi, InnoFac	KPMG, 2001; ERM, 2003; Arentsen and Janssen, 2003;
2	Invisibility and immeasurability of service value	ISW, AKC-NH, Stimuland, Poultry Centre, GAT, Courage. AKC-F, FVIL, MVA, Agro&Co, LaMi, AKK, Horti Solutions, InnoFac	Arnold et al., 2003; ERM, 2003; Arentsen and Janssen, 2003; Van de Graaff and de Jong, 2002; Beemer et al., 2005
3	Unclear images of innovation intermediaries' roles	InnoFac, MVA	KPMG, 2001; ERM, 2003; Bureau Bartels, 2004; Arentsen and Janssen, 2003
4	Too limited mandates	AKC-NH, Syntens Agro, Stimuland	KPMG, 2001; Van de Graaff and de Jong, 2002; Molenschot and Oostdijk, 2004
5	The added value of innovation process management is not recog- nized or even seen as competition by providers of R&D and KIBS	AKC-NH, FVIL, ISW, InnoFac, GAT, Syntens Agro, FVIL, Agro&Co, LaMi, Horti Solutions	Arentsen and Janssen, 2003; Molenschot and Oostdijk, 2004; KPMG, 2001; Van de Graaff and de Jong, 2002; Bureau Bartels, 2004; Beemer et al., 2005
6	Incoherent policy with regard to the establishment of innovation intermediaries.	ISW, Stimuland, GAT, TCA	ERM, 2003; Arnold et al., 2003
7	Difficulties in balancing the expectations of demand and sup- ply side	ISW, AKC-NH, FVIL, InnoFac, Horti Solutions	Beemer et al., 2005
8	Progressive client bias: focus on innovative entrepreneurs	Syntens Agro, MVA, GAT, MVA	Oenema, 2006a; Metselaar, 2004
9	May be seen as illegitimate state support for private companies	SIGN, AKK	Jong, 2002; Beemer et al., 2005; Molenschot and Oostdijk, 2004

Table 5.5 Reported tensions in the functioning of innovation intermediaries

Stimuland and LaMi. This holds true for type 1, 2, 3 and 4 organizations. Both kinds of pressure reduce the perceived impartiality of innovation intermediaries in the eyes of agricultural entrepreneurs and/or as sources of knowledge, and/or causes loyalty conflicts with financiers/shareholders.

2. Invisibility and immeasurability of service value

Some process-oriented services of innovation intermediaries, such as demand articulation and brokerage, take place in the early phases of the innovation process and are highly intangible and invisible, i.e. non-compatible with SMART criteria. In their role as innovation process managers, innovation intermediaries sometimes choose to operate in the background or their contribution cannot be easily distilled as they operate in multi-actor networks. The contribution of innovation intermediaries (types I and 2) to a successful innovation is thus in hindsight often taken for granted by clients, or the specific contribution is hard to define (Tödtling and Kaufmann (2002) and Huggins (2000) have made similar observations). If this work is done on a fee-for-service basis, there may be little incentive to pay for such a service and organizations experience difficulties charging for it. AKC-NH has had this experience and resolved the problem by merging with publicly financed Syntens in the Syntens Agro pilot. Publicly financed organizations do not have this complication, but the difficulty of showing the effect of activities on the end result may undeservedly negatively influence impact evaluations, as Arentsen and Janssen (2003), for example, conclude in their evaluation of Stimuland. In other evaluations, too, it has proved difficult to grasp the process-oriented work of intermediaries in indicators that reveal the added value (Beemer et al., 2005). Usually indicators are limited to the number of assisted entrepreneurs, referrals, and other activities organized by the innovation intermediary (ERM, 2003; Arnold et al., 2003) or to measuring client satisfaction (Van de Graaff and de Jong, 2002; KPMG, 2001). This can have consequences for the continuity of public funding.

3. Unclear images of innovation intermediaries' roles

Many of the functions innovation intermediaries execute are also partly fulfilled by other KIBS organizations, as is also observed in the literature (Bessant and Rush, 1995; Den Hertog; 2000; Howells, 2006). Innovation intermediaries in fact can be considered to be a sort of KIBS. It is rather the combination of demand articulation, network brokerage and innovation process management functions that makes innovation intermediaries unique within the knowledge infrastructure. As other KIBS organizations do not have a good understanding of the actual activities and added value of innovation intermediaries, some tend to see these as competitors rather than facilitators.

4. Too limited mandates

In the case of public funding, innovation intermediaries ought to be active only in the pre-competitive phase, before entrepreneurs contract R&D and KIBS providers. When mandates of (generally publicly funded) innovation intermediaries are confined to demand articulation and network brokerage, clients feel that an independent innovation process manager is lacking. Even when a certain degree of involvement is allowed, only a limited amount of time is available. Evaluations of publicly financed, type I innovation intermediaries indicate that clients appreciate the involvement of an impartial intermediary in the innovation process and would like to see it continued throughout the process (KPMG, 2001; Van de Graaff and de Jong, 2002). When no such process management is offered, lack of momentum in innovations may cause processes to peter out. 5. Innovation process management is seen to compete with services provided by other KIBS

Private innovation intermediaries do not have the restriction of being limited to providing services in the pre-competitive stage of the innovation process, but informants indicate that some of the R&D and KIBS organizations to which innovation intermediaries are linked as brokers perceive their involvement as a threat. A number of reasons for this emerge from the data:

- In the event of (having to evolve to) private funding through user payments in order to recover costs made for demand articulation and network brokerage and to gain sufficient income, innovation intermediaries often focus heavily on innovation process management and may even become a content-providing KIBS rather than a facilitator; this may hamper the brokerage function. This is especially noticeable in for-profit organizations (such as InnoFac, HortiSolutions).
- The lead operator and caretaker roles of innovation intermediaries in innovation process management is not always considered to be necessary and of additional value. Providers of R&D and KIBS feel they can offer such process management activities themselves. It is also felt that the services provided by innovation intermediaries artificially raise the cost of R&D and KIBS service delivery in the innovation process.
- The aim of organizations such as MVA to stimulate knowledge exchange amongst peers was sometimes explained as 'now we do not need those consultants anymore who only transfer our knowledge from one farm to the other.' This may cause R&D and KIBS providers to (initially) distrust such organizations and see them as competitors instead of facilitators.
- 6. Lack of coherence in policy

As indicated, the regional approach of innovation intermediaries is appreciated. There seems to be a lack, however, of coherence in national policy with regard to their establishment. This is illustrated by the fact that the government-funded ISW had high client satisfaction (Van de Graaff and de Jong, 2002) but was nevertheless discontinued. One year later, the Ministry of Agriculture decided to jointly invest in the Syntens Agro pilot project aimed at including the agricultural sector within the service provision of Syntens, the innovation support centre of the Ministry of Economic Affairs. The network and skills built up in ISW were lost. Another observation relating to incoherent policy is that many of the initiatives aim to expand to other regions (e.g. InnoFac, Syntens Agro, (Agro&Co), through regional policies. Although, in a way, a sign of success, this can result in a certain redundancy as respondents observe, or even competition between innovation intermediaries. As a response, one can observe alliances being forged (between GAT and Syntens Agro, for example).

7. Different expectations of intermediaries' cooperation partners

Informants from type I and 2 organizations indicate that the demand of agricultural entrepreneurs is often perceived by R&D providers as being too insignificant. They prefer more substantially sized projects from well-resourced commissioners. Analogous to observations of Isaksen and Remøe (2001), agricultural entrepreneurs often do not need elaborate R&D projects; the help of a specialized KIBS provider is sufficient. Sometimes, the scale problem for R&D is solved by forming a group of entrepreneurs with similar interests, who then forward a collective demand. Such an approach is adopted, for example, by GAT and InnoFac.

8. Progressive client bias

Many innovation intermediaries (types 1, 2 and 3) explicitly focus on what they regard as innovative entrepreneurs, those that could be described as innovators and early adopters (Rogers, 1995). This focus can be observed in both privately and publicly financed organizations. Paradoxically, many of these organizations thus support those entrepreneurs that to some degree already possess the skills to function in the KIBS and R&D markets (as has also been noted by Izushi (2003) and Isaksen and Remøe (2001)). In the case of private innovation intermediaries, it corresponds with the danger mentioned by Bessant and Rush (1995, p. 113) that 'consultants will tend to work with those groups of firms able to support a direct commercial relationship with the risk that a large group of less experienced firms will be excluded'.

9. Innovation intermediation may be seen as illegitimate state support to firms Because of public co-funding of innovation through innovation intermediaries, their work is sometimes seen as illegitimate state support, which hinders the setting up of innovation projects.

From these contributions and tensions discerned in relation to the various types of innovation intermediaries, a number of preliminary lessons can be learned that can assist policy makers in the design of such instruments to facilitate agricultural knowledge infrastructures in transition.

5.5 Discussion: policy implications for setting up innovation intermediaries in agricultural knowledge infrastructures in transition

From the analysis of the reported contributions, it appears that many of the design requirements presented by Kolodny et al. (2001) have been fulfilled to a reasonable degree, although some of the innovation intermediaries analyzed in this chapter have been active for too short a period, or existed for too short a time, to arrive at well substantiated conclusions with regard to their contributions in absolute terms.

Nonetheless, most of the analyzed innovation intermediaries are visible and accessible, have access to appropriate sources of knowledge and information, see their impartiality as a core value to be credible to both agricultural entrepreneurs and sources of knowledge and information, respond quickly to the requests of agricultural entrepreneurs, and thus are complementary to the weaknesses of agricultural entrepreneurs. These requirements seem to apply principally to type I, 2 and 3 organizations, because type 4 organizations are less in contact with current realities. Overall, innovation intermediaries seem to have been received positively by stakeholders in the Dutch agricultural innovation support landscape. However, a number of critical issues with regard to their design can be derived from the analysis.

1. Their design should enable neutrality and impartiality

As the results show, innovation intermediaries are typically the result of a concerted effort and commitment to optimize innovation system interaction, involving several parties, in a public, private, or public/private constellation. However, motives for participation are sometimes incompatible with the required impartiality of innovation intermediaries. The results of this study suggest that the commitment of stakeholders in terms of funding exerts substantial influence upon the functioning of innovation intermediaries. In the case of private funding, when providers of R&D and KIBS act as financiers or shareholders, they often see innovation intermediaries, implicitly or explicitly, as a tool for procurement. Isaksen and Remøe (2001) made similar observations in their analysis of technology attachés. This may cause loyalty and impartiality conflicts for staff of innovation intermediaries: should they serve their financiers/shareholders or their clients? In the case of public funding, this is usually done within a certain thematic policy framework. If such a framework does not correspond with agricultural entrepreneurs' interests and becomes prescriptive, this can be detrimental to the innovation intermediaries neutrality and impartiality (see also Laschewski et al., 2002; Leeuwis et al., 2006). Despite this risk, public funding, as opposed to private funding or a for-profit model, seems to be the most suitable way of funding innovation intermediaries that fulfil the demand articulation and the brokerage role. It appears difficult to earn sufficient revenues from these activities, and thus for-profit organizations are forced to undertake a project management role in which they may compete with certain R&D and KIBS providers, damaging their perceived credibility as impartial brokers.

2. Public support for innovation intermediaries appears to be needed, but difficult to justify

In light of the discussion of the role of governments in privatized systems of agricultural R&D and KIBS provision, the analysis suggests that an additional role for governments has emerged. Besides being a client for R&D and KIBS and/or a market supervisor (cf. Barnes, 2001; Hanson and Just, 2001; Currle et al., 2002), government also becomes a market facilitator whose aim is that transactions on the R&D and KIBS markets run smoothly and that effective innovation networks are formed. As the typology shows, such facilitation takes place at different levels of system aggregation, with different ambitions and differing time horizons (short/medium/long term). A major concern with respect to the role of governments or other collective bodies in the funding of market facilitation that has emerged from both our analysis and the literature is its justification. Although public (or collective) funding may provide a solution to loyalty and impartiality conflicts, it seems hard to find sufficient justification for such funding. From our analysis it has become clear that innovation intermediaries have difficulty in showing their impact in absolute terms: whereas some evaluations attempt to capture impact through multiplier factors (Arentsen and Janssen, 2003; Beemer et al., 2005), most stick to reporting achievements by using descriptive statistics, i.e. counting participants, activities, number of requests successfully processed etc., and by measuring client satisfaction (KPMG, 2001; Van de Graaff and de Jong, 2002; Arnold et al., 2003; ERM, 2003). These findings concur with findings by others that it is difficult to calculate the effects of innovation intermediaries on innovation in terms of multiplier factors and spillover effects, because of attribution problems (Isaksen and Remøe, 2001; Curran and Storey, 2002). On the one hand, arguments in favour of continued public support can be found: Bessant and Rush (1995, p. 113) refer to the work of innovation intermediaries as 'missionary work', which 'needs to be recognized as a long term education and development process rather than a short-term consultancy, and subsidized as part of infrastructure development within industrial policy'. On the other hand, whereas public funding for innovation intermediaries is generally justified on the basis of market failure arguments, or social economy arguments, justification for innovation intermediaries, and enterprise development programs in general, often rests on assumptions, rather than on proven effectiveness (Curran and Storey, 2002; Phillipson et al, 2004). The effective evaluation of innovation intermediaries would require the development of interactive indicators to measure 'soft' processes like network formation and institutional linkages emerging in the context of innovation (cf. Oughton et al., 2002), and both qualitative and quantitative evaluation methods (cf. Curran and Storey, 2002).

3. Embedding innovation intermediaries in the R&D and KIBS market: establishing the limits of their mandates

It is also essential for public funding agencies to determine whether the innovation intermediaries they fund should focus only on the demand articulation and brokerage roles, or whether they should also engage in innovation process management (given that this role may conflict with services provided by R&D and KIBS organizations). Publicly funded innovation intermediaries may confine their mandate to demand articulation and brokerage (as is now often the case) but encourage their clients to contract specialized service providers (such as specialized project management organizations) to perform the innovation process management role (see e.g. Hinloopen, 2004). The results suggest that innovation intermediaries need to create awareness amongst providers of R&D and KIBS about their activities and added value, as these often do not have a good image of what they do and thus tend to see them as competitors instead of facilitators (see Bureau Bartels, 2004). A complication herein is that some of the activities of innovation intermediaries are also fulfilled by other KIBS providers (see Den Hertog, 2000; Howells, 2006), although generally not in a similar, integrated fashion. Besides raising awareness about their own activities, they can also stimulate increased attention on innovation process management in the training of R&D and KIBS staff. However, whether innovation process managers are contracted by clients or not, it is desirable that publicly funded innovation intermediaries (especially types 1 and 2) fulfil an innovation process monitoring role to remove blockages in the innovation process and, when necessary, re-forge innovation networks. This would call for a broader and more flexible range of activities and time allowed per client than in current (pre-competitive) mandates. Furthermore, the scope of public innovation intermediaries might justifiably not remain confined to only innovative entrepreneurs.

- 4. Innovation intermediaries as a permanent or temporary innovation policy instrument? An interesting question is whether innovation intermediaries that assist agricultural entrepreneurs in their innovation efforts are the product of a transition period: will they disappear when agricultural entrepreneurs have attained the skills to make strategic innovation plans and successfully act on the R&D and KIBS market (cf. Hanson and Just, 2001; Izushi, 2003) and when such capacity building is part of regular education curricula (cf. Henry et al., 2003)? Or will they have a permanent character? A paradox of innovation intermediaries is that they partly derive their existence from the fact that there is opacity on the R&D and KIBS market. Ideally, they should contribute to capacity building so that both sides of the market can learn to manage certain transactions without external help. By doing so, however, they would obliterate their own reason to exist. In this regard, Van der Meulen et al. (2005) suggest that innovation intermediaries constantly need to adapt to institutional changes in the system that they wish to optimize. But market and system failures may be too great to eventually overcome, or the transaction costs may be substantial; such a scenario calls for the continuous intervention of innovation intermediaries. Actors may also decide to contract out innovation intermediation activities, such as demand articulation, network brokerage and innovation process management, when benefits outweigh the costs.
- 5. Achieving coherence in policies with regard to innovation intermediaries This analysis has made it clear that the different types of intermediate organizations operate at various aggregation and complexity levels of innovation. So far,

Dutch agricultural innovation policy with regard to the establishment of innovation intermediaries appears to have been characterized by incoherence and discontinuity. Some of this is due to their being experimental: especially those installed as procurement instruments in the years directly after privatization have disappeared because they could not attain the goals of their paymasters. Incoherence is also demonstrated by the fact that many organizations have been set up (and are planned to be set up and/or expanded) as a result of regional innovation policy. Although a regional focus is positive in the sense that it enhances context sensitivity, the lack of a clear national policy may cause redundancies. Following other critical evaluations (RLG, 2001; Van der Vlist and Van Galen, 2005; AWT, 2005), this calls for the development of coherent policy in which innovation intermediaries cooperate or even merge, instead of compete. Bessant and Rush (1995) foresaw similar expansion in support policies, mechanisms and services and plead for a one stop access point. It seems that only recently the Dutch Ministry of Agriculture has recognized this and has installed a special coordination unit for innovation support policies (LNV, 2005a). Integration with support instruments of the Ministry of Economic Affairs has also been sought (an example is Syntens Agro). Coherence in innovation support policies should also link 'soft instruments' (awareness raising, networking, consultancy, training, i.e. functions of innovation intermediaries) to 'hard instruments' (such as physical infrastructure, funding) (Kaufmann and Tödtling, 2002; North and Smallbone, 2006).

5.6 Conclusion

As this chapter has shown, innovation intermediaries can contribute to relieve several of the constraints that have emerged for both the demand and the supply side in the market for R&D and KIBS. They can facilitate the formation and maintenance of innovation networks, and therefore can play an important role in an agricultural sector in which entrepreneurship and innovation are seen as important assets for survival. In addition to these intermediaries providing the services of demand articulation, network brokerage and innovation process management in the case of specific innovations, this study has shown that because of their pre-competitive scope and impartial position they can fulfil an important liaison function in the agricultural innovation system and restore the innovation systems interaction and coordination that have been disturbed by privatization processes. Furthermore, they may raise awareness and help build capacity with regard to competences needed for innovation, information acquisition on the R&D and KIBS market, and demand-driven R&D and KIBS delivery. Innovation intermediaries hence provide a new agricultural innovation policy instrument for policy makers. In the context of the roles for government after the privatization of agricultural research and extension establishments in the provision of knowledge-intensive services to support agricultural innovation, a third role has emerged in addition to the two role commonly mentioned in the literature. Besides directly contracting services that fulfil a public good role (i.e. becoming a client) and acting as a market supervisor, government becomes a market facilitator. The public interest involved in acting as a market facilitator is that it catalyzes innovation, which in current policy and scientific literatures is seen as key to economic viability. Rivera et al. (2005) see system coordination as an essential role for government in current pluralistic agricultural knowledge and information systems. In the Dutch context, the installation of innovation intermediaries has been a process of trial and error, because their embedding in the knowledge infrastructure is a continuous process of institutional learning for both the innovation intermediaries and the actors in the agricultural knowledge infrastructure, and the broader innovation system to which they are connected. To enhance coherence in agricultural innovation policy, we concur with Smits and Kuhlmann (2004) that further comparative analysis is needed on the interaction between the different types of intermediary intermediaries, i.e. how the functions these instruments fulfil at micro-, meso- and macro-system levels interlock. Such studies should give insights into how synergies can be reached, and how redundancies and omissions can be avoided.

Although revealing several positive contributions of innovation intermediaries, the chapter has shown that, in practice, proper justification of public spending on innovation intermediaries appears difficult, because of the invisibility and immeasurability of the services they provide in the end result of the innovation process. As determining the impact of innovation intermediaries is inherently difficult, additional systematic analysis (both quantitative and qualitative) of the effects of the support tools of innovation intermediaries on innovation routines of agricultural entrepreneurs is therefore desirable.

6

Balancing multiple interests

Embedding innovation intermediation in the agricultural knowledge infrastructure

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Abstract

The purpose of this chapter is to provide insights into the emergence, embedding and optimal design of intermediaries who act as a bridge between demand and supply in the agricultural knowledge infrastructure. Using a case-study approach, the chapter focuses on the relationships between a for-profit intermediary organisation in The Netherlands and several parties for which it performs various bridging functions, i.e., coupling these parties in particular innovation processes and channelling their subsequent interactions. The findings suggest that although innovation intermediation is seen as beneficial, tensions emerge regarding the innovation intermediary's governance structure, the way it generates its revenues and the different activities it performs. A clearer delineation between its different activities has to be made in order to minimise competition with other providers of R&D and knowledge intensive business services, and to protect its credibility and impartiality. Furthermore, some tasks of innovation intermediaries are best funded publicly, whereas others should be funded privately. The originality of the chapter lies in the fact that it focuses on relationships between an innovation intermediary and the supply side of the knowledge infrastructure, whereas typically the focus is on interactions with end-users of knowledge and information.

6.1 Introduction

The purpose of this chapter is to provide insights into the changing relationships within agricultural knowledge infrastructures, i.e., between the demand side (endusers of innovations such as agricultural entrepreneurs, government) and the supply side (providers of R&D and knowledge intensive business services - KIBS³⁸), and to report on and critically examine the emergence and embedding of intermediaries who act as a bridge between demand and supply for knowledge and information to support innovation.

Against a background of an agricultural sector becoming organised along demanddriven production chains in competitive global markets (Zilbermann et al., 1998; Reardon et al., 2003), these 'innovation intermediaries' have emerged to assist agricultural entrepreneurs in coping with challenges such as articulating their innovation needs, contracting appropriate services for the support of their innovation projects and successfully executing these projects. Entrepreneurship and innovation are seen as key to successful performance in the current agricultural sector (Phillipson et al., 2004; Knudson et al., 2004). Such innovation intermediaries act as a bridge between the demand side and the supply side of the agricultural knowledge infrastructure. As innovation intermediation can itself be considered a KIBS, the chapter aims to provide insights into how for-profit type innovation intermediaries become embedded into the agricultural knowledge infrastructure.

Section 6.2 contains a brief review of recent thinking on innovation, followed by a brief overview of important changes that have occurred in the agricultural knowled-ge infrastructure and challenges that have emerged as a result of these changes. The role of innovation intermediaries is then explained. In section 6.3, the case of the innovation intermediary, InnoFac Ltd.³⁹ is presented, and the goal of the chapter is explained. After a brief discussion of the research methods in section 6.4, section 6.5 presents the results of the current research. This is followed by a discussion in section 6.6. Finally, the conclusions are presented in section 6.7.

6.2 Changes and challenges in the support of agricultural innovation

6.2.1 Changes in thinking on innovation

In the agricultural innovation literature as elsewhere (see Smits and Kuhlmann's (2004) review), the linear view on innovation (i.e., agricultural R&D generates technologies that agricultural extension transfers to agricultural producers for adoption) is criticised, and replaced by innovation systems approaches (e.g., Röling and Engel, 1991; Hall et al., 2003; Sumberg and Reece, 2004). Innovation is considered a complex, interactive process in which there is a large amount of co-evolution of scientific, technological and societal systems, in which cause and effect are often difficult to distinguish (Smits, 2002). It requires deliberate efforts to create effective linkages between technological arrangements, people and social-organisational arrange-

ments (Geels, 2004), i.e., between hardware, software and orgware (Smits, 2002). Whereas linear views on innovation are considered to be largely supply-driven, systems approaches emphasise the needs of the demand side and active involvement of end-users of innovations (Edquist and Hommen, 1999; Oudshoorn and Pinch, 2003).

In the innovation systems perspective, several actors are seen as relevant to agricultural innovation, including agricultural entrepreneurs, researchers, consultants, policy makers, supplier and processing industries, retail, customers. These actors form networks, called innovation configurations by Engel (1995) and coalitions by Biggs and Smith (1998), to engage in a process of joint learning and negotiation to shape an innovation. Involvement in effective networks is considered as key to innovation, as a broad review of literature on networking and innovation by Pittaway et al. (2004) indicates. In such innovation configurations or coalitions, agricultural R&D and KIBS are not the dominant providers of knowledge and information, but are amongst many stakeholders (Van Dijk and Van Boekel, 2001; Sumberg, 2005). In the innovation systems perspective, production and exchange of (technical) knowledge and information are not the only prerequisites for innovation; several additional factors play a key role, such as policy, legislation, infrastructure, funding, and market developments (Klein Woolthuis et al., 2005)

6.2.2 Changes in the agricultural knowledge infrastructure

Because of I) the changing structure of agricultural markets and the agricultural sector and 2) the privatisation of the public agricultural knowledge infrastructure (i.e., applied agricultural research institutes and agricultural extension services), the support of innovation in the agricultural sector has recently undergone major changes. As far as the first phenomenon is concerned, a transition from the production of commodities to differentiated products, new types of products (e.g., algae culture) and new services (e.g., landscape management) can be observed (Zilbermann et al., 1998; Van Huylenbroeck and Durand, 2003). This transition has major repercussions on the agricultural knowledge infrastructure because as a result a different demand for knowledge arises (Janssen and Braunschweig, 2003). As Smits puts it (2002: 868): 'While in the 'old' agricultural sector, dominated by mass production, the request for new knowledge and technologies had a rather homogeneous character, the diversification of products in the 'new' agricultural sector will lead to the agricultural knowledge infrastructure no longer having a more or less homogenous group as a customer, and will need to start anticipating the wishes of customers with very different needs and wishes. This development will have an enormous impact on the content, organization and institutionalization of the agricultural knowledge infrastructure and more in particular on the interface between the users and producers of knowledge.'

The second major change has been the privatisation of public agricultural knowledge infrastructures. Agricultural knowledge and information were considered as public goods, provided by the state through public applied agricultural research institutes and extension services (Bennett, 1996; Rivera, 2000; Lacy, 2001). However, in practice these were often not the exclusive source of knowledge and information for innovation: private service providers were also active (Biggs, 1990). Privatisation has led, depending on the local context, to either the emergence or acceleration of a market for agricultural R&D and KIBS for the support of agricultural innovation (Holt, 1998; Leeuwis, 2000; Levidow et al., 2002). Knowledge and information become private or toll goods (as far as characteristics such as excludability and rivalry make this possible - see Kidd et al., 2000; Hanson and Just, 2001) for which users have to pay.

Both developments have led to the emergence of a 'second knowledge infrastructure', defined as 'an informal (private) second knowledge infrastructure or knowledge base, partially complementing and partially taking over the intermediary role traditionally played by parts of the more institutionalised, formal (public) first knowledge infrastructure.' (Den Hertog, 2000: 518)

6.2.3 Challenges on the demand and supply side

Starting from an innovation systems perspective with a strong emphasis on effective linkages between actors, the changes in the interface between producers and users of knowledge and information discussed above pose a number of constraints and challenges to actors in the agricultural knowledge infrastructure.

On the demand side, the changing structure of the agricultural sector makes new demands on farmers' entrepreneurial skills. With regard to coping with these new demands Phillipson et al. (2004: 32) state: 'Farmers are being encouraged to be more market oriented, to seek out new opportunities, and to act in a more strategic manner. This shift from a production to a business and market orientation has focused attention on the adequacy and application of generic business skills within the farming sector as opposed to technical skills and knowledge in livestock and crop production.'

Farmers hence have to become agricultural entrepreneurs who need to play an active role in the acquisition of knowledge and information to support their business strategies and innovation projects (Gielen et al., 2003; Knudson et al., 2004; De Lauwere, 2005). Instead of being beneficiaries, receiving free-of-charge innovation support from a public service, agricultural entrepreneurs need to explore the market and contract suitable private providers of R&D and KIBS (besides finding other cooperation partners). Because of market failures, such as information asymmetries and poor identifiability of R&D and KIBS service value, and imperfections in their competences, they face constraints with regard to setting up innovation projects. The constrains experienced by agricultural entrepreneurs are similar to those experienced by non-agricultural SMEs as both types of enterprise display similar characteristics (Röling, 1990; Senker and Faulkner, 2001). These include: lack of awareness of strategic, organisational, and technological deficiencies; difficulties in needs articulation; embeddedness in strong networks, which may preclude new insights; lack of awareness of and/or failing access to appropriate sources of know-

ledge and information; and practical constraints such as lack of time and funds for innovation (Vos et al., 1998; Bessant and Francis, 1999; Kaufmann and Tödtling, 2002; De Groot, 2003; Garforth et al., 2003a; Edwards et al., 2005). The constraints that have to do with search costs associated with identifying potential transaction partners and difficulties in ex ante evaluation of R&D and KIBS service value are often labelled as an 'information gap' (Bougrain and Haudeville, 2002; Izushi, 2003). In a similar vein, Johnson (2004) and Pollock et al. (2004) talk about 'structural holes' (Burt, 1992). These exist when parties do not pay attention to each other and do not exchange information in the course of social interaction. The constraints that result from SMEs' deficient competences in setting up innovation projects are labelled as a 'managerial gap' (Vos, 2005). Other R&D and KIBS clients, such as government, may also experience information and managerial gaps (Echeverría and Elliot, 2002).

On the supply side, traditional providers of agricultural R&D and KIBS also face several constraints and challenges. Because of increasing product differentiation and producer specialisation, they need to offer tailor-made services in order to respond to the heterogeneous demand for knowledge and information (Smits, 2002; Janssen and Braunschweig, 2003). This also entails a shift away from the traditional focus on the technicalities of production, towards more generic business consulting services. Phillipson et al. (2004) argue that, in the present context of 'entrepreneurial' farming, providers of traditional advisory services are not suited to provide generic business support to farms, and suppliers of non-agricultural support services and farmers are often still unfamiliar with dealing with one another. However, as Leeuwis and Van den Ban (2004) observe, there is a noticeable shift in the services provided by traditional agricultural KIBS: they no longer offer merely technical advice but also services such as entrepreneurship assistance, financial management and business management.

Developments in general science and their applicability to agriculture (e.g., vision technologies, nanotechnology) make the demarcation of 'agricultural sciences' increasingly blurry (Roseboom and Rutten, 1998; Janssen, 2002). This implies that providers other than those traditionally active in agricultural R&D and KIBS, such as general universities, may become active in those markets. Traditional providers of R&D and KIBS thus need to intensify procurement efforts. The resultant requirement for them to become more client-oriented calls for institutional change towards a demand-driven mode of working (Byerlee et al., 2002; Levidow et al., 2002; Hall et al., 2003) forming effective linkages with industry and government (Etzkowitz and Leydesdorff, 2000) and society as a whole (Gibbons et al., 1994). However, inappropriate organisational incentives, or cultural and cognitive differences between different actors involved in innovation configurations, may hamper a demand-driven mode of working and an efficient exchange of knowledge and information (Caputo et al., 2002; Nooteboom, 2002). This holds especially true for traditional R&D providers, such as research institutes and universities, and reduces their appeal to agricultural entrepreneurs as cooperation partners (Caputo et al., 2002;

Pannekoek et al., 2005). Several studies show that both agricultural and non-agricultural SMEs prefer other sources of information (such as peers, suppliers, clients, professional magazines) above R&D institutes (Kaufmann and Tödtling, 2001; Gielen et al., 2003; Solano et al., 2003; Kingsley and Malecki, 2004).

Changes in reward systems also present a challenge. The competition that arises between different R&D and KIBS providers makes them act strategically with regard to the sharing of knowledge and information, and leads to closure of agricultural knowledge infrastructures (Boehlje, 1998; Leeuwis, 2000; Lacy, 2001). A focus on capitalisation of knowledge through patents can hamper knowledge development because of access restrictions (Heller and Eisenburg, 1998) and may conflict with academic incentives that call for publication (Beesley, 2003). Changing systems of public financing of R&D and KIBS provision (from input financing to output financing, introduction of competitive grant systems, the need to find matching funds) cause uncertainty and raise transaction costs (Huffman and Just, 1999a; Echeverría and Elliot, 2002). A strong focus on pre-defined results may be counterproductive for the development of creative ideas (Leeuwis, 2000).

6.2.4 The emergence of innovation intermediaries

As a response to the several constraints and challenges apparent on both the demand and supply side of the agricultural knowledge infrastructure, intermediaries have emerged whose primary aim is to enhance interaction between agricultural entrepreneurs and providers of R&D and KIBS in innovation processes. Such innovation intermediaries (Howells, 2006) have the objective of fulfilling a bridging function between the demand side and the supply side in the knowledge infrastructure, i.e., they aim to overcome information gaps, managerial gaps, and cultural and cognitive gaps in relation to innovation processes.

In the agricultural literature, innovation intermediaries have been mentioned in prospective and preliminary studies as possible solutions to uncertainties resulting from the transformation to R&D and KIBS markets (Senker and Faulkner, 2001; Clark, 2002; Garforth et al., 2003a; Sulaiman et al., 2005), and some empirical studies have been undertaken to describe them (Phillipson et al., 2004; Smits and Kuhlmann, 2004; Smallbone et al., 2003; North and Smallbone, 2006). However, innovation intermediaries have been more extensively described in the industrial literature, which is ample but dispersed, as Howells (2006) notes.

In both the industrial and the agricultural literature, an unequivocal description of innovation intermediaries seems to be lacking however. They are described in several ways, e.g., as brokers, third parties, knowledge intermediaries, boundary organisations, and systemic instruments (e.g. Kaufmann and Tödtling, 2001; Hargadon, 2002; Pittaway et al., 2004; Smits and Kuhlmann, 2004, see Howells, 2006 for more descriptions). Also, several definitions have been coined to capture what constitutes 'innovation intermediation'. In an attempt to synthesise the many existing definitions, Howells (2006: 720) defines an innovation intermediary as: 'An organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties. Such intermediary activities include: helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between, bodies or organizations that are already collaborating; and helping find advice, funding and support for the innovation outcomes of such collaborations.'

On the basis of this definition, the main functions of innovation intermediaries were initially seen to be: scanning and information processing; knowledge processing; scoping and filtering (selection of collaborative partners and network brokerage); gate-keeping and knowledge brokering; knowledge testing and validation; and knowledge commercialisation. Based on empirical work this list was expanded with what Howells calls 'unrecognised and undervalued' functions such as foresight and diagnostic work (problem specification); accreditation, validation and regulation, and standards work; independent advice and mentoring on protecting intellectual property; and evaluation of the outcomes of innovation collaboration (see Howells, 2006: 721-722, for a more elaborate description of the abovementioned functions). Whereas some innovation intermediation functions appear to be primarily targeted at assisting individual firms in innovation processes, others have a more systemic focus. According to Smits and Kuhlmann (2004), these so-called systemic instruments fulfil functions such as the management of interfaces, building and organising (innovation) systems, providing a platform for learning and experimenting, providing an infrastructure for strategic intelligence, and stimulating demand articulation, strategy and vision development. Howells (2006) calls this an 'animateur' role to create new possibilities and dynamism within a system.

6.2.5 Innovation intermediation as a core business or as a function within regular KIBS?

A complexity with regard to innovation intermediation is that it appears to be hard to define what constitutes a 'pure' innovation intermediary, i.e., to distinguish these from other KIBS, as KIBS are seen to fulfil several intermediary roles relating to innovation within the present (agricultural) knowledge infrastructure. Smedlund (2006: 210) defines an intermediary in a knowledge system as 'an organization that functions in the midst of the users and producers of knowledge'. In the linear model of innovation, intermediaries were seen to facilitate technology transfer from science to end-users (a role previously fulfilled by agriculture extension services in the old agricultural knowledge infrastructure). In the current systems perspective on innovation, KIBS are seen not only to transmit knowledge but also to re-engineer knowledge, i.e., fostering several multilateral knowledge flows (Den Hertog, 2000). As innovation intermediation forms part of fostering such multilateral knowledge flows, it can thus also be seen as a KIBS.

The degree to which KIBS (as well as R&D) organisations act as innovation intermediaries differs however. Howells (2006: 720) states that 'organizations identified as providing intermediary roles in innovation processes are complex and multiple entities, whose primary role may often not be as an intermediary' and further states (2006: 726): 'Organizations providing intermediation functions do not solely or even wholly restrict themselves to intermediary functions, but also cover more traditional contract research and technical services which involve no third-party type collaboration. Care is therefore needed in classifying and describing an organization solely as an innovation intermediary.'

For example, Bessant and Rush (1995) identify many innovation intermediation roles within KIBS providing traditional consultancy.

To distinguish pure innovation intermediation KIBS from other KIBS, a distinction made by Den Hertog (2000) may provide clarity. Pure innovation intermediaries should be considered facilitators of innovation (supporting the client in an innovation process but the innovation neither originates from, nor is transferred by, the particular KIBS provider), whereas traditional R&D and KIBS should be considered as either sources of innovation (playing a major role in initiating and developing an innovation) or carriers of innovation (transferring an innovation that does not originate from the particular KIBS provider). A pure innovation intermediary would then have facilitation of innovation as its core business, rather than being also a source or carrier of innovation. A key premise of this facilitator role is an impartial and independent position (Isaksen and Remøe, 2001; Hanna and Walsh, 2002). Following this line of thought, Kolodny et al. (2001) formulated a number of design requirements that they see as essential for proper functioning for pure innovation intermediaries that target SMEs: (1) visibility and accessibility to SMEs, (2) trustworthiness to SMEs, (3) access to appropriate sources of knowledge and information relevant to the innovation process, (4) credibility of the intermediary organisation with these sources, (5) quick response to the requests of SMEs, and (6) complementarity to the weaknesses of the SMEs it serves.

On the basis of market failure arguments (particularly information failures - Curran and Story, 2002) or social economy arguments (Phillipson et al., 2004), intermediary organisations functioning as pure innovation intermediaries are often policy induced and publicly funded as a part of formal SME enterprise development programmes (Malecki and Tootle, 1996; Huggins, 2000; Kolodny et al., 2001; Laschewski et al., 2002; Phillipson et al., 2004; Thorpe et al., 2005; North and Smallbone, 2006). However, as such funding is typically on a temporary basis, public innovation intermediaries have to become self-sufficient (Malecki and Tootle, 1996; Rosenfeld, 1996; Ffwocs-Williams, 2000). Consequently, they become a player themselves, as a KIBS provider, in the market for R&D and KIBS.

6.3 Goal, case selection, and research questions

Despite the existence of a substantial body of work about the benefits of innovation intermediaries to SMEs (e.g. Major and Cordey-Hayes, 2000; Kolodny et al., 2001; Isaksen and Remøe, 2001; Kaufmann and Tödtling, 2002; Caputo et al., 2002; Izushi, 2003; Smallbone et al., 2003), pleas have been made for further investiga-

tion. Hanna and Walsh (2002) and Pittaway et al. (2004) have found that the role of third parties operating within networking structures is under-researched, and Smits and Kuhlmann (2004) plead for the stock taking of systemic instruments. While acknowledging the importance of studying the relationships between end-users of knowledge and information and innovation intermediaries, and recognising that to assess the actual effect on the innovation process relationships of such bridging organisations both the demand and the supply side of the knowledge infrastructure need to be studied, the chapter focuses on relationships with the supply side, i.e., R&D and KIBS. Since innovation intermediaries have emerged to tackle several market and system failures that have arisen in the transition of the agricultural knowledge infrastructure, it is crucial to know how they become embedded in the system whose functioning they wish to optimise. Especially relevant in this sense is how they relate to the traditional providers of R&D and KIBS, which also provide services to support innovation. Because several of these services are also of an intermediary nature this is, according to Den Hertog (2000), an important unanswered research theme relevant to the formulation of innovation policy. Howells (2006: 725) states in this respect: 'Much more research needs to be undertaken into the nature of the relationships that intermediaries exist in (...) most of the discussion about intermediaries has been in the context of their function and not their network relationships. Simple triadic structures are mainly implied, whilst where more complex multi-actor relationships in terms of intermediation are, en passant, acknowledged they are then largely ignored.'

The case presented here is that of an innovation intermediary in The Netherlands, called here InnoFac. InnoFac started operations in 2003. It is located in the south east of The Netherlands. The firm consists of seven persons: a director/manager and three so-called co-innovators, and three persons engaged in support tasks. Following Howells' (2006) typology, it performs the following innovation intermediation tasks: diagnostics (problem specification and articulation of information needs and requirements of the client), scanning and information processing (information gathering and identification of potential collaborative partners), scoping and filtering (selection of collaborative partners and network brokerage), gate-keeping and knowledge brokering (in the sense of improving knowledge exchange in multi-actor learning processes (cf. Hargadon, 2002)), arranging intellectual property protection, and implementation of innovation process outcomes (i.e., testing, validation, and training). InnoFac explicitly presents itself as a facilitator of innovation, i.e., as a pure innovation intermediary. InnoFac is distinctive from most other pure innovation intermediaries with respect to funding and governance structure.

Regarding funding: whereas subsidised organisations target a certain audience within a non-competitive mandate, InnoFac has to earn its income from the market by charging for the innovation intermediation activities it executes for its clients. Although in the literature the execution of innovation intermediation tasks by private for-profit consultancy firms is discussed (Bessant and Rush, 1995; Den Hertog, 2000; Massey, 2003; Bureau Bartels, 2004; Howells, 2006), innovation intermedia-

tion is InnoFac's core business whereas in consultancy firms it is often a side activity (these are usually also sources and/or carriers of innovation (Den Hertog, 2000)). Connected to this issue, a key research question is: How do traditional providers of KIBS (i.e., R&D or other agricultural KIBS) perceive the activities of pure innovation intermediaries, and how do they relate these to their own activities? How does this in turn affect the functioning of pure innovation intermediaries?

Regarding governance structure: Whereas most other pure innovation intermediaries are public organisations or non-profit organisations, InnoFac is a private firm with a number of shareholders. These shareholders come from both the public (municipalities, provinces) and the private sector (privatised research institutes, banks, agricultural supplies companies). They have invested because they see the potential of an independent innovation intermediary to add value by connecting demand and supply in the market for agricultural R&D and KIBS. They also see an added value in its systemic function as an 'animateur' of agricultural innovation (a typical role for intermediaries operating on a regional scale, according to Smedlund, 2006). Connected to this issue, a key research question is: How does an innovation intermediary manage different shareholders' interests in light of its impartial position?

Hence, rather than studying the actual effect of an innovation intermediary's involvement on the outcome of innovation processes, the chapter aims to provide insights into how innovation intermediaries affect the institutional setting and dynamics within agricultural knowledge infrastructures, and in turn how institutional settings affect the performance of innovation intermediaries. In the context of innovation systems in which major changes in the relationship between users and producers of knowledge are taking place, this may give insight into how innovation intermediation can best be operationalised. It is especially relevant for the formulation of innovation policy in view of policy makers' desires to make innovation intermediaries self-sufficient.

6.4 Methods

The fact that InnoFac is solely dependent for its continued existence on its performance as a pure innovation intermediary makes this is an interesting case. Against the background of other innovation intermediaries being predominantly subsidy driven, one may even speak of a revelatory case, which according to Yin (2003: 42) occurs when 'an investigator has an opportunity to observe and analyse a phenomenon previously inaccessible to scientific investigation', and which justifies the single case set-up of this study. For this study, 40 open semi-structured interviews were conducted with staff of R&D providers (18), KIBS providers (3), municipalities (3), regional government (4), farmers' organisations (which also have their own KIBS branches) (4), other intermediary organisations (5), and agricultural supply companies (3). Open interviews with InnoFac's director and the three co-innovators were also conducted. Respondents were selected on the basis of cooperation with InnoFac and were obtained through snowball or chain sampling (Patton, 1990). The interviews were geared towards identifying respondent practices, perceptions, and evaluations regarding InnoFac. A qualitative approach was chosen because of the explorative character of this study that aims to identify the important achievements, bottlenecks, and pitfalls that emerge in the interaction between InnoFac and the supply side actors with which it cooperates. The interviews were tape-recorded and fully transcribed to capture subtleties in the data (Emans, 2002). Because of the single case character, the results may not be simply generalisable but may nevertheless indicate key issues. The study was carried out between February and April 2005.

6.5 Results

6.5.1 Perceptions about significance of InnoFac's activities to R&D and KIBS providers

InnoFac's main activities are seen to be matchmaking and network brokerage, and knowledge brokerage, and it is seen to have a general systemic function as initiator and catalyst of innovation. Diagnosing problems and (latent) innovation needs was generally not explicitly mentioned as a separate activity of InnoFac. The perception that InnoFac is successful in arriving at the core of the client's innovation query indicates that these functions are, however, implicitly recognised. Benefits for agricultural entrepreneurs are seen to be (from the supply-side point of view):

- The problem is thoroughly analysed, and knowledge and information needs are clearly articulated. This provides clarity for clients about the investments they have to make in terms of the purchase of innovation support services (R&D and KIBS). Actors on the supply side of the R&D and KIBS market perceive that this makes it easier for agricultural entrepreneurs to approach them.
- InnoFac has a good overview of the different sources of knowledge and information. This implies a reduction in the investments that agricultural entrepreneurs have to make in the search for and selection of suitable parties with whom to cooperate.
- InnoFac speeds up innovation processes by focusing on clear objectives. This is seen to have a positive effect on the willingness of agricultural entrepreneurs to become engaged in an innovation process. It deviates from how researchers often work: they aim to get a very detailed and comprehensive view on the matter. This would scare off agricultural entrepreneurs from cooperating with them, because of the lack of a clear and manageable goal.

For R&D and/or KIBS providers the following benefits are mentioned:

• Through InnoFac, R&D providers can get into contact with agricultural entrepreneurs that would normally be hard to find and/or approach. R&D providers find that InnoFac serves as an outsourced procurement instrument for them, leaving more time to researchers to do actual research.

• It enhances contact of R&D providers with what is happening 'in the field', because InnoFac (through involvement in regional platforms) is more aware of current regional developments.

With regard to its systemic value, the following benefits are recognised:

- InnoFac finds and matches several parties relevant to an innovation process who otherwise would be less likely to have come together. InnoFac motivates people to innovate and catalyses innovation processes in the region by synchronising the ideas, goals, and expectations of several actors relevant to a particular innovation.
- InnoFac speaks the language of agricultural entrepreneurs, policy makers and researchers. It can thus transcend the different discourses and act as a knowledge broker. InnoFac bridges some of the gaps that exist between the modus operandi of the entrepreneur and the researcher with regard to innovation.
- Also the possibility of 'crosspollination' with actors from sectors other than those traditionally involved in the agricultural sector (i.e., other R&D institutes, KIBS providers and hardware companies) is seen as a positive aspect.

Despite these apparent benefits of being a problem clarifier, a needs articulator, a network broker and a knowledge broker a number of tensions are identified.

- Through the brokerage process, InnoFac clients are referred to those parties that possess the best qualities to help them to advance in their innovation projects, regardless of what kind of organisations these may be. For Innofac this is not a tension as this is how it aims to work, and this corresponds with fundamental 'design requirements' such as impartiality and credibility in the eyes of SMEs (cf. Kolodny et al., 2001). However, R&D providers that participate as shareholders see a 'portal' function in the network brokerage task that InnoFac performs: in their view, InnoFac is a procurement instrument that refers potential clients only to them, generates pure research questions and facilitates their investigation. InnoFac regards this attitude of R&D organisations as undesirable, because it claims to be independent from its shareholders. Several respondents belonging to R&D organisations indicated that they were disappointed not to be regarded as a preferred provider, and even tend to see InnoFac as a competitor in project procurement.
- The apparent link to shareholding R&D institutes generates another unwanted effect. Although InnoFac claims to be impartial as a broker, R&D organisations and KIBS providers who do not participate as shareholders interpret the apparent connection with shareholding R&D institutes as meaning that it actually is a portal for shareholders. This reduces InnoFac's credibility in their eyes. This is further enhanced by the fact that InnoFac refers to shareholding R&D and KIBS providers as its 'back office' in its early publications.

As regards the roles that InnoFac performs when parties have been matched and an

actual innovation process has started, such as knowledge brokerage, facilitating access to investment capital, and implementation of new knowledge, respondents are very critical. The main criticisms are:

- The functions that InnoFac executes as a pure innovation intermediary are perceived to be insufficiently differentiated from some roles KIBS and R&D providers perform during innovation processes.
- InnoFac goes beyond its role as facilitator of innovation and also executes certain advisory, organisational, and research activities, e.g., the organisation of events, and the execution of preliminary studies. Such acting as a source and/or carrier of innovation is seen by R&D and KIBS providers as direct competition.
- R&D and KIBS organisations also perceive that InnoFac sometimes unnecessarily places itself between them and agricultural entrepreneurs to channel their interactions, although they are confident that such an intervention is unnecessary.
- Despite appreciation on the part of R&D providers that InnoFac sharply delineates the scope of the project and monitors its progress, InnoFac is perceived as trying to extract as much as possible, pressing researchers to do more than they are actually paid for (which actually would correspond with a broker's task of getting best value for money (cf. Hinloopen, 2004)).

6.5.2 Perceptions about InnoFac's firm structure

As explained in section 3, InnoFac has to derive its income from user payments. It employs a system in which it charges a percentage of the total project value for each project for which it successfully acts as an innovation intermediary. It thus sells a complete package of R&D and KIBS services contracted from and delivered by other suppliers to the client, and charges a percentage of its value. It does not sell content relevant to the nature of the innovation (e.g., technical knowledge), rather, it sells process facilitation.

The positive aspect of this system is that it is seen to be an incentive to work quickly in a result-oriented manner, without wasting any energy on unfeasible projects. On the other hand, the approach also presents a number of pitfalls:

- Innovation processes generally need considerable time to materialise and require a lot of 'invisible' preparatory work (such as problem analysis, needs articulation and network brokerage). On the one hand, it would be difficult to charge on an hourly rate or fixed price basis for such activities, as willingness to pay may be low since results often do not concretise in the early phases of an innovation process. On the other hand, a complication for the tariff calculation method based on a percentage of the project cost is that innovation projects may not materialise at all, or may be much smaller than anticipated, with the result that the tariff may not cover the expenses.
- InnoFac's tariff calculation method is perceived to be opaque. The relationship between InnoFac claiming a percentage of the total project value and the added

value of InnoFac's activities is not specified clearly enough in the eyes of both demand and supply-side parties. Some respondents claim that, through InnoFac's intervention, R&D and KIBS services should become cheaper, because R&D and KIBS providers will not need to include the costs of procurement in their tariffs. A willingness to do so has not been observed however, as InnoFac staff have indicated. Others feel that, because the tariff calculation method is based on a percentage of the project cost, InnoFac may prefer to opt for large projects, since this would bring in more revenues. From the perspective of agricultural entrepreneurs, research projects have to be as small and cheap as possible. However, R&D providers complain that most of the projects so far created through brokerage by InnoFac have not been large enough. Because of this perceived conflicting interest with regard to project size, several respondents think that the tariff calculation method may threaten InnoFac's credibility as an independent and impartial network broker.

6.5.3 The position of other innovation supporting organisations vis-à-vis InnoFac

Most of the respondents (75%, n=40) do not perceive InnoFac as a competitor. Those that do (20%, n=40) are staff of R&D and KIBS organisations. Their main reasons for this are the previously mentioned (see section 5.1) expectation that InnoFac would serve as a procurement instrument through its brokerage function, and the fact that these respondents see some of the tasks in the management of the innovation process as advisory tasks they themselves could also fulfil. Some respondents from farmers' organisations view InnoFac in part as a competitor. They expressed the worry that InnoFac may become a competitor with regard to expressing opinions and views (invited or uninvited), since it is an active participant in various multi-stakeholder platforms concerned with development of rural areas in the region.

Those that do not see InnoFac as a competitor have several reasons for this. Some staff of R&D organisations do not see it as a competitor because they are confident that InnoFac will need to refer clients to their organisations, since InnoFac does not possess the specific expertise itself. Municipal and regional governments see InnoFac as an instrument to develop a broader network and improve communication with other actors relevant to innovation. Other intermediary organisations see InnoFac as complementary to their own activities, since they differ in the types of innovation they want to instigate (incremental or radical innovation), their audience (innovations in the public or private sphere), and their geographical reach (national, regional).

6.6 Discussion: tensions in the functioning of a for-profit innovation intermediary

As the results show, respondents on the supply side of the R&D and KIBS market, as well as other organisations with a policy focus on supporting agricultural innova-

tion, perceive a pure innovation intermediary as having several positive influences. However, a number of tensions can also be perceived, from which certain implications can be derived relevant to the design of innovation intermediaries, and their embedding in the knowledge infrastructure.

6.6.1 Tensions in maintaining an impartial position

A first set of tensions has to do with the influence of the governance structure of an innovation intermediary on its desired role as a credible and impartial broker. The results suggest that, when several parties participate as shareholders, these also express a direct, stakeholder interest in an innovation intermediary's activities. This may result in role ambiguity. Participating R&D providers support the work of an innovation intermediary through their investments as shareholders, but are at the same time a direct stakeholder in the brokerage process because they desire to receive referrals for their services. Even though there is recognition that an innovation intermediary must act impartially, there is often an implicit expectation that it is there to create a direct return on investment for shareholders by generating R&D projects. Letza et al. (2004: 243) state with respect to shareholding that it 'regards the firm as a legal instrument for shareholders to maximise their own interests investment returns.' Apart from this being a complication in the management of relationships with shareholding R&D providers when these expectations cannot be fulfilled, it also has consequences for relationship management with other R&D and KIBS providers. An innovation intermediary may be seen as partial because of supposed interwovenness with shareholding R&D providers. Other studies have made similar observations to the effect that, when an innovation intermediary is linked to a 'content providing' R&D or KIBS organisation, it is not seen as sufficiently impartial (Isaksen and Remøe, 2001; AWT, 2005).

Besides the issue of implicit expectations of return on investment, the results indicate that there is a general risk of an innovation intermediary becoming a vehicle for realising other parties' objectives and expectations. The results suggest that this may be partly attributable to its embeddedness in the region in which it is active, in the role of innovation intermediary and 'animateur' of innovation (cf. Howells, 2006; Smedlund, 2006), and the expectations of the shareholders. This situation can be beneficial to an innovation intermediary because of easier access to certain resources, but can also be a hindrance because of diverging interests and expectations. For R&D providers it should generate business, i.e., research projects. For agricultural entrepreneurs it should efficiently and effectively guide an innovation process. For municipal and regional governments it should help realise and implement policy. Other intermediary organisations wish to dovetail their activities with those of InnoFac, so that they can supplement each other. KIBS organisations welcome it as a network broker, but see it as a competitor in the provision of certain services during the innovation process. Farmers' representatives positively evaluate its contribution to innovation, but at the same time see it as a threat in terms of InnoFac's role as an opinion leader in its role of 'animateur'. There is thus vagueness about the

different roles that InnoFac is desired to play, i.e., whether it is a 'sparring partner' for the development of ideas on innovation, a broker that matches demand and supply in the knowledge infrastructure, a delegated taskmaster for agricultural entrepreneurs and hence client of R&D and KIBS providers, or a mere procurement instrument for R&D and KIBS providers.

A social dilemma situation can be observed in the attitudes of shareholding parties towards innovation intermediaries. Ostrom (1998: 1) states that 'Social dilemmas occur whenever individuals in interdependent situations face choices in which the maximization of short-term self-interest yields outcomes leaving all participants worse off than feasible alternatives.' This case has revealed two ways in which such a social dilemma manifests itself. One manifestation is that, by investing in an innovation intermediation organisation, shareholders can be considered to be making an investment in the public interest (i.e., the systemic, 'animateur' of innovation function). However, the same shareholders also want to use the innovation intermediary to satisfy their self-interests by using it for procurement or as a policy realisation instrument (a risk also observed by Isaksen and Remøe (2001), and Laschewski et al. (2002)). The other manifestation is that, because an innovation intermediary is used as a broker, the collective interest of stakeholders is served because the best possible innovation configuration is achieved, with the resultant benefit for the final outcome. However, because the actors involved are unwilling to bear the costs of this service, the longevity of the innovation intermediary may be threatened. Such unwillingness can be recognised amongst R&D providers who are hesitant to render procurement costs in their tariffs to an innovation intermediary who saves them from incurring these costs themselves.

6.6.2 Tensions in generating revenues

A second set of tensions arises in respect of the way in which an innovation intermediary generates its revenues. The results suggest that, when the intermediary is a for-profit firm in which results are directly linked to revenues, this provides an incentive for higher accountability, efficiency, and effectiveness. However, the way in which it generates its revenues entails a number of risks that may threaten the longevity of the firm.

A general risk regarding the cost of innovation intermediation is that it is rather seen as an additional cost that makes the innovation more expensive. Showing the added value of innovation intermediation services, such as diagnosing, needs articulation, and network brokerage, is complicated, due to their intangibility and their 'invisibility' in the end-result of the innovation process. Huggins (2000) found that, although firms in hindsight recognise brokerage activities, and would be willing to financially contribute to the broker's payment, they would not be willing to do this ex ante because of the high perceived risk of network failure.

Another risk relates to the difficulty of achieving a balance in the desired project size that is satisfactory for both the demand and supply side. Whereas agricultural entrepreneurs more often want fast solutions at low cost and do not necessarily need

research, R&D providers prefer substantially sized projects with larger budgets in which more in-depth research is performed. Similar observations on differing planning horizons and preferred innovation pathways have been made by Isaksen and Remøe (2001), Pannekoek et al. (2005), and AWT (2005).

A risk associated with working on a provisional basis is that the often long lead-time to the materialisation of innovation processes makes it hard to recover the costs that have been incurred: the process may require more investment than anticipated. In this sense, Bessant and Rush (1995: 113) refer to such work as 'missionary work'. In addition, R&D and KIBS providers may feel that due to the involvement of an innovation intermediary their share in projects is reduced. From the perspective of R&D and KIBS providers, payment of a percentage share of the project value to the innovation intermediary reduces their revenues and encourages the innovation intermediary to assign itself a large role in projects. This may threaten their willingness to work with an innovation intermediary.

Hence, when a broker represents both the demand and the supply side, as is often the case with innovation intermediaries that fulfil a mediating role, it continuously has to seek a balance between its role as a representative of the demand side and its role as a representative of the supply side. Especially for brokers dependent on the market for financial resources, balancing short-term considerations and long-term considerations (i.e., building social resources that enhance future brokering flexibility) is crucial (Pollock et al., 2004).

6.6.3 Competing functions: the manifestation of function ambiguity

A third tension that can be deduced from the results is the - still unclear - role division within innovation trajectories between a - process-oriented - pure innovation intermediary and providers of - content-oriented - agricultural R&D and KIBS. As noted in section I, innovation intermediation functions are also fulfilled by traditional providers of R&D and KIBS (Howells, 2006). Bessant and Rush (1995) state that traditional consultants assist in making a diagnosis and clarification of problems, articulate needs, and function as a network broker. Pittaway et al. (2004) see a role for R&D providers, what they call 'science' partners, as brokers or intermediaries within networks, where they act as neutral agents, stimulating communication and the building of trust between the different network participants. A relevant issue with regard to this role division is, however, what interest parties have in becoming involved as sources or carriers of innovation in addition to acting as facilitators of innovations, as this is linked to the impartiality they can exercise as a broker.

In a context in which R&D and KIBS providers have to derive their income from the market, as is the case in the privatised agricultural knowledge infrastructure in The Netherlands, such impartiality will always be influenced by the stake that is to be gained in the subsequent innovation project. When an agricultural entrepreneur seeks assistance from traditional R&D and KIBS providers exercising network brokerage roles, this may influence the articulation of needs and the selection of cooperation partners in favour of the needs of the provider rather than those of the client.

Although the added value of a neutral, pure innovation intermediary lies precisely in this impartiality aspect, this is not always recognised, as is illustrated by the fact that, in the case of InnoFac, R&D and KIBS providers claim that they perform activities that are similar to those that InnoFac performs as facilitator of innovation. This 'function ambiguity' indicates that there is a blurry line between innovation intermediation as core business and as a function within traditional R&D and KIBS. Particularly after an innovation network or innovation configuration (Engel, 1995) has formed, conflicts may emerge about the role division between an innovation intermediary and traditional R&D and KIBS providers, as this case and also other surveys in the Dutch context have shown (Bureau Bartels, 2004). The intervention of an innovation intermediary can be seen as unnecessary, when its added value as a knowledge broker (i.e., bridging cognitive and cultural gaps) is denied or not recognised. Also, some of the services it delivers can be seen as, or actually be, insufficiently differentiated from the services offered by traditional R&D and KIBS providers. An innovation intermediary may become too involved with activities that take the character of KIBS as a source or carrier of innovation. This can be linked to the problem that arises because many of the services an innovation intermediary delivers are intangible and immeasurable, especially services provided in the early stages of an innovation process (i.e., problem identification, needs articulation, network brokerage). To prove its value it may then rely on services of proven and recognised value. According to Rosenfeld this is a permanent threat for those intermediaries involved in brokerage who are seeking to be self-sufficient. Self-sufficiency would make brokers move 'toward services that are of known and measurable value to firms and away from any kind of 'improvement' or 'modernization' mission for which firms cannot yet judge the value' (Rosenfeld, 1996: 261).

6.7 Conclusion: Implications for theory and policy

This chapter has shown that, seen from the perspective of the supply side of the agricultural knowledge infrastructure, a pure innovation intermediary can play a desired role in initiating and catalysing innovation. It can assist in matching demand and supply for R&D and KIBS, which is recognised as a function supplementary to traditional KIBS. The chapter has also revealed that pure innovation intermediaries have to balance the sometimes contradictory interests of several parties for which they act as broker, as well as their own interests. This is a complex task, as Pollock et al. (2004: 52) indicate: 'Brokers are effective when they strike an acceptable balance between the economic interests of buyers and sellers and their own profit objectives. Because preferences are often hard to decipher ex ante, and because there are inherent conflicts involved in most strictly distributive contexts, the task of brokerage is neither easy nor programmable.' Furthermore, innovation intermediation is not only about offering one-off intermediary services, but also involves offering longer term, relational innovation capabilities (Howells, 2006). The need to maintain durable, satisfactory relationships with several parties in the knowledge infrastructure (to secure credibility with, and access to, these parties) and constantly negotiate mutually acceptable solutions has several theoretical and practical implications. With regard to this complex balancing task, a first conclusion of the chapter is that in the design of pure innovation intermediaries their position as an impartial broker in the knowledge infrastructure should be carefully considered ex ante. This supports earlier findings of Kolodny et al. (2001), whose design requirements are useful guidelines for the designing of innovation intermediaries. Funding mechanisms and governance structures should be appropriate for fulfilling this impartial position. Although on the one hand public and private actors in the knowledge infrastructure manifest their good intentions in optimising the functioning of the innovation system by supporting the setup of a pure innovation intermediary, on the other hand diverging interests, expectations and policy agendas of these actors may later negatively influence the broker's performance (see also Hanna and Walsh, 2002; Laschewski et al., 2002).

In the case of an innovation intermediary with shareholders that themselves are suppliers of R&D and KIBS, there needs to be acceptance that the credibility of a broker depends on having the possibility to freely choose the most suitable provider of innovation support services for a certain case. In a highly competitive and developing market for R&D and KIBS however - a situation that applies to the Dutch knowledge infrastructure in transition - such acceptance of a free choice between different providers may be hard to achieve. This calls for alternative ways of providing seed capital for pure innovation intermediaries, so that they become fully detached from other parties in the knowledge infrastructure and can be truly impartial.

As this chapter has shown, a for-profit structure can damage the required impartial position of an innovation intermediary. In order to generate sufficient revenues, a for-profit firm needs to have a clearly visible role in the innovation process, whereas services such as problem diagnosis, needs articulation, gate-keeping, network brokerage, and knowledge brokerage are hard to make tangible and visible. This may force innovation intermediaries to execute activities that are more tangible, but which compete with the activities of those to whom they refer clients, i.e., they become sources of innovation and carriers of innovation. This makes them less credible in the eyes of providers of R&D and KIBS and reduces their access them.

In view of the abovementioned design issues, a second conclusion is that it is difficult to perform a wide array of innovation intermediation functions within one organisation. The different kinds of innovation intermediation functions seem to have their own particular requirements regarding the way they are funded and who best executes them. This derives from the nature of the activities in terms of their discreteness and tangibility, whether they are in the public or the private interest, and how they relate to activities of other KIBS (i.e., function ambiguity). As the case study has shown, combining certain (sets of) functions can be conflictive; this suggests the desirability of a separation of functions.

The role of 'animateur', creating new possibilities and dynamism in a system by

connecting several actors, appears to be in the public interest. Given the social dilemmas that arise in paying for this systemic function with private funds, and impartiality issues attached to the execution of this function by R&D and 'regular' KIBS providers, having a publicly funded innovation intermediary fulfilling this role could provide a solution to avoid these conflicts (following observations by Bessant and Rush, 1995; Senker and Faulkner, 2001; North and Smallbone, 2006). Public policy makers should in this case curb their desire to aim for the self-sufficiency of such intermediaries as they must have sufficient time to show their systemic value (cf. Huggins, 2001; Rosenfeld, 1996). Public funding should then be directed towards supporting tasks such as foresight, problem diagnosing and needs articulation, scoping and filtering (selection of collaborative partners), and network brokerage roles. These services generally take place in the early, pre-competitive stages of the innovation process (in terms of contracting R&D and KIBS) and are not seen as competition by traditional KIBS providers (Bureau Bartels, 2004). Instead, they incur benefits for both the demand side (in terms of lower search costs and broader access to sources of knowledge and information) and the supply side (in terms of lower procurement costs) of the knowledge infrastructure.

Innovation intermediation services that take place after the network brokerage phase (i.e., after referral) can be left to private companies. An innovation configuration has actually formed at this stage. Services include: gate-keeping and knowledge brokering; knowledge testing and validation; knowledge commercialisation; accreditation, validation and regulation, and standards work; independent advice and mentoring on protecting intellectual property; and evaluation of the outcomes of innovation collaboration. Providing these services through a publicly funded organisation may crowd out private parties, given that the provision of these services is seen by several authors as a potential and/or actual role for commercial consultancy firms (Bessant and Rush, 1995; Den Hertog, 2000; Bureau Bartels, 2004; Howells, 2006). In the case of InnoFac, many respondents recognise that some of these services are also provided by several traditional R&D and KIBS providers that do not have innovation intermediation as a core business. Nonetheless, the existence of a specialised, pure innovation intermediation KIBS can have several benefits because innovation intermediation requires certain skills and staff competences, as this chapter and other studies (Kolodny et al, 2001; Turner and Keegan, 2001) have indicated. In a similar vein, Hinloopen (2004) states that a market of innovation intermediaries undertaking knowledge brokerage may incur efficiency gains, higher quality of R&D and KIBS delivery, better implementation of R&D results, and a smaller administrative burden for clients (i.e., SMEs, government).

A third conclusion is that, for such a market of innovation intermediaries to work, the activities they carry out in the management of innovation processes (i.e., after the network brokerage phase) should be made more distinctive from the services offered by other, traditional R&D and KIBS providers. In addition, their added value should become more explicit. In order to verify the real added value of independent, pure innovation intermediation, a client (i.e., an agricultural entrepreneur) may

demand the involvement of the intermediary in the management of innovation projects instead of their relying on the process management skills of the contracted KIBS or R&D provider. At the same time, R&D and KIBS providers may see this as outsourcing such activities so that they can concentrate on other core activities. Given that agricultural entrepreneurs generally do not see R&D providers as suitable partners for cooperation in innovation processes because they are perceived as not sufficiently tailoring their services to the client's needs, and because of other cultural and cognitive differences between the two groups, the usefulness of network and knowledge brokerage seems obvious. This, however, needs to become recognised in the knowledge infrastructure. An important implication of the study is that the functioning of such a market of knowledge brokers requires appreciation and acceptance of the added value of facilitation-oriented, pure innovation intermediaries, and the right skills to deal with them. Whereas innovation intermediaries emerge as a result of certain market failures and innovation systems failures in the knowledge infrastructure (i.e., information gaps and managerial gaps), the very same market failures and system failures hinder innovation intermediaries from optimising system performance. To resolve this paradox, what is required is an institutional learning process on the part of both agricultural entrepreneurs and traditional R&D and KIBS providers regarding the valuation of innovation intermediation services.

Further research should address the issue of whether and how such an institutional learning process can take place on both the demand and the supply side of the agricultural knowledge infrastructure, and how innovation intermediation may in turn change as a result of this. A relevant issue related to this institutional learning process is how to measure the added value of innovation intermediaries, as their effect still often rests on assumptions (cf. Curran and Storey, 2002; Phillipson et al, 2004) and needs to be made visible to actors in the knowledge infrastructure and to policy makers. Evidence for their beneficial effect on the innovation process in terms of efficiency and effectiveness is often through reported stakeholder perceptions (e.g. Kaufmann and Tödtling, 2002; Vos, 2005; this chapter) or is measured in terms of growth of the number of organisations fulfilling innovation intermediation functions, hence showing the demand for these functions (Howells, 2006). Given their indirect effect on the business value chain, a quantitative impact assessment is inherently difficult however (Howells, 2006). Process studies of the dynamics and interaction within innovation configurations involving pure innovation intermediaries could be better suited to provide insights regarding their added value. Besides the added value being made explicit, the feasibility and operationalisation of the division between innovation intermediation tasks that are in the public interest and those that are in the private interest need further analytical attention and finetuning.
Notes Chapter 6

- 38 KIBS can be defined as private companies or organisations relying heavily on professional knowledge (i.e., knowledge or expertise about a specific discipline or functional domain) supplying intermediate products and services that are knowledge based (Den Hertog, 2000; Müller and Zenker, 2001).
- 39 InnoFac is a pseudonym.

7

Institutionalization of inter-firm network brokerage organizations

A case study from Dutch agriculture

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Submitted for publication

Abstract

This chapter investigates the embedding of an externally induced network brokerage organization in the agricultural knowledge infrastructure. Results show that a demand-driven way of working may prevent externally induced network brokers losing their neutrality in farmers' eyes, but that a network brokerage organization nevertheless can be perceived as disruptive by consultancy service providers. This derives from the hybrid nature of enterprise development service provision, in terms of whether the service can be characterized as a public or private good. This dilemma prompts critical examination of the mandates of publicly funded network brokerage organizations.

7.1 Introduction

In recent years, in industrialized countries increasing attention has been given to the entrepreneurship development of farmers (Knudson et al., 2004; Lans et al., 2004; Phillipson et al., 2004; Pyysiäinen et al., 2006) as a result of the shift from productionist agriculture under a protectionist economic regime to multifunctional agriculture in an open economy. Many governments seek to support farmers in developing their entrepreneurial and innovative capacities by setting up enterprise development programs (Phillipson et al., 2004; Rosenfeld, 2001; Smallbone et al., 2003). Such programs have a long tradition in the support of non-agricultural small and medium enterprises (SMEs) (Curran and Storey, 2002; Huggins, 1998, 2000). Phillipson et al. (2004) distinguish three models of enterprise development designed for farms. The first model is the one commonly referred to as 'agricultural extension' (see Leeuwis and van den Ban, 2004, for several definitions). Critiques on shortcomings of public extension services have had major impacts on the content and form of such services, and as a result of the privatization of extension services a market has emerged through which technical and economic advice is provided by private consultants (Feder et al., 2001; Rivera, 2000; Wolf et al., 2001). The second model is the 'full integration model' and deals with the provision of generic business support services to farms, so that farms are treated like other (rural) firms and provided with the same kind of services. The third model is the 'intermediate model' and involves an intermediary agency acting as a bridge between farms and generic support providers. Phillipson et al. (2004) argue that for the present context of 'entrepreneurial' farming the intermediate model is the most suitable, because providers of traditional consultancy services are not suited to provide generic business support to farms, and the full integration model does not take account of the unfamiliarity of suppliers of non-agricultural support services and farmers in dealing with one another. In the agricultural literature, several pleas have been made for an intermediary (i.e. a bridging organization) that that supports farmers to find their way around the multiple sources of knowledge and information in current pluralistic consultancy systems (Clark, 2002; Garforth et al., 2003; Sulaiman et al., 2005).

Although the abovementioned intermediate model recognizes that farmers use, and need to be connected with, different sources of information and different consultancy services, it appears to undervalue the role of peer networks. Several studies show that peers rank among the information sources most used by farmers (Diederen et al., 2003; Gielen et al., 2003; Pannekoek et al., 2005; Sligo et al., 2005; Solano et al., 2003). This is also common amongst non-agricultural SMEs (Kaufmann and Tödtling, 2001; Kingsley and Malecki, 2004). Within the SME literature, such peer networks are often referred to as inter-firm networks. An inter-firm network is loose-ly defined as three or more firms that cooperate in order to gain strength of numbers, solve problems, enter new markets, or develop and produce goods (Rosenfeld, 1996). Roughly two types of networks can be distinguished: 'hard' networks, joining

together to co-produce, co-market, co-purchase, or co-operate in product or market development, and 'soft' networks, joining together to solve common problems, share information, or acquire new skills. Hard networks often require formal cooperative or joint business arrangements, whereas soft networks usually remain informal. Often, soft networks serve to get information for operational issues, but they are also used to obtain information for strategic management or innovation (Kingsley and Malecki, 2004; Nieuwenhuis, 2002). Inter-firm networks of SMEs are generally seen as key instruments for enhancing SMEs' entrepreneurial and innovative performance (Hoang and Antoncic, 2003; Pittaway et al., 2004; Thorpe et al., 2005). Network formation is seen as an important new paradigm for rural development (Murdoch, 2000; Wiskerke et al., 2003). With regard to enterprise development in the agriculture sector, the formation of such soft networks is regarded as a new role for development agencies (Murdoch, 2000; Oerlemans and Assouline, 2004; North and Smallbone, 2006).

This chapter focuses on the intermediary organizations designed to facilitate such inter-firm networking to stimulate entrepreneurship and innovation. In their recent review on SME networking and innovation, Pittaway et al. (2004) conclude that the role of such third parties is still under-researched. Sapsed et al. (2007:1314) argue that 'we have now an expansive understanding of the range of functions and activities of bridging organizations that effect innovation' but go on to state that 'we lack an organization-level understanding of what makes bridging institutions effective in their role of compensating for weaknesses in a system.' While Sapsed et al. explore the effect of bridging organizations on the innovation process, this chapter analyzes the institutionalization of such a bridging organization, i.e. its efforts to become embedded in the existing knowledge infrastructure ⁴⁰. Den Hertog (2000) argues that the question as to how such 'new' intermediary organizations accommodate themselves in the 'traditional' knowledge infrastructure is an important unanswered research theme relevant to the formulation of innovation policy.

The chapter proceeds by giving an overview of the role of intermediary organizations as network brokers, and certain tensions that may emerge with regard to their establishment (section 7.2). It is followed by a case study in which the embedding of such an intermediary organization is described and analyzed in light of the tensions identified (sections 7.3, 7.4 and 7.5). The chapter concludes with a discussion of the implications of the results in light of these tensions (sections 7.6 and 7.7).

7.2 Challenges of policy induced network initiatives

Building on the definition of hard and soft networks, Huggins (2001) distinguishes informal network initiatives for the support of soft networks and formal network initiatives for the support of hard networks. In the context of entrepreneurship development in agriculture, these informal network initiatives appear to be particularly relevant. They can be further divided into general network initiatives, where the interaction primarily consists of information and knowledge exchange that is usually of an on-going and non-goal-specific nature (e.g. business clubs), and informal, task-specific initiatives, involving a form of workshop-based learning aimed at achieving some common end result (e.g. benchmarking and best practice clubs). With regard to the management of network initiatives, many authors see the involvement of network brokers as a key element. Snow et al. (1992) identify three general roles for such network brokers: a network architect who designs and builds the network (i.e. scanning, scoping, filtering, and matchmaking - Howells, 2006), the lead operator who acts as an organizer and manager of the network created by the architect, and the caretaker who maintains the integrity of the network (i.e. performing tasks referred to as 'knowledge brokerage' (Hargadon, 2002) or 'structural hole brokerage' (Burt, 2004)). These roles are seen as important for network formation, maintenance, and performance (Chaston, 1995; Malecki and Tootle, 1996; Ffowcs-Williams, 2000; Hanna and Walsh, 2002; Huggins, 2001; North and Smallbone, 2006; Oerlemans and Assouline, 2004; Rosenfeld, 1996⁴¹). Also, bringing external information into the network from and about other networks in other places (gate-keeping) is an important role (Malecki and Tootle, 1996; Nooteboom, 1999). From this literature it emerges that such brokers can be either persons within the network with certain characteristics that make them apt for brokerage tasks, or persons from external organizations of diverse natures that carry out these tasks for longer or shorter periods. Following Howells' (2006) work on innovation intermediaries, the range of intermediation tasks network brokers undertake can be seen as a function of organizations that also undertake a host of other tasks, or it may be central to an organization's identity. The latter type may hence be characterized as a network brokerage organization.

Forming part of formal enterprise development programs, network brokerage organizations (of which network brokerage may be a more or less central function and core identity) are often policy induced and publicly funded (Cooke and Wills, 1999; Curran, 2000; Ffowcs-Williams, 2000; Fulop, 2000; Huggins, 2000; Laschewski et al., 2002; Malecki and Tootle, 1996; Phillipson et al., 2004; Rosenfeld, 1996). Public funding for such intermediary organizations is generally justified on the basis of market failure arguments (particularly information failures - Curran and Story, 2002), or social economy arguments (Phillipson et al., 2004). A number of scholars have studied the impact of such policy induced initiatives on existing structures for enterprise development, addressing challenges such as the neutrality of intermediary organizations vis-à-vis their clientele and parties outside the network, their funding, and the coherence of enterprise development policies (Huggins, 2000; Laschewski et al., 2002; Phillipson et al., 2006; Smallbone et al., 2003). Although a relevant issue, given the scope of this chapter policy coherence will not be further discussed (see Kaufmann and Tödtling, 2002; North and Smallbone, 2006).

7.2.1 Neutrality vis-à-vis network participants

Neutrality is a broker's key asset, to be credible both to the inter-firm network's par-

ticipants and to external agents (Hanna and Walsh, 2002; Kolodny et al., 2001). A first challenge is hence maintaining neutrality in the eyes of network participants. Despite the recognition that brokers can fulfill an important role, criticisms are voiced with regard to negative influences of external (government) intervention on networks (Huggins, 2000; Fulop, 2000; Laschewski et al., 2002; Phillipson et al., 2006). Nooteboom (1999) argues that government should limit itself to the (legal) enabling and facilitation of the network brokerage role, but whereas Thorpe et al. (2005) conclude that, by not directly providing advice to entrepreneurs itself but by indirectly supporting peer networks, governments can remain neutral and credible, Laschewski et al. (2002) suggest that such neutrality is always paradoxical. This paradox lies in the fact that the idea and strength of networking are generally related to informal activities and personal relationships, and that state intervention is connected with a degree of formalization of structures and goals. Such formalization may destabilize and erode the informal basis upon which the network is built. Following this line of thought, Morrison and Bergin-Seers (2001) identify a cultural mismatch between the needs of entrepreneurs and what support program designers think to be relevant. Furthermore, external intervention may imply that the scope of the network is influenced to match the objectives of the external agent, but this may be detrimental to the network's dynamics.

7.2.2 Neutrality vis-à-vis actors external to the network

As regards the second challenge, maintaining neutrality vis-à-vis actors external to the network, Laschewski et al. (2002: 389) point out that external brokerage organizations may face an 'alienation dilemma' that exists when these 'are perceived as lacking a detailed understanding of local businesses, politics, and group dynamics, but must also bring extensive external knowledge to reinforce the legitimacy of their guiding role' (see also Fulop, 2000), and go on to state that 'a critical issue in this regard is the positioning of the newly formed network alongside or within existing business and political groups.'

7.2.3 Funding of network brokerage organizations

For network brokers to be effective a sustained effort is needed, whereas funding agencies are generally impatient and withdraw funding too soon(Ffowcs-Williams, 2000; Rosenfeld, 1996). In contrast, some authors argue that network initiatives and other forms of entrepreneurship/business support are often sustained without sound justification (Curran, 2000; Curran and Storey, 2002; Phillipson et al., 2004). In any event, the problem of network initiatives being supported for either too long or too short a period of time can be connected to the difficulty of quickly making visible to public funding agencies and policy makers the positive effects of informal networking on entrepreneurial capacity and competitive advantage (Huggins, 2000; Huggins, 2001; Rosenfeld, 1996). Concerning the difficulty of showing the effects to firms, Huggins (2000) found that, although firms in hind-sight recognize the benefits of the broker, and would be willing to financially contri-

bute to his/her payment, they would not be willing to do this ex ante because of the high perceived risk of network failure. Despite this difficulty of obtaining private payments from network participants, often brokerage organizations must gradually seek (partial) self-sufficiency. This may negatively influence the brokerage task, because brokers will have to devote time to searching for funding (Malecki and Tootle, 1996) and this may lead them 'toward services that are of known and measurable value to firms and away from any kind of 'improvement' or 'modernization' mission for which firms cannot yet judge the value' (Rosenfeld, 1996: 261). Ffowcs-Williams (2000) argues that, even with a subsidy, network development activities cannot be made profitable for most brokers, and Bessant and Rush (1995) label such activities as missionary work needing prolonged public support (see also Rosenfeld, 1996; Thorpe et al., 2005).

7.3 Emergence of network brokerage organizations in the agricultural knowledge infrastructure: the case of the Dutch Dairy Farming Academy

7.3.1 Background

This section introduces the case of the Dutch Dairy Farming Academy (DFA). DFA emerged as a response to recent developments in agriculture, such as new challenges for farmers due to changing markets, and the policy focus on developing farmers' entrepreneurial skills in which inter-firm networking is seen as an important instrument to achieve this policy goal (LNV, 2005b). Furthermore, DFA emerged as a result of changes in the agricultural knowledge infrastructure, most notably the privatization of agricultural research and extension establishments. In the Dutch agricultural sector, informal network structures (so-called study clubs) traditionally existed, often guided by an external facilitator (generally an extensionist or private consultant) (Leeuwis and Arkesteyn, 1991; Horlings, 1996; Oerlemans et al., 1997; Guijt and Proost, 2002; Oerlemans and Assouline, 2004; Bergevoet and Van Woerkum, 2006). Due to changes such as more heterogeneous interests of farmers (Smits, 2002), a decreasing number of farmers, less exchange of knowledge due to strategic interests as a result of privatization of the knowledge infrastructure (Leeuwis, 2000; Nieuwenhuis, 2002), and the fact that facilitation by a consultant from a public agricultural extension service is no longer available free of charge, the traditional study club concept has come somewhat under pressure. Generally, with privatized agricultural knowledge infrastructures it has become more complex for farmers to find the right cooperation partners to obtain the knowledge they need (Garforth, 2003a). Explicitly, network brokerage organizations such as DFA state that they wish to revitalize post-privatization agricultural knowledge infrastructures, i.e. restore the linkages between the different components and fulfill a bridging function, and bring the study club concept a step further.

DFA became operational in January 2005, jointly managed by the Animal Husbandry Research Institute (ASG) and the consultancy branch of the Northern Dutch Farmers' Association (NLTO). At that time, DFA was funded jointly by the Ministry of Agriculture, the Dutch province of Friesland, the NLTO, the Dutch Dairy Commodity Board, the European Union, and a Dutch farmer-oriented bank. Funding was secured for two years, but the aim was that DFA would eventually become self-supporting. Participating farmers pay a yearly contribution of ϵ_{IOO} , plus entrance fees for some activities. DFA started as a pilot project in three northerly provinces of The Netherlands, and was implemented on a national scale in the course of 2005.

7.3.2 Functions of DFA

By its own definition, DFA aims to fulfill two functions (DFA, 2004: 1): to stimulate peer-to-peer information exchange and learning from experiences outside the dairy sector, and 2) to channel information about farming practice being exchanged in the diverse DFA forums to actors in the policy arena (government and farmers' organizations) and R&D and educational institutes, to inform policy formulation and R&D and education programs. DFA's focus as a network brokerage organization is on the functions of articulation of needs and requirements, matchmaking, and gatekeeping (cf. Howells, 2006). DFA does not have the objective of delivering knowledge intensive services itself, but rather of facilitating knowledge exchange between other actors by organizing informal task-specific initiatives.

With regard to the first function, DFA strives to induce a learning trajectory that starts with peer-to-peer information exchange (connecting farmers and inspiring them with new insights) but gradually evolves into a collective innovating trajectory ('deepening knowledge'). DFA organizes general networking activities such as information exchange through an online databank, network members' farms are used as demonstration farms, and experienced farmers act as coaches for less experienced farmers. DFA organizes task-specific initiatives such as demand articulation meetings (for identification of (latent and/or incipient) strategic needs and information deficits), best practice meetings (so-called dairy farming cafés) in which farmers discuss a theme of common interest, workshops (called master classes) guided by experts and successful entrepreneurs, and the formation of new networks based on a shared interest. Demand articulation meetings and dairy farming cafés are open to all dairy farmers, but participants are strongly encouraged to become DFA members in order to attend the other activities. DFA aims to be demand driven, programming working themes based on aggregated demand obtained by analysis of the online databank, and on impressions obtained by facilitators during previous sessions. Also, questionnaires are used to ascertain farmers' preferences for activities. To be able to closely identify with farmers' lifeworlds, facilitators themselves are dairy farmers.

For the second function, DFA organizes meetings in which dairy farmers provide their practical insights to policy makers and researchers, and dairy farmers serve as tutors to agricultural students. For their funding agencies, DFA aims to offer the following added value:

- Support the transition to socially accepted and market-driven dairy farming;
- Strengthen entrepreneurship in the dairy sector;
- Facilitate access to and interaction with (innovative) dairy farmers;
- Have input in determining the themes addressed in DFA's activities.

7.4 Goal and method

The overall goal of this chapter is to investigate how farmers and several stake-holding actors in the agricultural knowledge infrastructure (i.e. policy makers, farmers' representatives, consultants, other innovation intermediaries, researchers, and agricultural educational institutes)⁴² perceive and interpret the activities of a network brokerage organization such as DFA, and how they relate these to their own activities and objectives. This may generate insights that can both inform inter-firm network policy formulation and contribute to theory development on institutional factors that affect the embedding and success or failure of brokered network initiatives. DFA presents features that make it an interesting case in relation to the previously outlined challenges of brokered network initiatives:

- Relating to the neutrality paradox: DFA is neither a fully policy implanted (i.e. top-down) nor a fully organic network initiative (i.e. bottom-up), but an initiative set up by private parties who have found public financial support. Furthermore, its program is determined by network participants. According to Huggins (2001), research on inter-firm networks should incorporate the crucial distinction between organic and implanted structures. As DFA aims to work on a demand-driven basis, this case may provide insights into potential tensions and/or synergies between a network brokerage organization driven by farmers' demands and funding agencies' policy objectives.
- Relating to the alienation dilemma: DFA's focus on entrepreneurship development implies that the nature of its activities may be of both a public and a private good nature (cf. Massey, 2003). This may conflict with the activities of private parties forming part of the agricultural knowledge infrastructure. Furthermore, DFA explicitly aims at promoting system interaction. The case may provide insights into how an enterprise development initiative based on brokerage of inter-firm networks interacts with existing structures.
- Relating to funding continuity: DFA aims to provide additional value to existing informal inter-firm networking structures. However, research has shown that such externally driven network structures often fail to consolidate (Huggings, 2001; Guijt and Proost, 2002). As gradual self-sufficiency is a key premise of DFA, the case may provide insights into why a network brokerage organization may or may not become securely embedded.

Since the study concerns mainly 'how' and 'why' questions about a contemporary set of events over which the researcher has no control, a case study setup can be considered an apt research strategy to explore, explain, describe, and illustrate the causal links in real-life situations (Yin, 2003). The present chapter draws its data from several sources:

- To obtain the dairy farmers' perspective on DFA, systematic observation was undertaken during a focus group session with farmers in the development stage of DFA. Furthermore, a telephone survey was conducted in the pilot area amongst 227 members of DFA who had participated in at least one DFA activity (out of a total of 347 members⁴³). The response rate of 78% led to a sample size of n=178. This survey took place in November 2005. Secondary sources were also used to ascertain the dairy farmers' perspective: an in-depth qualitative study (amongst 10 DFA members, 10 farmers who visited DFA activities but had not yet become members, and 7 non-members who also had not visited an activity) (Oenema, 2006a), and a telephone survey amongst 120 non-members (Oenema, 2006b).
- To ascertain the perspective on DFA of actors in the agricultural knowledge • infrastructure, observation was undertaken during lobby meetings with consultancy companies (3), educational institutes (1), and policy makers (1). Also, 23 open semi-structured interviews with staff of consultancy companies (6), policy makers (4), farmers' organizations (6), staff of other innovation intermediaries (2), and education institutes (5) were conducted. These interviews were held in March 2006. Interview respondents were selected on the basis of (previous) contact with DFA and were obtained through snowball or chain sampling (Patton, 1990). The interviews were geared towards identifying respondent practices, perceptions, and evaluations regarding DFA. A qualitative approach was chosen to identify the important achievements, bottlenecks, and pitfalls that emerge in the interaction between a network brokerage organization, such as DFA, and the agricultural knowledge infrastructure in which it operates. To obtain the view of scientists on DFA, and to complement the view of consultants on DFA, observation took place during two presentations and discussion meetings regarding the relationship between DFA and these actors.
- Lastly, use was made of DFA proposals (DFA, 2004) and progress reports (DFA, 2005). Furthermore, news on DFA in agricultural magazines was screened to acquire complementary insights.

7.5 Results

This section presents the results following the three main tensions of network brokerage organizations previously identified, i.e. the neutrality paradox, the alienation dilemma, and funding continuity. Farmers' views and knowledge infrastructure actors' views are presented separately.

7.5.1 The neutrality paradox: experiences with and perceptions about DFA's demand-driven character

Farmers' views

DFA aims to work in a demand-driven fashion. This is achieved through an intake scan, in which a profile of information demands and information offerings is articulated. This profile is put in a web-based databank to enable members to find a person with common interests and/or possible solutions to a problem. Table 7.1 summarizes members' experiences and perceptions of DFA's intentions to work in a demand-driven fashion.

Apart from enabling direct networking, the demand-supply databank also enables an aggregation of demand, on the basis of which themes for networking activities are distilled. However, as Table 7.1 indicates, the majority of members did not use this feature. Furthermore, members can contact the farmer facilitator to address their needs. Although at the time of the survey only 43% of the members (n=178) had had contact with the facilitator, the majority of the members who had contact found this positive. With regard to the demand-driven philosophy of DFA, a majority of the respondents feel that they can influence the kind of themes addressed in DFA activities. Many respondents feel that the information they can acquire through DFA fits well with their needs (44%), although several respondents also feel neutral about this statement (35%) or even negative (21%).

Indicators for working in a demand- driven fashion	Members' response		
	Yes (%)	No (%)	
Use data-bank (n=178)	20	80	
Has had contact with facilitator (n=178)	43	57	
	Positive (%)	Negative (%)	Neutral (%)
Contact with facilitator was useful (n=73)	87	12	I
Perceived influence on themes addressed (n=178)	60	16	24
Information fits with needs (n=178)	44	21	35
DFA is easily approachable and accessible (n=178)	85	ю	5

Table 7.1: DFA members' perceptions of DFA's demand-driven character

Most respondents consider it important that they can influence the themes addressed by DFA. In addition, Oenema's (2006a) study revealed that DFA members highly esteem the neutrality of DFA, i.e. it is not driven by commercial interests. These results indicate that members generally feel that DFA is demand driven and that they can exercise influence on the kind of activities that take place, but it does not necessarily mean that the actual activity suits their needs. A majority of the respondents find DFA easily approachable and accessible, but since respondents are all members this may not give a realistic picture. Oenema's study indicates that non-

members do not participate in DFA activities because the name, Dairy Farming Academy, suggests that activities require a certain entrance level and hence this scares them off. The results presented in this section suggest that DFA empowers farmers to shape their own learning activities, i.e. that they are demand driven, but that DFA's approach does not appeal to all farmers. In this respect it is telling that Oenema's (2006a) study indicates that both DFA members and non-members see DFA as an organization for large innovative farming businesses.

Views from actors in the knowledge infrastructure

Amongst other parties in the agricultural knowledge infrastructure, there is a general feeling that DFA helps farmers to articulate their entrepreneurial and innovation strategies and to convert these into information demands towards other farmers and consultancy service providers. They also see DFA as an organization that may raise farmers' self-awareness and empower them to approach service providers and farmers' representatives more critically. DFA is thought to do so by using creative facilitation methods stimulating the active participation of farmers. In contrast, activities organized by traditional consultancy providers are seen to foster a more passive role for farmers and focus less explicitly on demand articulation and strategy formulation. Also, the fact that DFA focuses on peer-to-peer learning and enables farmers to form networks with farmers outside of established networks is seen as an added value. However, traditional consultants indicate that they also have recognized the need for a coaching role in strategy development and the potential of peerto-peer learning, and claim that they are evolving towards enterprise development, focusing on issues other than mere technical advice. There are contrasting views on the degree to which DFA matches farmers' lifeworlds and discourse: on the one hand, other parties in the agricultural knowledge infrastructure state that DFA possesses a great deal of cultural proximity, because of the use of farmer facilitators and peer-to-peer learning methods; on the other hand, it is said that use of terminology such as 'academy' and 'master class' may scare off certain types of farmers who find this too grandiloquent.

Parties in the broader agricultural knowledge infrastructure regard DFA as being demand driven with regard to the content of its activities. Besides this form of demand steering, another level of demand steering can be discerned. This level involves the goals that other parties want to see realized through DFA. As argued above, public agencies often fund network brokers in the context of enterprise development policy. This has become a major policy focus in the Dutch agricultural sector, as several policy documents indicate (LNV, 2005b; LTO, 2006). The policy objectives that public funding agencies want to realize through DFA are formulated in the quite general terms that are typical for this kind of program (cf. Curran and Storey, 2002). Main objectives include the inculcation of skills for the recognition of entrepreneurial weaknesses, for the articulation of learning needs, and for autonomous learning behavior (i.e. life-long learning - see Morrison and Bergin-Seers, 2001; Lans et al., 2004). A few tensions can be observed with regard to these objec-

tives. One tension is that funding agencies (the Ministry of Agriculture and the Province of Friesland) complain that members are proceeding too slowly to the activities that induce a collective learning and innovating trajectory (e.g. deepening knowledge by means of master classes). This conflicts with a philosophy of demand-driven service delivery based on the preferences and learning pace of farmers and may mean that activities remain confined to facilitating network formation and maintenance. Another tension is that one of the funding agencies, a farmers' organization, embraces the demand-driven philosophy of DFA but nevertheless feels that DFA content should correlate with the development strategies they see as relevant for the agricultural sector. This may also conflict with the ambition to be driven by farmers' demands.

7.5.2 The alienation dilemma: experiences with and perceptions of the place and function of DFA in the agricultural knowledge infrastructure

The introduction of a network initiative such as DFA is likely to affect existing farmer networks (cf. Laschewski et al., 2002) and the agricultural knowledge infrastructure (cf. Den Hertog, 2000; Laschewski et al., 2002). Existing farmer networks would especially be affected in the case of network initiatives that are imposed from the top down. Despite its philosophy of being demand driven and the active support of farmers' organizations, DFA is externally induced and largely publicly funded. This section explores the degree to which this influences existing structures.

Farmers' views

As already stated, the Dutch agricultural sector traditionally possesses a culture of informal, soft networks of neighboring farmers (i.e. study clubs), but this has recently become exposed to certain pressures. Nevertheless, many farmers still participate in these clubs. DFA wishes to revitalize and refresh the study club culture and enable farmers to come into contact with farmers that are outside their established networks. Table 7.2 lists farmers' perceptions regarding various issues that arise when making these new contacts, and the role of DFA therein.

Issue	Members' response		
	Positive (%)	Neutral (%)	Neutral (%)
Information exchange with other farmers is important $(n=178)$	82	9	9
Participation in study club (n=178)	74	-	-
DFA has an added value vis-à-vis existing study clubs (n=132)	45	13	13
DFA enabling extra-regional contacts is positive (n=178)	78	12	12
Opportunities for extra-regional contacts are adequate (n=178)	85	II	II
Has made new contacts through DFA (n=178)	23	-	-
New contacts are useful (n=4I)	86	7	7
DFA has added value vis-à-vis existing business and consultancy structures	64	13	13

Table 7.2: DFA members' perceptions of the position of DFA vis-à-vis existing structures

A great majority of the respondents state that they consider it important to exchange information with other farmers and participate in a regular study club. According to anecdotal evidence gathered by DFA, in the dairy farming cafés participants say that they appreciate being able to compare their own situation with the situation of others, to see where they stand, and they may help each other in realizing concrete plans (Oenema, 2006a). This corresponds with reported benefits of study clubs (Guijt and Proost, 2002).

In light of the revitalization and refreshing mission, when asked whether DFA offers added value vis-à-vis their regular study club, of the 132 respondents that participated, 45% found this to be true, whereas 42% did not see any added value. Although a great number of respondents said they were not convinced about the added value of DFA vis-à-vis study clubs, a majority of the respondents found it positive that DFA offers opportunities to come into contact with farmers outside their own region, and a majority found that the opportunities DFA offers to come into contact with other farmers were adequate. However, at the time of the survey, only 23% of the respondents (n=178) had made new contacts. Of the 41 DFA members who had made new contacts, the majority (86%) indicated that they found these new contacts useful. As the results above indicate, DFA seems to exist side by side with existing networking structures of DFA members, such as study clubs. However, Oenema's (2006a) study indicates that some non-DFA members indeed perceived DFA as a threat to existing farmer networking structures (as opposed to DFA members who do not see it as a threat). With regard to the added value of DFA vis-à-vis other innovation support services, such as applied research projects and consultancy, 64% of surveyed DFA members (n=178) indicated that they saw such an added value. Hence, from the members' viewpoint, DFA is seen as an addition to existing services.

Views from actors in the knowledge infrastructure

For respondents from the broader agricultural knowledge infrastructure, the place occupied by DFA in the agricultural knowledge infrastructure differs according to the position of the organization being questioned. There is consensus that DFA can fulfill a liaison function with the following potential benefits: scientists find that they can be brought into contact with farmers to involve them in their projects; policy makers find that it promotes information exchange within the dairy farming system and that it informs policy; educators find that it can link their students with experienced farmers; farmers' representatives find that it helps to inform their agenda; and consultants find that they can be brought into contact with potential clients. However, not all these functions have materialized, and in some cases DFA is not willing to fulfill a liaison role. Although in one case a mentor program for agricultural students has been set up, other respondents from education institutes complain that DFA is poorly embedded in the regional educational infrastructure. Scientists and several consultants also state that they feel that they have been denied access to farmers participating in DFA, whereas DFA ensued from an ASG initiati-

ve and looked for support from consultants. They attribute this to a need on the part of DFA to manifest itself as a distinct initiative. At the time of the study, a link with scientists was made, and DFA had organized activities to inform research agenda setting.

Especially within the consultant group, DFA is seen as potential threat: most consultants tend to see DFA as a competitor, a feeling that is also perceived by other respondents. Consultants feel that facilitating peer-to-peer networking and organizing thematic group meetings is something they also do. In this regard, DFA competes for the time and attention of farmers. Consultants state that farmers can only visit a limited number of gatherings in a week. Because DFA is subsidized, they perceive it to be market disturbance. A difference from their own group meetings would be that DFA's meetings require more active participation and are more multidisciplinary. However, consultants state that a consultant's view may enrich the discussion and that their own activities also are increasingly aimed at enterprise development involving multiple issues. In contrast, some consultants see that because of DFA they have recently become involved in specific cases when the farmer has a clearer view of his/her entrepreneurial and/or innovation strategy, because DFA has done the preparatory work. DFA selectively brings in external experts (gatekeeper function) but does not, however, actively refer farmers to external parties and aims to provide more individually tailored support itself (e.g. by way of organizing master classes). By not pursuing a referral function, DFA claims, and is perceived by farmers (Oenema, 2006a), to be more objective than consultants because there are no hidden objectives such as client acquisition. From the interviews and observations it emerges that the main reason for consultants to participate in DFA (as an external expert or through funding) would be to come into contact with potential clients. However, consultants perceive DFA as also having a (policy prescribed) growth objective itself, and a need to win clients, and thus also as having a goal of client acquisition. Although most consultants do not fear that they will lose clients to whom they individually provide services because of DFA, they regard DFA as limiting their opportunities to reach new clients. This is because supporting study clubs and organizing group meetings are important acquisition channels for them, and DFA does not take on the role of an intermediary linking farmers with service providers (i.e. fulfilling the referral function suggested by Phillipson et al., 2004).

7.5.3 Funding continuity: perceptions about the funding of DFA

DFA gets its funding from several sources, i.e. the majority through subsidies from public funding agencies (government, province), sponsorship by private parties (bank, commodity board), as well as a small membership fee. Subsidies and sponsorships have been provided on a temporary basis, on the premise that DFA would become self-supporting within two years by realizing sufficient member growth. In this regard, a policy maker explicitly stated that DFA was considered a project.

Farmers' views

At the time of the survey, DFA had not succeeded in reaching its goal of 1.200 members after its expansion from the pilot area to the whole country, but succeeded in enrolling 700 paying members. A telephone survey amongst 120 non-members of DFA (Oenema, 2006b) indicated that the main reasons for not becoming a member are a lack of time to participate in meetings, having already sufficient sources of information available, and being hesitant to participate because neighboring farmers do not participate. As the current number of members would not be sufficient for DFA to remain operational on the basis of current user fees, renewed external funding has been sought. Limited financial sustainability is seen as the greatest threat to DFA. Willingness to pay for the kind of services DFA delivers appears to be a critical issue, as survey results, interview results, and focus group results indicate. When members were asked whether they would continue their membership if the fee were doubled, 55% stated they would not, while 14% were uncertain whether they would or not (31% would remain a member though, n=178). Focus group participants and most interview respondents indicate that, due to farmers' low willingness to pay, the goal of self-sufficiency will be difficult to attain. In line with findings in the literature, they find it hard to estimate the benefits of their investments in knowledge acquisition - a process that would need considerable maturity of experience (Hanson and Just, 2001). Although the literature indicates that, when services are in the private interest and give a direct and tangible benefit, farmers would be willing to pay for the kinds of services DFA offers (cf. Katz and Barandun, 2002), this direct benefit is hard to assess.

Views from actors in the knowledge infrastructure

Consultants state that the group activities they organize themselves are seldom directly profitable, but that they organize them for marketing purposes (often with no admittance fee). It is also suggested that, although DFA aims to be demand driven, it is nevertheless seen as an externally implemented initiative. This would reduce feelings of ownership amongst dairy farmers, and hence willingness to pay. As a solution to the difficulty of ensuring funding on the basis of user fees, several respondents mention the option of DFA acquiring finance on a project basis as a service organization for several external organizations. Services could include organizing interactive group meetings for other parties (such as scientists, government, consultants) based on their novel facilitation methods, and channeling information from farming practice to policy makers, scientists, farmers' representatives, and consultants, so that these stay in touch with farmers lifeworlds (i.e. capitalize upon the liaison function). A similar function on a commercial basis for network brokers mediating interaction on virtual platforms has been observed by Verona et al. (2006). Policy makers indicate that working on such a project basis with concrete deliverables would be a way to obtain continued political support for public funding as it has proven hard to show the impact of DFA, beyond measuring parameters such as the number of members and participants in activities. However, a drawback

to such a method of funding, as some respondents also state, is that it may increase the influence of financiers on the content of activities and have a negative influence on DFA's neutrality. In order to safeguard its neutrality, DFA has until now kept most commercial consultants at a distance and has only selectively cooperated with these.

7.6 Discussion

This section discusses the findings in light of the challenges attached to network brokerage initiatives, i.e. neutrality within and outside the network, and funding continuity.

7.6.1 Tackling the neutrality paradox through a demand-driven approach

Despite DFA being externally induced, the results indicate that it is to a considerable extent steered by members' needs. This suggests that, when network initiatives that are externally induced by brokerage organizations orient themselves towards, and are driven by, participants demands, the neutrality paradox need not become manifest. If a brokerage organization is receptive to demands, creates conducive environments with an emphasis on cultural commonality and shared interests, and does not impose certain preferred development strategies, it may well operate neutrally without 'formalization of structures and goals'. This is consistent with earlier findings by Huggins (2000: 128) who found that brokered network initiatives can be successful when 'facilitated within an environment possessing a degree of informality, allowing interaction to develop within business settings that have a 'social' dimension'. A demand-driven approach may hence prevent the occurrence of a cultural mismatch between entrepreneurs and program designers as reported by Morrison and Bergin-Seers (2001).

However, operationalizing such a demand-driven approach in the case of a network brokerage organization that receives public funding can be problematic. In such a situation, a brokerage organization has to deal with a constant struggle about whose objectives should be given priority, i.e. those of members or those of the funding agencies, because the demands of paymasters (i.e. public finding agencies) should also be taken into account (cf. Hanna and Walsh, 2002). In the case of DFA, such pressure could be observed in funding agencies wanting DFA to make farmers adopt a collective learning and innovating trajectory (deepening knowledge), and setting this as an important impact criterion in the evaluation of DFA's performance. This study hence suggests that the tendency towards formalization of structures and goals attached to government intervention, as reported by Laschewski et al. (2002), seems to be indeed a threat to the continued neutrality of network brokers, including when there is no direct government intervention by a state agency.

7.6.2 Function ambiguity and the alienation dilemma

As DFA operates on a demand-driven basis, employs farmer facilitators, and provides access to several sources of information, the problem of not having a detailed understanding of local businesses, politics, and group dynamics, and at the same time needing to bring in extensive external knowledge to reinforce the legitimacy of their guiding role, seems to be of little relevance. However, another element of the alienation dilemma, regarding 'the positioning of the newly formed network alongside or within existing business and political groups' (Laschewski et al., 2002: 389) does play a significant role. The results suggest that the establishment of an interfirm network brokerage organization induces certain changes in the institutional setup of the agricultural knowledge infrastructure. Some changes are perceived to be positive, such as the facilitation of information flows between different components of the agricultural knowledge infrastructure in its role of liaison agent and its role of empowerment agent to stimulate farmers to play a more active role with regard to strategy development and entrepreneurial learning. The added value contributed by DFA vis-à-vis existing network structures is attributed to features such as: novel ways of theme identification and network facilitation, the use of farmer facilitators, and the opportunity to establish contacts with, and learn from, like-minded actors outside of existing networks.

However, whereas members may regard an inter-firm network brokerage organization as a neutral organization, i.e. without commercial and policy interests and not in competition with existing structures, non-members and other actors from the agricultural knowledge infrastructure may not regard it as neutral. The case indicates that network brokerage organizations, including when these merely focus on forming linkages between farmers and between farmers and other information sources and have no intention of selling advisory services themselves, may nevertheless be perceived by other knowledge intensive service providers, such as consultants, as competitors because their activities clash with some activities they also provide, and they lose opportunities to offer services because farmers are assisted to gather information in other ways. This 'function ambiguity' derives from the inherent complexity of characterizing innovation intermediation as a function or as an organization (see Howells, 2006). As Klerkx and Leeuwis (forthcoming a) argue, innovation intermediation tasks can be fulfilled by certain specialized innovation intermediaries as their core business, but these tasks may also be performed as part of service provision by other knowledge intensive service providers (such as R&D providers and consultants such as accountants or providers of technical or management advice as work of Bessant and Rush (1995) and Thorpe et al. (2005] indicates).

Analogously, Howells (2006) observes that innovation intermediation functions are fulfilled by both private and public providers, and Massey (2003) states that it is essentially a policy choice whether enterprise development services are offered by public or private providers.

This case indicates that it is important to carefully analyze the impact of brokerage initiatives on the existing support system, in terms of which activities may potential-

ly crowd out service delivery by private parties and disrupt networking initiatives of non-participants. Following Van der Meulen et al. (2005), the case also suggests that there appear to be inherent difficulties for intermediaries such as network brokerage organizations in developing a structural position and an autonomous identity, because on the one hand they have been set up as a reaction to shortcomings of current knowledge infrastructures with regard to enterprise development and wish to distance themselves from current practices, but on the other hand they are dependent on certain established parties for resources (in the form of funding and knowledge). It is essential for brokers to balance short-term and long-term considerations in order to maintain the social resources needed for brokerage flexibility and to obtain financial resources, as Pollock et al. (2004) state.

7.6.3 The emergence of a funding paradox

With regard to the funding of brokered network initiatives - a factor identified by many authors as a key tension (Ffowcs-Williams, 2000; Huggins, 2000; Rosenfeld, 1996), several of the issues identified in the literature can be discerned in this case. Like many other brokered network initiatives dependent on public funding, DFA is subject to 'funding impatience' and seen as a project rather than as a longer lasting institution that to become permanent would have to become self-supporting. The results from this study support the findings of others about the difficulties that arise in becoming self-supporting because farmers often do not immediately recognize the benefits and thus are reluctant to pay, at least initially (cf. Huggins, 2000). The premise of being self-supporting therefore entails a paradox: whereas brokerage organizations are set up to relieve certain shortcomings of current knowledge infrastructures (i.e. information asymmetries that prevent firms from finding suitable cooperation partners, reduced system feedback links due to strategic interests in privatized knowledge infrastructures, inability to provide the kind of services required by the current context of agriculture), the demand that they become self-supporting may result in their suffering from the very same market failures and system failures themselves. This is expressed by information asymmetries due to difficulties of ex ante evaluation of a network broker's service value and ex post evaluation of a network broker's impact on enterprise development. It is also expressed in the manifestation of a social dilemma that the benefits for the collective are recognized (enhancing innovation systems performance by facilitating the formation of linkages between system components) but that parties want to realize conflicting goals through a broker as a condition for (financial) support, which can damage the core value of neutrality. Hence, brokerage organizations have to deal with balancing the interests of several stake-holding parties, as they often have to respond to several paymasters. In the event of the need to become fully self-supporting inducing a shift towards becoming a service organization, there is a risk that the network broker will either become a direct executor of other parties' policy or commercial objectives (cf. Laschewski et al., 2002) and let self-interest prevail above network members' interests (cf. Fulop, 2000), or evolve into being a provider of services of proven value to entrepreneurs and hence abandon its improvement and modernization mission (cf. Rosenfeld, 1996). The former development may imply a loss of credibility and neutrality vis-à-vis entrepreneurs; the latter may imply a loss of credibility and neutrality vis-à-vis providers of consultancy services.

7.7 Conclusion

The chapter has indicated that the introduction of network brokerage organizations for the formation and maintenance of inter-firm networks with the purpose of inducing enterprise development and innovation is perceived to have positive aspects, but that it appears to be a function that is hard to make self-sufficient through a dedicated brokerage organization. In order to resolve the funding paradox, the need can be seen for continued government support for network brokerage organizations (following Bessant and Rush, 1995; Ffowcs-Williams, 2000; Rosenfeld, 1996; Thorpe et al., 2005). As this study has shown however, this requires a critical examination of the mandate given to these organizations. On the one hand, if mandates become too prescriptive or restrictive, this may hamper demand-driven service delivery, and may eventually affect the brokers' neutrality towards network participants. On the other hand, mandates should be appropriately confined so that publicly funded demand-driven brokers do not disturb consultancy service markets (i.e. they maintain their credibility and neutrality vis-à-vis providers of consultancy services). In addition to existing difficulties such as finding appropriate evaluation methods to show the impact of network brokerage organizations and justify their existence, striking the correct balance between control and liberty of mandates may provide a new complex task for policy makers.

Notes Chapter 7

- 40 Smith (1997: 94-95) refers to a knowledge infrastructure as a 'complex of public and private organizations and institutions whose role is the production, maintenance, distribution, management and protection of knowledge. These institutions possess technical and economic characteristics that are not dissimilar to those of physical infrastructure.' Whereas this definition appears to focus principally on the supply side of the knowledge infrastructure, current innovation systems thinking emphasizes the role of the user in the co-creation of knowledge (Edquist and Hommen, 1999; Smits, 2002; von Hippel, 2005, Hall et al., 2006).
- 41 Specific functions defined by these authors to be fulfilled by network brokers include: finding participants with commonalities and similar interests; creating a conducive environment and format for knowledge exchange balancing informal, social aspects with formal business goals; developing a learning plan, setting tangible targets that lead to expectancy levels of participants being manageable in both the short and long-term; creating trust amongst participants in the network; balancing the self-interest of individual participants with the common interest of the group; creating sufficient critical mass through balanced network composition; building a learning architecture in which absorptive capacity of participants is increased; facilitating the building of social capital with which to sustain collective action; when needed, bringing external information into the network from and about other networks in other places; coordinating and taking advantage of other institutions, programs, and facilities that could be of benefit to participants of the network.
- 42 In the context of Dutch agriculture, knowledge infrastructure has been traditionally used to indicate the whole of agricultural research, extension and education establishments. From approaches such as agricultural knowledge and information systems (AKIS) (Röling 1990) and the agricultural innovation systems perspective (Hall et al., 2006), several other parties can be mentioned that form part of the broader innovation system, such as supply companies and processing industries. However, the parties specified in this chapter were chosen because they have explicit relationships with DFA, and because their policy objective is to contribute to enterprise development and innovation.
- 43 In September 2006, the number of members in the whole of The Netherlands amounted to 700. The Netherlands has, according to 2005 data, 21,238 dairy farms (Berkhout and Van Bruchem, 2006)

8

General discussion and conclusion

This thesis has explored the ways in which demand-driven working has been operationalized in the Dutch agricultural knowledge infrastructure, and how new organizational arrangements aimed at matching the demand and supply side of the agricultural knowledge infrastructure for the support of agricultural innovation have emerged and have become embedded in the knowledge infrastructure. In this final chapter of the thesis, the results of the different case studies presented in Chapters 2 to 7 will be linked to the general objectives and the research questions. These objectives were:

- 1. To document the operationalization of demand-driven R&D and KIBS provision;
- 2. To explore and increase understanding of the functioning of new organizational arrangements in the agricultural knowledge infrastructure for matching demand for and supply of R&D and KIBS;
- 3. To assess the embedding of new organizational arrangements in the agricultural knowledge infrastructure by exploring the positions and roles of the actors in the knowledge infrastructure vis-à-vis such new organizational arrangements, with an emphasis on end-users (i.e. farmers), R&D and KIBS providers, and the government.

In the following three sections (8.1-8.3) these objectives will be addressed. Section 8.4 discusses the implications for the actor groups that are the focus of this thesis, i.e. farmers, R&D and KIBS providers, and government. The chapter ends with the general conclusions of the thesis (section 8.5) and a number of policy recommendations and suggestions for further research (section 8.6).

8.1 The multifaceted nature of demand: what and whose demand is driving R&D and KIBS provision in the privatized agricultural knowledge infrastructure?

8.1.1 What demand?

As has become clear in the previous chapters, 'demand' and 'demand driven' have become key issues in policy making and knowledge intensive service provision for agricultural innovation. However, these chapters have also revealed that the concept of demand is often used without clearly distinguishing the different meanings and expressions it can have in different contexts. The same applies to notions such as the 'demand side' and the 'supply side' of the agricultural knowledge infrastructure. As von Hippel (2005) notes, in innovation processes actors may in one respect be on the demand side, and in other respects on the supply side. This is especially relevant when innovation is seen as a process of co-creation by several actors. As stated in Chapter I, for the purpose of this thesis, demand side refers to those involved in knowledge search⁴⁴ and supply side refers to those concerned with knowledge use (cf. Clark, 2002). However, as knowledge use is often also the ultimate goal of those engaged in knowledge search, this is better specified as those preoccupied with knowledge sale (which implies that those in search of knowledge are preoccupied with knowledge purchase). Such a definition of demand side and supply side fits well with the current market-oriented governance model of the agricultural knowledge infrastructure.

As much of the literature on the reform of agricultural knowledge infrastructures is informed by economics, the economic definition of demand can provide a good starting point for this discussion. In neo-classical economics, demand is defined as 'the desire for a particular good or service supported by the possession of the necessary means of exchange to effect ownership' (Bannock et al., 1998: 97). In this definition, two basic elements can be distinguished: the desire to purchase something, and the purchasing power required to do so. As is shown in the NMSS case discussed in Chapter 2, in which the concepts of economic demand and substantive demand are introduced, there was neither an autonomous desire for the purchase of KIBS on nutrient management nor autonomous disposition of means of exchange. However, the notion of economic demand that is used in that chapter refers principally to the element of purchasing power, and desire is seen as forming a part of substantive demand. From an economist's point of view, one can therefore criticize the use of the term economic demand in Chapter 2 as being confusing because it does not encompass the element of desire. However, if one follows the definition of Bannock et al. (1998) by adding the element of desire to the notion of economic demand, the notion of substantive demand holds its relevance, especially in the context of nondiscrete 'knowledge service goods' such as R&D and KIBS provision during innovation processes. This notion of substantive demand is relevant in light of service goods such as R&D and KIBS being intangible, and hence implying asymmetric information about the value of service (cf. Hanson and Just, 2001; Van Dijk, 2002);

this implies that desire and purchasing power in themselves are not sufficient to get a product that meets the desired requirements. Depending on the nature of the problem and/or challenge faced by farmers/end-users, two forms of substantive demand articulation are imaginable:

- Ex ante: As a point of departure for service delivery with a more or less discrete nature (e.g. advice on operational issues) or for tangible technologies. This may also continue ex post in the form of user adaptation and/or innovation (see Douthwaite et al., 2001; von Hippel, 2005).
- In-process: As a starting point and as a leitmotiv for the co-creation of a knowledge intensive service or technology (for innovation process with several knowledge intensive components such as R&D and KIBS). In this way, incipient and latent demands are concretized (see Boon et al., forthcoming; Sumberg and Reece, 2004⁴⁵).

This latter kind of demand articulation is in line with the nature of services, following the definition of Gadrey et al. (1995; cited by Den Hertog, 2000: 492) 'to produce a service (...) is to organize a solution to a problem (a treatment, an operation) which does not principally involve supplying a good. It is to place a bundle of capabilities and competences (human, technological, organizational) at the disposal of a client and to organize a solution, which may be given to varying degrees of precision'. Den Hertog elaborates upon this definition and reveals the need for such a concept as substantive demand in R&D and KIBS provision by stating (2000: 493): 'This definition makes it clear that apart from technological capabilities, human and organizational capabilities are also important for providing services. Additionally it allows for a differentiation between highly standardized service products or service formulas with quasi good characteristics (e.g. fast food chains), and the more customized services that are much harder to pinpoint. The latter category of services is often based on more tacit forms of knowledge. Moreover, the services often emerge as a result of co-production between the actual service provider and its client, as many consulting and advisory services show' (see also Laurent et al., 2006). Furthermore, again from an economic perspective on demand, from the viewpoint of new institutional economics, the difficulty of specifying complete contracts in knowledge intensive service provision can be overcome by resorting to 'relational contracts,' which are characterized by less detailed specification about what to do and give the provider more operational freedom (see Braun, 2003).

Co-production of knowledge is seen as an essential feature in the evolution from linear, supply-driven agricultural R&D and extension systems to demand-driven systems with an emphasis on joint (social) learning (see e.g. Engel, 1995; Röling and Wagemakers, 1998; Leeuwis, 1999; Sulaiman and Hall, 2002; Hall et al., 2006), but, as the cases of NMSS, DCB and Bioconnect (Chapters 2, 3, and 4) show, this requires institutional change amongst these parties. Although putting the means in the hands of end-users of innovations creates a demand pull, this does not mean that service delivery will be in accordance with the substantive demands of the enduser. For this, a co-operative attitude and the ability to co-operate are needed on both the demand and the supply side, as well as an enabling institutional environment, as others have also noted (e.g. Vos et al., 1998; Katz and Barandun, 2002; Caputo et al., 2002; Just et al., 2003; Sumberg and Reece, 2004; Klein Woolthuis et al., 2005), to engage in a process of joint and continuous demand articulation as indicated in Chapter 3. However, as Chapter 4 indicates, such a process of joint and continuous demand articulation requires significant efforts to synchronize different objectives, different norms and values, incentive and reward systems, monitoring systems, and power inequalities. An intermediary can play an important role in this process as a neutral facilitator, but various pressures are at play on the intermediary that influence this neutrality (see Chapter 4).

8.1.2 Whose demand?

One of the principal reasons for the privatization of agricultural knowledge infrastructures has been to make R&D and KIBS providers more responsive and accountable to clients by installing a demand pull instead of a supply push. Chapters 2, 3, and 4 deal with cases in which such a demand pull has been operationalized. These cases suggest that privatization, although not the direct focus of these studies, has given rise to orientation and accountability towards clients, in this case government and commodity boards, thereby concurring with findings of Rivera et al. (2002) and Katz and Barandun, 2002. The cases however also reveal that a demand pull does not necessarily result in the most apt or desired service when substantive demand is not adequately articulated (as discussed in section 7.2.1), and furthermore does not guarantee orientation and accountability towards the end-user. As the cases show, orientation is often towards the financier and the demands of the financier. Such financier-driven demands may correspond with end-user demands, but often they are policy induced and hence induce service provision that may not be fully in the private interest of end-users as the NMSS case (Chapter 2), the DCB case (Chapter 3), and the Bioconnect case (Chapter 4) show, as also studies of others (Huggins, 2000; Laschewski et al., 2002; Hanna and Walsh, 2002). Often, public and private interest can be united in a compromise that serves most interests, but when interests are very divergent, this can become problematic. Furthermore, policy-induced demand is not only effectuated through mechanisms such as public funding and private delivery (either by contracting-out (see Rivera et al., 2002) or demand-side financing by means of voucher schemes (see Bebbington and Sotomayor, 1998; Janssen et al., 2004)) that provide direct funding for service delivery, but, as Chapter 7 shows (the DFA case) demand can also be steered by intermediaries who do not offer 'content' themselves in the form of R&D and KIBS⁴⁶ (i.e. the so-called 'neutrality paradox' (Laschewski et al., 2002)).

It appears that, because government has given away direct control over R&D and KIBS provision by privatization, they have lost their channel for achieving desired change through communicative intervention (which is often an element in an intervention mix and needs to be accompanied by other policy measures, as Chapter 2

indicates; see also Leeuwis and van den Ban, 2004; Klein Woolthuis et al., 2005). Although contracting-out could provide a means to realize communicative intervention on themes of public interest because government as the direct client essentially determines which message should be sent to the beneficiary (i.e. the farmer), making the farmer the direct client by providing a voucher with restricted opportunities for spending will not automatically induce purchase of information on 'unwanted' themes of public interest. As Katz and Barandun (2002: 60) note, 'demand-side financing is appropriate mainly for services characterized by a substantial degree of private interest.' In this regard, a distinction should be made between 'demand orientation,' which implies that service providers orient themselves towards end-user demands within the framework set by the commissioner, and 'demand driven' in which there is total freedom of choice for the user (cf. Rijkckmans et al., 2002). In the NMSS case, it was demand orientation rather than demand-driven service delivery that took place, because the Ministry of Agriculture set the framework within which the vouchers could be spent (see Chapter 2). In this regard, demand orientation can be understood as 'commissioner demand orientation' and demand driven as 'end-user demand orientation'.

Also, when the goal is not to induce R&D and KIBS delivery relating principally to public interest themes (or being perceived as such), but to support innovation that is (perceived to be) in the private interest and is fully demand driven, there is seldom a single demand, as Chapters 3 and 4 indicate. As the DCB and Bioconnect cases of R&D planning show, this is a process of negotiating substantive demand, as others have also noted (Stewart, 1995; Davenport et al., 2003; Hall et al., 2003). Lacy (1996: 36) states in this regard: 'the variation in groups that create demand for agricultural research is substantial and often competing and conflicting. Thus, the problems finally chosen for research and extension education arise out of a complex set of negotiations, persuasion, and coercion.' Although in the case of DCB the demand pull comes from end-users, the substantive demand that is generated does not necessarily correspond with their innovation needs, because no synchronic development has taken place from the several institutional arrangements that co-determine demand articulation (i.e. organizational aspects, incentive systems, value and norm systems, reward systems) to enable end-users effectively to exercise substantive demand. In the case of Bioconnect, different groups are enabled to articulate substantive demand in a joint process, but this case indicates that in such a system of delegation of R&D planning/funding to networks there are problems such as information asymmetry and desynchronized monitoring systems that complicate the process of joint demand articulation. In light of analyses of the relationship between commissioners and researchers as a principal-agent relationship (Van der Meulen and Rip, 1998; Huffman and Just, 2000; Van der Meulen, 2003), an important finding is that when several parties can steer R&D this adds to the complexity of the process, as there are multiple principals towards which agents need to orient themselves (compare with Morris, 2003), with often conflicting goals and monitoring criteria.

8.2 Innovation intermediaries as a new organizational arrangement to enhance system interaction within the Dutch agricultural knowled-ge infrastructure

The high degree of system interaction within the Dutch agricultural knowledge infrastructure during the pre-privatization era, the so-called OVO-triptych (meaning Research-Extension-Education triptych), has been a key factor in the development of innovative capacity within Dutch agriculture, as many authors argue (see e.g. Röling, 1990; Vijverberg, 1996; Wielinga, 2001).⁴⁷ However, the OVO-triptych was increasingly criticized in the nineteen eighties because of its linear, supply-driven character and its focus on homogeneity in agricultural production (Bunte et al., 1997; Verkaik, 1997; Enzing et al., 1998; Korthals and Maat, 1998). Because of the growing inadequacy of such a supply-driven, linear perspective on innovation, and several other endogenous and exogenous pressures (such as a tendency towards privatization of public services, diverging interests between government and farmers, diversification of production; see Rutten and van Oosten, 1999; Korthals and Maat, 1998; Wielinga, 2001; Grin, 2004) the OVO-triptych was not maintained.⁴⁸

Partly as a reaction to the observed and/or perceived disintegration of the system interaction component of the OVO-triptych as a result of the several reform measures (i.e. privatization and rationalization of research and extension establishments, a tendency in some sectors to let private interests prevail above collective interests). a number of proposals for new organizational arrangements to facilitate systems integration have been formulated (see Verkaik, 1997; Enzing et al., 1998; De Groot, 2003; Lans et al., 2005). However, these studies are mostly conceptually oriented and present proposals rather than empirical assessments of new organizational arrangements. This thesis has attempted to describe the several arrangements that have emerged and place these in the broader perspective of how such innovation intermediaries are described in the overall scientific literature. As Chapter 5 reveals, such organizational arrangements for connecting individual actors and system components within the agricultural knowledge infrastructure have emerged for several reasons, have been induced by several (policy) initiatives of public and/or private actors, and have taken form through different organizational arrangements. The analysis of new organizational arrangements in the agricultural knowledge infrastructure presented in Chapter 5 has shown that several types of intermediary organizations have emerged, which differ in several aspects. These are:

- Orientation towards different demands: i.e. societal, individual, collective.
- Orientation towards different systems aggregation levels: supersectoral (rural space as a whole, including economic activities other than agriculture), sectoral (agricultural secor), subsectoral (subsectors such as dairy production, horticulture).
- Representation of different interests: private, public, and collective private, often in mixed form.
- Different spatial reach: regional, national.

- Different topical focus: cross-sectoral (whole agricultural sector) or sub-sectoral (subsectors such as dairy farming, horticulture).
- Either an active or a passive role in demand articulation and brokerage.
- Different ambition levels for innovation: i.e. incremental or radical innovation, systems innovation.

In addition to the different types of intermediary organizations described in Chapter 4, Bioconnect as a multiple boundary organization can be also characterized as a new organizational arrangement. This would suggest that an additional type of intermediary organization has emerged in the agricultural knowledge infrastructure, i.e. research councils with innovation agency (cf. Gulbrandsen, 2005).⁴⁹

Despite the several differences between the various types of intermediary organizations, a common denominator is that these organizations wish to play a facilitating role with regard to connecting demand and supply for knowledge intensive services for the support of agricultural innovation (i.e. R&D and KIBS), as well as a facilitating role in streamlining other factors essential to innovation (such as funding, legislation, infrastructure). Hence, the term innovation intermediaries coined by Howells (2006) seems appropriate, as the intermediary organizations described fit Howells' (2006: 720) definition of an innovation intermediary, i.e. 'An organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties. Such intermediary activities include: helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between, bodies or organizations that are already collaborating; and helping find advice, funding and support for the innovation outcomes of such collaborations.'

Chapters 4 and 5 show that the reasons for establishing such innovation intermediaries are of a diverse nature:

- They can be policy driven, by both national and regional government policy, because of the need to address public themes by means of knowledge intensive service provision (e.g. on the theme of nutrient management, see Chapter 2; organic agriculture as an 'incubator' for sustainable agriculture, see Chapter 4) in a situation where direct government intervention through a public service is no longer possible and contracting-out such interventions to private providers is undesirable or unfeasible. Increasingly, stimulating innovation has become a theme of public interest in light of debates on the importance of innovation in the knowledge economy (LNV, 2002; LNV, 2006a; AWT, 2006).
- They can be market and/or innovation system-failure driven, because actors involved in agricultural innovation feel that there are impediments that need to be overcome in order to arrive at concerted action to solve problems and tackle challenges facing agriculture. Such failures include information asymmetries, selection problems due to difficulties of ex-ante assessment of service value, and systems closure due to strategic interests (i.e. competition between providers

and valorization of knowledge through patents and/or first mover advantage), as well as enclosure in 'strong-tie' networks precluding innovative insights to be gained from engaging in 'weak-tie' networks, and system 'lock-in' (see Smits and Kuhlmann, 2004; Tödtling and Trippl, 2005).

- They can be resource-seeking driven, because traditional client-provider linkages have become corroded as a result of privatization and there is a need to install new linkages for reasons of procurement.
- They can be driven by discussions on the changing role of science (i.e. by mode 1
 - mode 2 science and post-normal science thinking, second order knowledge
 infrastructure thinking see Gibbons et al., 1994; Funtowicz and Ravetz, 1993;
 Den Hertog, 2000), as a response to the shortcomings of current systems of
 knowledge intensive service provision to adequately support entrepreneur-driven
 innovation and innovations that are socially acceptable and viable.

That these reasons are not mutually exclusive is partially explained by the fact that often multiple actors (i.e. public, private) are involved in the setup of innovation intermediaries. This corresponds with the observation of Van der Meulen et al. (2005: 7) that 'The establishment of an intermediary organization is often contingent on the specific political context or on typical opportunities and needs within research and innovation sectors.' Also, in line with hypothesizing by the same authors that suggests that innovation intermediaries are dynamic with regard to their objectives ⁵⁰, innovation intermediaries can change over time as a result of interaction with their environment. Therefore the original reason for its establishment can become obsolete as the innovation intermediary adapts to its environment. As discussed in Chapter 5, especially in the years after privatization of the agricultural knowledge infrastructure, the motive of resource seeking has been a major reason for the establishment of type I and type 2 innovation intermediaries (see Chapter 5⁵¹), as well as the realization of policy objectives. As a result of policy discussions, some kinds of innovation intermediaries may come 'into vogue'. This is exemplified in the different kinds of academies that have been set up recently to facilitate peer-to-peer learning because a network perspective on innovation with a focus on 'the strength of weak ties' has become popular (see e.g. Rutten and van Oosten, 1999; Van de Geijn et al., 2002), as well as the establishment of sub-sector oriented systemic foresight instruments based on the Innovation Network Rural Areas and Agricultural Systems (see Van Lente et al., 2003; Smits and Kuhlmann, 2004; Chapter 5 of this thesis). The embedding of innovation intermediaries in the agricultural knowledge infrastructure will be discussed more extensively in section 8.3.

As regards the roles and functions that innovation intermediaries fulfill, Chapter 5 presents an aggregated characterization. It introduces the aggregated functions of demand articulation, network brokerage, and innovation process management ⁵², which can be broken down into several more specific functions ⁵³ (see Smits and Kuhlmann, 2004; Howells, 2006; chapter 6). ⁵⁴ As Chapter 5 shows, these aggregated functions are similar throughout the different types of innovation intermediaries stu-

died, although they may vary with regard to the more specific intermediary functions executed, which in turn depend on the audience of the intermediary organizations, its systems aggregation level, its thematic focus, and its mandate. The mandate, as Chapters 5, 6, and 7 show, is again linked to the constellation of public and/or private actors involved in the setup of the innovation intermediary, and the organizational structure chosen. As Chapter 5 indicates, there is a large variation, but the main organization forms are non-profit foundations, quasi-autonomous executive government agencies (see Kickert, 2001), and for-profit firms.

As several authors indicate (see e.g. Huggins, 2000; Kolodny et al., 2001; Hanna and Walsh, 2002; Laschewski et al., 2002; Van der Meulen et al., 2005), and as also emerges from the case studies presented in Chapters 4, 5, 6, and 7, innovation intermediaries are premised upon a number of core values, of which access to and credibility in the eyes of a broad network of innovation system actors is one key value, and a perceived impartial or neutral position within this network is another key value. Maintaining such a neutral position can be a complex challenge because, due to their intermediary position, innovation intermediaries are subject to several pressures, as will be discussed in the next section.

8.3 The embedding of innovation intermediaries: juggling with demands, balancing interests, and institutional learning in the agricultural knowledge infrastructure

From Chapters 4, 5, and 6 it emerges that innovation intermediaries are perceived to have several beneficial influences on the agricultural knowledge infrastructure and innovation system interaction: they help articulate demands, assist in finding suitable co-operation partners in innovation processes (who may be both knowledge intensive service providers and other parties), forge a connection with these actors, and facilitate interaction during the innovation process. However, from the several case studies presented in this thesis some tensions also emerge with regard to their functioning. Many of these tensions have to do with how the setup and the objectives of these innovation intermediaries fit within the established agricultural knowledge infrastructure. Van der Meulen et al. observed in this regard (2005: 7): 'The institutional development of intermediary organization may increase the capabilities to perform intermediary functions, but may also result in an increased institutional identity and a risk to lose impartiality. As far as other actors accept these identities this may create a rather stable configurations, but changes at the side of either one or both actors involved in the intermediary relationships may easily be transformed into pressures on the intermediary organization. One response of the intermediary organization is to adapt and develop a new position and role, but this requires internal capabilities for institutional change. Other possibilities are that the intermediary organization will be faced with competing intermediaries or new intermediary organizations are established between the old and other actors. In both

cases the number of intermediary bodies increases, configurations become more complex and we may need to look at the development of intermediary fields, rather than organizations. These latter changes may either be the result of organic changes as a result of a range of individual organizational choices, or as a result of policy driven change.'

Several of the assumptions made by Van der Meulen et al. (2005) appear to be confirmed by observations in Chapters 4, 5, 6, and 7. More specifically, the following tensions and pressures emerge with regard to the functioning and institutionalization of innovation intermediaries:

- The neutrality or impartiality paradox, i.e. that innovation intermediaries cannot be neutral or impartial because they always exercise a certain degree of steering (cf. Laschewski et al., 2002) even when they do not provide knowledge intensive services which are linked to the 'content' of the innovation themselves (i.e. as sources or carriers of innovation) but act as a facilitator enabling interaction between actors.³⁵ As Chapters 2, 4, 6, and 7 have shown, this can be explained by the fact that innovation intermediaries need to balance different kind of demands addressed to them that have a direct influence on their present and future position (cf. Pollock et al., 2004). Resource dependencies in particular, with an implicit or explicit expectation of return-on-investment, may force innovation intermediaries to exercise a certain amount of topical steering in demand articulation as well as a network brokerage bias (biased towards matching with certain parties). Such steering by policy or procurement objectives threatens neutrality/ impartiality and gives rise to a social dilemma situation as discussed in Chapters 6 and 7. However, as the case studies show, most innovation intermediaries attach much value to maintaining their neutrality/impartiality and try either to ignore such pressures from financiers/other stakeholders, or to combine the different demands in a mutually acceptable solution.
- Function ambiguity and the alienation dilemma. In line with observations by • Pittaway et al. (2004) and Howells (2006) that innovation intermediation can be a function both of knowledge intensive service providers (for-profit or not-forprofit) and of a dedicated organization (i.e. a 'pure' innovation intermediary, see Chapter 6⁵⁶), the case studies have revealed that, in the Dutch agricultural knowledge infrastructure, innovation intermediation as an autonomous identity (in the words of Van der Meulen et al., 2005) has not yet been fully accepted. This is partly due to the response from established players to the 'revitalization and refreshment' mission of innovation intermediaries, and partly due to the overlap with existing or new functions from 'traditional' R&D and KIBS parties (see also Den Hertog et al., 2000; Van Lente et al, 2003). As Chapters 6 and 7 indicate, there appears to be a distinction with regard to 'pre-competitive' and 'competitive' functions (in terms of contracting services from traditional R&D and KIBS providers). Whereas the aggregated functions of demand articulation and network brokerage (i.e. scanning, scoping, filtering, and matchmaking) predominantly fall into the pre-competitive category, the aggregated function of innovation

process management belongs more to the competitive category. In this regard, Sulaiman et al. (2005: 8) state that 'extension - in the public or private sector should play the role of a bridging organization or a central node to help connect the farmer to other organizations. Whereas a private agency might wish to develop these links and partnerships and be actively involved in them as part of the service it provides, a public service might give more emphasis to facilitating their formation' (see also Garforth et al., 2003b; Crawford et al., 2007). Combining these pre-competitive and competitive functions appears to require a considerable balancing act. As a result of competing functions, innovation intermediaries may alienate themselves from players in the existing knowledge infrastructure who nevertheless can be important for network brokerage (i.e. scanning, scoping, filtering, and matchmaking).⁵⁷ The complexity of positioning themselves alongside or within existing business and political groups is referred to as the alienation dilemma by Laschewski et al. (2002), and the prevention of such alienation is seen as a design requirement by Kolodny et al. (2001).

- The funding paradox. The case studies presented in Chapters 2, 5, 6, and 7 show that various tensions relating to the funding of innovation intermediaries give rise to a funding paradox. This means that whereas innovation intermediaries wish to tackle various market and systems failures in the agricultural knowledge infrast-ructure, they suffer themselves from the same systems and market failures. These include:
 - Difficulties in ex-ante evaluation of service value and low ex-ante identifiability of benefits that affect willingness-to-pay amongst private parties for, especially, demand articulation and network brokerage functions (see also Huggins, 2000; Hanson and Just, 2001; Enzing et al., 1998; Katz and Barandun, 2002 58). This may result in a shift to providing services that are more marketable but entail moving away from the innovation intermediaries' core function (which is often an 'improvement' mission (cf. Rosenfeld, 1996) or a revitalization and refreshment mission (see Chapters 6 and 7)) and/or competing with services provided by other parties and hence risking to loose neutrality;
 - Funding impatience: public funding is provided for too short a period and this impedes the innovation intermediary from becoming well-established. This is enhanced by the fact that the impact of innovation intermediaries on innovation is hard to make visible with current evaluation methods (see Curran, 2000; Curran and Storey, 2002; AWT, 2005). 59 Private investors withdraw funding when return-on-investment (implicit or explicit) is deemed insufficient. In this sense, Laurent et al. (2006: 14) observe that 'From a macro-economic point of view, new contradictions appear between political projects aimed at assigning new roles to agriculture in society, and the implementation of a technical support policy. Yet, strangely enough, whereas intangible investments are considered to be a key issue in most sectors, in agriculture this phenomenon is seldom studied.'
 - The manifestation of a social dilemma, in the sense that the systemic contribu-

tion of innovation intermediaries is recognized, but individual actors who benefit from the contribution innovation intermediaries make to the system's innovation capacity are hesitant to contribute long term to the intermediaries' funding without having a short term return-on-investment.

These tensions appear to be felt particularly by types 1, 2, and 3 innovation intermediaries (see Chapter 5) who offer services to optimize innovation at the level of the individual farmer, but also affect type 4 innovation intermediaries who are oriented towards facilitating systemic innovations. As a response to these tension and pressures, and corresponding changes in organizational structure and funding arrangements, as Chapters 5 and 6 in particular show, a continuous adaptation takes place with regard to the activities of the studied innovation intermediaries and has resulted in the disappearance of some of them, and a shift amongst enduring innovation intermediaries towards activities that can be sustained under a certain funding regime. Besides institutional change processes on the part of innovation intermediaries, two institutional change processes can be observed on the part of innovation intermediaries' clients (both demand and supply side of the agricultural knowledge infrastructure, regarding types 1, 2, and 3 innovation intermediaries):

- An institutional learning process and capacity building with regard to co-operation in innovation processes that is actively instigated by the innovation process management functions, especially through the knowledge brokerage function.
- An institutional learning process with regard to the position and usefulness of an independent pure innovation intermediary as a facilitator in innovation processes.

As hypothesized in Chapter 5, such an institutional learning process may result in (types 1, 2, and 3) innovation intermediaries being a temporary phenomenon that become eventually obsolete, or changing their function or putting more emphasis on certain activities (cf. Van der Meulen et al., 2005). For example, Regeer and Bunders (2007) suggest a shift in emphasis from mediating between separate parties (focusing on network brokerage, i.e. matchmaking and channeling information from one party to the other) towards knowledge brokerage in established networks (focusing on innovation process management to bring about alignment) when 'Mode 2' science becomes the prevalent way of practicing science (what Regeer and Bunders call a 'Mode 2 - intermediary'). Den Hertog (2000) suggests that the innovation intermediation functions of KIBS, which pure innovation intermediaries (especially types 1, 2, and 3) can also be regarded as fulfilling, change as a result of changes in the knowledge infrastructure, i.e. from a public knowledge infrastructure towards a second order public-private knowledge infrastructure, to finally become a 'networked' knowledge infrastructure 60 (see Den Hertog, 2000: 518-523). The results presented in Chapter 5 and Chapter 7 suggest that institutional learning has resulted in the procurement argument as a motive for financial participation in innovation intermediaries becoming less prevalent. Also, they suggest that capacity building with regard to innovation skills and co-operation for innovation has taken place, including the acceptance of the brokerage function (both network and knowledge brokerage) of a pure innovation intermediary. The degree to which this has taken place has not been explored by this study however.

As regards the emergence of intermediary fields, one could regard the different types of innovation intermediaries that have emerged as described in Chapter 5 as intermediary fields. Following Van der Meulen et al. (2005), these fields have emerged as a result both of organic changes emanating from a range of individual organizational choices (such as procurement needs, expansion strategies), and of policy driven change. As indicated earlier, reasons for setting up innovation intermediary organizations have often been mixed, and reasons for change are also mixed. With regard to the policy-driven factor, they do not appear to be the result of coherent policy ⁶¹, but rather of dispersed policy initiatives (see Chapter 5) that in turn have been fed by general policy discourse. Recently, more coherent policy with regard to public support of innovation intermediaries appears to have been developed, as policy documents indicate (LNV, 2003; LNV, 2006a). Although the emergence of competition between different innovation intermediaries has not been directly investigated, the results suggest that there is some form of competition as innovation intermediaries fish in the same pool of farmers. As a result, one can see co-operation being forged, or mergers, or efforts on the part of innovation intermediaries to come together to mutually demarcate the individual territory of each intermediary. 62

8.4 Changing roles of government, farmers, and R&D and KIBS providers

Chapter 2 of the thesis outlines a number of roles for government in a privatized agricultural knowledge infrastructure that are important for proper functioning of the market in agricultural R&D and KIBS. The two main roles are those of a client, paying directly for services that serve public interests, and a market supervisor, promoting competition, setting legal rules, controlling quality, and promoting institutional responsibility (see Carney, 1998; WRR, 2000; Katz and Barandun, 2002; Currle et al., 2002; Garforth et al., 2003a; Garforth et al., 2003b; Rivera et al., 2005). However, as Chapters 2, 4, 5, and 6 indicate, the context of a market for agricultural R&D and KIBS and a heterogeneous agricultural sector in which effective co-operation for innovation is seen as key to survival also requires a role for the government as a market facilitator, or more broadly an innovation system facilitator. ⁶³ This corresponds with pleas by Rivera et al. (2005) who see a system coordination role for governments in agricultural knowledge infrastructures (to which they refer as AKIS) ⁶⁴; Nooteboom (1999) and AWT (2006) see a role for government in the facilitation of cluster formation and innovation network formation.⁶⁵ Braun (2003: 317) states in the context of science policy with regard to the role of the state as a facilitator: 'The focus of government activities in general and of science policy in particular becomes not the manipulation of the behaviour of scientists but the creation of interaction spaces, the reduction of transaction costs for inter-systemic and interdisciplinary co-operation and the maintenance of vigorous, self-organising systems. 'Management of interdependence' and not steering of scientific behaviour characterizes the new funding policy.'

The thesis provides a number of arguments to justify such a role for government as a market and innovation system facilitator, through the funding of innovation intermediaries:

- It appears difficult to make the demand articulation and network brokerage functions self-sufficient.
- Innovation intermediaries contribute to systemic interaction and have a role as catalysts of innovation.
- Innovation intermediaries can more neutrally fulfill the role of facilitator than parties that have a stake in the subsequent research or innovation process.

Nevertheless, the thesis also raises some problems in this regard, including:

- The justification of public spending on innovation intermediaries, as impact evaluation appears to be difficult. In the current situation, type 4 organizations appear to have more stable public and/or public/private (collective) support, whereas for types 1, 2, and 3 this appears to be more erratic.
- The proper demarcation of the mandate of publicly financed innovation intermediaries, as activities that go beyond demand articulation and network brokerage are sometimes perceived as competition. However, these activities are sometimes not yet performed by private companies, or are perceived not to possess the same degree of impartiality.
- The risk that due to resource dependencies the innovation intermediary may become a more or less 'hidden messenger' for government or another party.

As regards the role of farmers in the new agricultural knowledge infrastructure, Lans et al. (2004) and De Groot (2003) suggest that these need to have an open attitude and active position towards knowledge and information acquisition, but, as discussed in Chapters 4 and 5, farmers experience several constraints. Analysis of the cases presented in this thesis suggests that, besides fulfilling explicit demand articulation, network brokerage, and innovation process management tasks, innovation intermediaries also contribute implicitly to capacity building among farmers with regard to knowledge and information acquisition that enables these farmers to act independently on the market for R&D and KIBS. However, as to the degree to which this has taken place the thesis does not provide a clear answer. It is remarkable, though, that often it appears to be those farmers who are already somewhat more interested in innovation that are attracted by innovation intermediaries (see also Wielinga et al., 2007, who made similar observations). Sometimes, this is also the target group of such intermediaries, partly fed by policy discourses that boil down to the idea of 'innovate or perish'. As the DFA case (Chapter 7) suggests, whereas those innovative farmers are attracted to a new arrangement such as DFA, others, who do not wish to participate because they perceive it too avant-guard, see it as a threat to their existing networks.

With regard to the new role for R&D and KIBS providers, the emergence of the paradigm of demand-driven service delivery has brought about major organizational changes, as for example Proost and Duijsings (2002) note in the case of privatized extension service provider, DLV. Also, as the results presented in Chapters 6 and 7 suggest, R&D and KIBS providers have taken on some innovation intermediary roles that they see reflected in the work of the 'pure' innovation intermediaries. This is in line with suggestions put forward by Phillipson et al. (2004) that from previously being providers of mere technical advice, R&D and KIBS providers are diversifying or changing their service palette towards more generic business services. Such services include innovation scans (i.e. demand articulation), setting up strategic business plans, and coaching (see Chapter 7; Snel, 2004). This includes also a shift from being R&D providers to fulfilling facilitator roles in (peer) networks (such as gatekeeping and knowledge brokerage - see Grin et al., 2004; Hubeek et al., 2006; Wielinga et al., 2007; see also Pittaway et al., 2004). As the results indicate, because of these similarities in services, pure innovation intermediaries are sometimes seen as competitors (see section 8.3). However, clients of pure innovation intermediaries see their impartial position as mere facilitators of innovation, rather than as also sources or carriers of innovation, as a distinct benefit of pure innovation intermediaries (see Chapters 4, 5, and 6). Furthermore, they are less attached to the traditional roles, expectations, reward mechanisms, and constraints that the institutional context imposes on those working in research institutes (see Beesley, 2003; Grin et al., 2004). As to institutional change, a few hints as regards institutional learning can be distilled:

- R&D and KIBS providers appear to have learned that because of the adherence of innovation intermediaries to their impartial position they cannot be used as direct procurement instruments. Whereas they invested in early innovation intermediaries, they were more cautious and reluctant in the case of DFA, for example (see Chapter 7).
- Because some innovation intermediaries (especially type 3) fish in the same waters as some KIBS providers since both organize thematic group meetings and perform peer-network facilitation, some KIBS providers have decided to team up with innovation intermediaries. They regard it as an investment, because it may result in business later on, in the event of more specific advice being required.
- R&D providers acknowledge that the involvement of an innovation intermediary can have a beneficial effect on the innovation process, but the results suggest that the position of the intermediary as facilitator vis-à-vis their activities sometimes is not fully clear to them (see Chapters 6 and 7).
8.5 Main conclusions

This thesis addresses three main issues: operationalization of demand-driven R&D and KIBS provision for the support of innovation, the emergence of new organizational arrangements for matching demand for and supply of R&D and KIBS, and the embedding of such new organizational arrangements in the existing agricultural knowledge infrastructure.

8.5.1 The operationalization of demand

As regards the operationalization of demand, a number of conclusions can be drawn. A first conclusion is that the term 'demand-driven' in relation to knowledge intensive service provision for the support of innovation processes is often taken as a conceptual unity in the literature on the reform of agricultural knowledge infrastructures, but needs to be seen as a multifaceted concept that, besides having an economic connotation (i.e. economic demand), has a strong connotation as regards the content of the service provision that it drives (i.e. substantive demand) (Chapter 2). A second conclusion, one that is especially relevant in the context of continued government funding for R&D and KIBS provision through 'public funding-private delivery' arrangements, is that demand for non-discrete knowledge intensive services is the result of an interactive process of co-creation and negotiation between demander and supplier; in situations involving multiple demanders, however, the demands of the financier often prevail. This makes service provision demand oriented (considering end-users but finally determined by the commissioner) rather than demand driven (by end-user's demands) (Chapters 2 and 3). In the case of diverging public (i.e. government) and private (i.e. farmer and/or industry) interests, this threatens the effectiveness of certain service delivery schemes. Demand-driven KIBS service provision under a regime of public funding-private delivery by means of demand-side financing (i.e. vouchers) appears to be less suitable to bring about KIBS provision on themes with a public interest character, but in which private interest is low or is not appreciated (Chapter 2). Demand-driven R&D planning by means of delegation to networks under a regime of public funding results in a negotiation process in which public and private interests must converge towards a mutually acceptable solution.

A third conclusion with regard to the operationalization of demand is that demand for innovation support services is sometimes narrowed down too soon to demand for R&D and KIBS, whereas taking an innovation systems perspective calls for answering various demands that need to be satisfied in order to successfully bring about innovation, and this calls for other activities besides R&D and KIBS provision (Chapters 2 and 3).

8.5.2 New organizational arrangements

With regard to new organizational arrangements for matching demand for and supply of R&D and KIBS, a first conclusion is that innovation intermediaries can play a

useful role in articulating demand in consultation with farmers (end-users of innovation) to such an extent that it can be a starting point for network brokerage (i.e. scanning, scoping, filtering, and matchmaking). They can play a further role in guiding the process of demand articulation and actual service delivery when there is interaction between farmers (and other stakeholders) and knowledge intensive service providers in their role of knowledge broker by reducing cognitive distance. The added value of the latter role appears to be less accepted, though, by R&D and KIBS providers (Chapters 5, 6, and 7). In the Dutch agricultural sector, several types of innovation intermediaries have emerged that can be regarded as intermediary fields in a conceptual sense (i.e. because they perform similar tasks); however, due to their spatial dispersion and general region specificity in a practical sense they generally are not fields (i.e. a chain of innovation intermediaries under the same name and/or set up as a result of the same policy initiative) (Chapter 5).

A second conclusion is that innovation intermediaries appear to emerge, in the words of Van der Meulen (2005: 6), 'contingent on the specific political context or on typical opportunities and needs within research and innovation sectors', and also disappear contingent upon this political context and typical opportunities and needs. With regard to the Dutch agricultural sector, several experiments with innovation intermediaries have been conducted in a context of change in the agricultural knowledge infrastructure and the relationship with end-users of innovation, and of a search for an apt policy instrument for the support of agricultural innovation (Chapters 5, 6, and 7).

A third conclusion with regard to the emergence of new organizational arrangements is that, although not all types of innovation intermediaries can be characterized as purposefully set up 'systemic instruments' because they are targeted rather at facilitating innovation processes of individual farmers, they often do make a systemic contribution (i.e. articulating demand at higher systems aggregation level, informing policy agendas, fulfilling a liaison function between different innovation system and knowledge infrastructure components) (Chapters 5, 6, and 7).

8.5.3 Embedding of new organizational arrangements in the existing agricultural knowledge infrastructure

As to the embedding of new organizational arrangements for matching demand for and supply of R&D and KIBS in the existing agricultural knowledge infrastructure, a first conclusion is that, in their role as (network and knowledge) brokers who serve, and are go-betweens for, several stake-holding parties, innovation intermediaries have to balance several interests concerning the content of the innovation process (i.e. the nature and scope of the innovation), those to be involved in the innovation process, and the different interests of those involved in the innovation process. The degree to which they succeed to satisfactorily balance these different interest appears to have an influence on their perceived impartiality and credibility, and their resource position, and hence their longevity (Chapters 5, 6, and 7).

A second conclusion is that the intangibility of the services performed by innovation

intermediaries, and the difficulty of isolating their impact on the success (or failure) of the innovation process, implies complications in terms of willingness-to-pay and justification for public spending. Despite the difficulty of justifying public spending, in view of the difficulty of funding some of their services through the market and given the perceived positive effect of innovation intermediaries on innovation in their role of facilitators of innovation and systemic instruments, some form of continued public support from government appears essential (Chapters 5, 6, and 7). This implies that besides being a client of R&D and KIBS, and a market supervisor in the market for R&D and KIBS, government becomes a market facilitator (Chapter 2, 5, and 6).

A third conclusion is that an inherent complication of innovation intermediation is that it can be characterized as constituting a dedicated organization (i.e. a pure innovation intermediary), or innovation intermediation can be a function of an organization that also performs other activities. Whereas some functions are better performed by a specialized, dedicated pure innovation intermediary, others can be performed as functions of regular KIBS providers. In line with the former, innovation intermediation is found to constitute functions with both a private good character and a public good character. In particular, because of the uncertain outcome of those innovation intermediation functions that are particularly relevant in the early stages of the innovation process (i.e. demand articulation and network brokerage: scanning, scoping, filtering, and matchmaking) private parties (especially in a pure form, in the role of a mere facilitator of innovation (cf. Den Hertog, 2000)) are often not inclined to undertake them, whereas several innovation process management tasks are fulfilled by regular private KIBS firms. This requires careful demarcation of mandates of publicly funded innovation intermediaries to prevent crowding out of private parties. Such a clear distinction between public functions and private functions appears hard to make, however, and is also dependent on the added value that a pure innovation intermediary is seen to have (i.e. a 'make or buy' decision) (Chapters 5 and 6). Valuation of the function and the added value of innovation intermediaries appears to require a learning process amongst both farmers, R&D and KIBS providers, and government.

A last overarching conclusion with regard to their embedding is that innovation intermediaries emerge in response to certain market and system failures, and (need to) co-evolve with the system whose functioning they wish to optimize, because by their functioning they can resolve certain market and system failures and induce institutional learning that may obliterate certain reasons for their existence (Chapters 5, 6, and 7).

8.6 Policy recommendations and lines for further research

A number of policy recommendations can be derived from the different case studies discussed in this chapter. These concern the role of government as a market facili-

tator/ innovation system facilitator. On the basis of the points discussed in this chapter the following policy recommendations are made:

- Government needs to explore alternative communicative interventions in relation to issues of public interest, because inducing demand by means of financial incentives can be an ineffective way to realize policy objectives. Such communicative interventions should not 'hide' public interests within service delivery aimed at satisfying autonomous private demands, as this may damage the perceived neutrality and credibility of knowledge intensive service providers and/or pure innovation intermediaries.
- Government needs to support pure innovation intermediaries, allow sufficient time for publicly supported innovation intermediaries to become established, and establish non-competitive mandates for these innovation intermediaries, i.e. assess public and private functions of pure innovation intermediaries. Such mandates should be evaluated regularly to adapt them to the needs of the intermediaries' clients on both the demand (i.e. farmers) and the supply side (i.e. R&D and KIBS providers), and to innovation intermediation offered by other parties. Such mandates should allow for the implementation of a 'revitalization and refreshment' mission. At the same time, pure innovation intermediaries should recognize that at some point they may become redundant.
- Government needs to formulate coherent policy for the innovation intermediaries active at different systems aggregation levels to assess whether synergies can be reached by connecting intermediary organizations, without losing their context-specific character.
- Government and other funding agencies need to think more comprehensively about innovation, at the level both of the innovating individual and of the system in which the individual is embedded, and should develop their support instruments accordingly and coherently.

Given the apparent increase in the number of innovation intermediaries in real life, and the growing focus on this type of organizations in the scientific literature, which nevertheless indicates that still much synthesis and systematization of insights needs to be undertaken, the following suggestions for further research are offered:

- Further analysis of the effect of the involvement of pure innovation intermediaries upon the dynamic of (autonomous and self-organizing) innovation networks (following Van Lente et al., 2003; Sapsed et al. 2007), and the contribution to success or failure of the innovation in question, i.e. the optimal balance between autonomy and outsider facilitation of an innovation network.
- The design of adequate parameters to measure the effectiveness of innovation intermediation in terms of impact on economic performance of client firms or regional economic systems. Following Ekboir (2003) and Klein Woolthuis et al. (2005), these should take into account the multiple factors that influence the success or failure of an innovation and its economic impact.
- Further analysis of the distinction between public and private functions of pure

innovation intermediaries, corresponding funding regimes for these public and private functions of innovation intermediaries, and the role of traditional R&D and KIBS providers in the provision of innovation intermediation functions.

- Longitudinal analysis of the institutional development of innovation intermediaries, their effect on the knowledge infrastructure and the broader agricultural innovation system, and the converse effect of development of the knowledge infrastructure and the innovation system on innovation intermediaries.
- Analysis of the relationship between individual competences of staff of innovation intermediaries and its influence on the effectiveness of the several innovation intermediation functions.
- Further comparative analysis of the meaning and scope of intermediary functions as described within different scientific disciplines, and the development of unifying concepts.

Notes Chapter 8

- 44 I.e. knowledge embedded in physical goods and/or R&D and KIBS services.
- 45 Sumberg and Reece similarly note the shortcoming of thinking of demand in economic terms in relation to knowledge intensive service provision for innovation in their case particularly R&D (2004: 303-304): 'In the first instance, economic theory provides a basis for understanding (current) demand simply as the quantity of an existing good or service that is consumed at a given price. The additional demand for that good that is manifest as the price drops is termed latent demand. It is clear that innovation might allow actual demand to be met more efficiently, or it might allow latent demand to be realized by, for example, reducing the cost of production and thus the price to the consumer. This interplay of demand and supply can be seen in terms of functionality and utility. (...) However, this narrow definition of demand is of limited value for understanding the potential future interest in entirely new products or radical variants of existing products or processes. Here the notion of incipient demand, that is, demand that is expected to exist in the future, comes into play. An estimate of incipient demand effectively represents a guess as to the likely strength of future consumer interest in an as yet non-existent product.'
- 46 I.e. as sources or carriers of innovation (see Den Hertog, 2000).
- 47 As Maat (2003) argues, the focus on OVO does not do justice to other drivers of agricultural innovation. The term OVO, although originally referring to government policy with regard to innovation support and knowledge development for the agricultural sector, would have become synonymous with all knowledge and technology development in the agricultural sector. This would deny the important role of the private sector in agricultural innovation (see also Biggs, 1990; Van den Ban, 2000; Roseboom, 2003).
- 48 The OVO-triptych is however a concept that has remained firmly rooted in the collective memory and consciousness of those preoccupied with agricultural innovation, illustrated by the fact that the acronym is frequently mentioned and used as a starting point for new interpretations (see e.g. Van de Geijn et al., 2002; De Groot, 2003).
- 49 Furthermore, as several authors note (e.g. Van Lente et al., 2003; Pittaway et al., 2004; Howells, 2006; Boon et al., forthcoming), more 'traditional' organizations such as worker's unions, industry associations, chambers of commerce, and advocacy organizations (e.g. farmers' organizations) can fulfill innovation intermediation roles.
- 50 Van der Meulen et al. (2005: 7) state: 'we can distinguish phases in the development of an intermediary organization, from its early development towards institutionalization and situations of crisis and institutional change. The establishment of an intermediary organization is often contingent on the specific political context or on typical opportunities and needs within research and innovation sectors. If the establishment results in ongoing interaction and a more enduring organization, the organizations will develop specific capabilities to mediate the relationship and we may observe institutionalization of relationships and development of structural positions.'
- 51 The different types distinguished in Chapter 5 are: Type 1. Innovation consultants aimed at individual entrepreneurs; Type 2. Innovation consultants aimed at collectives of entrepreneurs; Type 3. Brokerage organizations that forge peer (inter-firm) networks; Type 4. Systemic instruments for the support of innovation at higher system level; Type 5. Internet-based portals and databases that organize and display knowledge and information relevant to farmers and related parties.
- 52 While finishing this thesis the author came to find out that a similar characterization has been made earlier by Van Lente et al. (2003), who label these aggregated functions as key functions which are I. articulation of options and demand, 2. alignment of actors and possibilities, and 3. support of learning processes.
- 53 Although Chapters 3 and 5 may suggest that these aggregated functions are part of a linear process, the explorative nature of innovation processes means that there is continuous demand articulation (see Boon et al., forthcoming). There is also continuous network brokerage: when a more or less stable network has been formed, new contacts can be added. Demand articulation, network brokerage, and innovation process management are thus best considered dynamic processes, in which a great deal of fuzziness occurs with regard to the application of certain aggregated or specific functions at certain moments.

- 54 See also Appendix I for a critical reflection on the use of these aggregated functions. As emerges from this reflection, demand articulation principally refers to foresight and diagnostics. Network brokerage from the perspective used in Chapter 5 principally refers to the composition of the network, which in Howells' (2006) terminology would boil down to the functions of scanning, scoping, filtering, and matchmaking. Innovation process management refers to knowledge processing, generation and combination (i.e. knowledge brokerage in Hargadon's (2002) definition); gatekeeping; testing, validation and training; regulation and arbitration; intellectual property protection; commercialization, i.e. exploitation of the outcomes; and assessment and evaluation. However, as Van Lente et al (2003) state, there is often an overlap in lists of functions.
- 55 As Groot (2002) argues, facilitators can never act totally neutral because the norms and values of facilitators always (subconsciously) influence the way they perceive the issue at stake, the choice of their theories and methodologies and their actions. This implies that facilitators should be aware of their norms and values. Some authors found that an innovation intermediary in the form of a 'single issue boundary organisation' may also actively take position and leave its neutral stance (Davenport and Leitch, 2005; see also Goldberger, forthcoming), but this would imply that their existence 'remains limited to the lifecycle of the issues they represent in societal debate' (Davenport and Leitch, 2005; 15).
- 56 The innovation intermediaries discussed in this thesis can be regarded as pure innovation intermediaries.
- 57 Candemir and Van Lente (2007) in this regard remark that innovation intermediaries are sometimes perceived as 'noise' instead of bridges, or catalysts of innovation.
- 58 Following Enzing et al., 1998, this can be coupled to inherent uncertainties attached to the kind of processes in which innovation intermediaries fulfill intermediation roles: multiple demanding parties, unarticulated demands for knowledge (which are subject to discussion and negotiation) and many potential executors.
- 59 Especially in the context of a privatized system and the contracting-out of public services to private providers, this has become important in terms of accountability for public spending and efficient and effective use of public funds.
- 60 This implies, according to Den Hertog (2000: 520), that: 'The traditional distinction between public and private knowledge based (advisory) services will gradually disappear. This could lead to a development in which not firms and institutions but networked service professionals irrespective of the formal organization to which they belong will increasingly act as carriers and sources of knowledge. This process of blurring boundaries will eventually result in a more flexible capacity of external KIBS professionals cooperating with internal KIBS professionals in providing knowledge-intensive business services.'
- 61 Describing the development of innovation policy targeting Dutch non-agricultural SMEs (the domain of the Ministry of Economic Affairs) in the context of a market in R&D and KIBS, Bartels (1993) notes there has also been much 'trial-and-error' policy.
- 62 For a discussion on the 'streamlining' of various innovation intermediation organizations (while maintaining region or sector specificity) in the context of non-agricultural SMEs, see Hassink (1996: 174-177).
- 63 See also RLG (2006) for a broader discussion on the changing role of the Dutch Ministry of Agriculture, Nature and Food Quility in the current context of agriculture.
- 64 Recently, market facilitation and innovation system coordination has become more central in Dutch agricultural innovation policy (see RLG, 2005; LNV, 2006a; LNV, 2006b).
- 65 See also Hearn and Rooney (2002) who broadly discuss the role of government in knowledge based economies, and come to the conclusion that government has a role as a coordinator, which these authors specify as mediator, organizer, and transformer. Tödtling and Trippl (2005) argue in a similar vein and state that government has a role in overcoming innovation system failure and should apply policies to enhance communication and interactive learning in the system.

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Appendix

In this thesis the following inconsistencies are apparent:

- The use of agricultural knowledge market in Chapter 3, which later changes to market for agricultural R&D and KIBS. Due to progressive insights this has been changed; see the discussion in the Introduction and Chapter 5.
- The terms 'state' and 'government' are used interchangeably.
- The use of 'needs articulation' and 'needs' in general (Chapters 3 and 4), which later on is changed to 'demand articulation' because of the availability of a more apt definition (Boon et al., forthcoming; Sumberg and Reece, 2004; Kodama, 1995). Following Sumberg and Reece, the term 'needs' may be too broad to guide technology development, and the term 'demand articulation' used in the later chapters is better suited. The new product development literature uses other terms, such as consumer 'needs' and 'requirements', to indicate the existence of an opportunity (i.e. a possibility to create effectively and then satisfy demand for a new product). However, as pointed out by Mowery and Rosenberg (1979) these terms have limited analytical value: lacking a precise definition, the 'shapeless and elusive notion of 'needs'' does little to distinguish among the 'potentially limitless set of human needs'.
- In Chapter 7, the terms 'network brokers' and 'network brokerage' have also been • used to encompass facilitation activities that according to Chapter 5 can be captured under the heading 'innovation process management' (such as e.g. knowledge brokerage and gatekeeping). This is due to the use of the term 'network broker' being prevalent within the enterprise development literature. As Howells' (2006) work points out, there is still much overlap of terminology within different disciplines 66. Note that the functions of demand articulation, network brokerage, and innovation process management as used in Chapter 5 are aggregated functions that encompass a range of more specialized functions described by Howells (2006) that 'unpacked innovation intermediation' (see p. 721-722). The perspective used in Chapter 5 relates to the chronological order of these intermediation functions in facilitating the innovation process as it often emerged from the case studies. This does not mean that all the functions necessarily are executed in this order, or that all functions are always applied in each innovation process. Demand articulation principally refers to foresight and diagnostics. Network brokerage from the perspective used in Chapter 5 principally refers to the composition of the network, which in Howell's (2006) terminology would boil down to the functions of scanning, scoping, filtering, and matchmaking. Innovation process management refers to knowledge processing, generation, and combination (i.e. knowledge brokerage in Hargadon's (2002) definition); gatekeeping; testing, validation and training; regulation and arbitration; intellectual property protection; commercialization, i.e. exploitation of the outcomes; and assessment and evaluation.
• The terms 'farmers' and 'agricultural entrepreneurs' are both used. However, the term agricultural entrepreneur is not used to indicate the degree to which the farmer exhibits entrepreneurial behavior. What constitutes an entrepreneur in terms of personality characteristics is still debated, also whether it is innate or can be learned (see Lans et al. 2004; Knudson et al., 2004, De Lauwere, 2005; Pyysiäinen et al., 2006; Bergevoet, 2005). In prevalent policy jargon, all farmers are addressed by the term entrepreneur, but the meaning in Dutch may be more comprehensive and less attached to certain entrepreneurial characteristics than its meaning in English, and how it is used in scientific literature.

Note

66 For example, innovation intermediaries are often called 'knowledge brokers', but there appears to be no consensus in the literature on what the exact function of a knowledge broker is: functions such as outsourced procurement and R&D management in the case of publicly financed R&D undertaken by several R&D providers (Enzing et al., 1998; Hinloopen, 2004), improving knowledge exchange in multi-actor learning processes (Hargadon, 2002; Van Mansveld, 2003; Johnson, 2004; Hubeek et al., 2006) or improving the provision of (scientific) information to end-users (Starkey and Madan, 2001; Lavis et al., 2003; Jacobson et al., 2004) are mentioned.

Summary

Agricultural knowledge infrastructures worldwide are in transition as a result of reform measures affecting funding and governance structures and as a response to new heterogeneous demands from an agricultural sector that has become increasingly knowledge intensive. This implies a shift from a supply-driven paradigm of service delivery towards one that is demand driven. In The Netherlands, reform measures have resulted in full privatization of public agricultural research and extension establishments; this, in turn, has given rise to the emergence of a market in agricultural R&D and knowledge intensive business services (KIBS). This market provides knowledge, embedded in services, for the support of operational decision making as well as support for agricultural innovation. It forms part of a broader agricultural innovation, such as 'hard institutions' (laws and legislation) and 'soft institutions' (norms, values, and incentive systems), and infrastructure in the form of roads and ICT, funding, etc.

The transfer to such a market in agricultural R&D and KIBS entails several demands and challenges for actors in the knowledge infrastructure on both the demand side (i.e. end-users of innovations such as farmers, government) and the supply side (i.e. providers of R&D and KIBS). These demands and challenges boil down to 1) adequately articulating demand prior to and during service provision (to guide knowledge and technology development), 2) developing adequate resources and competences for innovation (to implement new knowledge and technology), 3) dealing with market failures (such as information asymmetries, finding suitable cooperation partners, negative spillovers, substitution and exclusion risks), 4) financing the provision of agricultural R&D services and KIBS (i.e. undertaking procurement to find clients, and mobilizing funds to finance service provision), and 5) overcoming system failures (counteracting system closure and weakening system linkages). To assist various actors in the knowledge infrastructure to cope with these challenges and demands, new organizational arrangements have emerged that help to articulate demand, fulfill brokerage roles to find suitable cooperation partners and form linkages with these, and help overcome cognitive, cultural, financial, legislative, and practical barriers during cooperation for innovation. They thus attempt to match demand and supply in the agricultural knowledge infrastructure.

The thesis focuses on such new organizational arrangements, guided by three objectives, as described in Chapter 1:

- 1. It seeks to document the operationalization of demand-driven R&D and KIBS provision (principal focus of Chapters 2 and 3).
- 2. It seeks to explore and increase understanding of the functioning of new organizational arrangements in the agricultural knowledge infrastructure for matching demand for and supply of R&D and KIBS (principal focus of Chapters 4 and 5).
- 3. It seeks to assess the embedding of new organizational arrangements in the agri-

cultural knowledge infrastructure by exploring the positions and roles of the actors in the knowledge infrastructure vis-à-vis such new organizational arrangements, with an emphasis on end-users (i.e. farmers), R&D and KIBS providers, and the government (principal focus of Chapters 6 and 7).

Chapter 2 explores the operationalization of demand-driven KIBS service provision in relation to a public interest issue, using demand-side financing through a voucher scheme. It discusses the case of the Nutrient Management Support Service (NMSS), a government-funded support service in The Netherlands designed to optimize the fit between the demand for and supply of 'agricultural knowledge products' that reduce nutrient emissions into the environment. The activities of the support service were four-fold: (1) distributing vouchers to farmers, (2) establishing mechanisms for quality control, (3) facilitating the articulation of end-users' needs, and (4) improving market transparency. The chapter analyzes the extent to which the NMSS has succeeded in supporting a demand-driven KIBS market for the provision of knowledge on nutrient management. The results indicate that the financial incentive or subsidy that was given through the vouchers encouraged KIBS suppliers to inform their clients about the possibility of spending the voucher with them, rather than catalyzing an autonomous demand for KIBS provision on nutrient management issues. Furthermore, creating market transparency by means of certification of 'knowledge products' did not induce a search for the best buy amongst farmers, as they often stuck with their regular advisor. It appeared that it was the conflictive relationship between farmers and government regarding the nutrient management issue, as well as uncertainty about nutrient emissions regulation, that restrained farmers from becoming active in relation to nutrient management, rather than a lack of knowledge. The project was characterized by limited flexibility to adapt to clients' (i.e. farmers) wishes, because it had to orient itself towards the wishes of the paymaster. Although a market facilitator such as NMSS was appreciated in some respects, its project nature meant that it was inherently subject to 'funding impatience', as a result of which it could not establish itself long term within the agricultural knowledge infrastructure. The chapter concludes that demand consists not only of an economic component (i.e. desire to purchase and purchasing power), but also of a substantial component that is about co-creation of the desired service. The former was induced by the project, the latter not. It also indicates that clearly displaying supply is not sufficient to facilitate a KIBS market, as this does not aid in selection. Furthermore, it indicates that, when there is no or little private interest, using demand-side financing in a 'public funding-private delivery' KIBS scheme does not seem to be the most apt way to bring about knowledge exchange and learning on a public interest issue.

Chapter 3 presents a case study on the planning of R&D in a system of private collective funding. The current emphasis on making agricultural R&D systems demand driven implies that R&D should be steered by the needs of end-users of innovations (i.e. farmers). A principal challenge in this respect is to institutionalize demand-driven modes of working in agricultural R&D systems. This chapter focuses on collective R&D funding by farmers who pay levies that are subsequently used to contract agricultural R&D. In this system of 'contractual research planning,' enduser steering and control of the R&D planning process is institutionalized. Advocates of participatory R&D often see this as the maximum degree of end-user participation in R&D. The purpose of the chapter is to critically examine such a system for operationalizing end-user demands in R&D planning, and to reveal possible weaknesses. The outcomes suggest that, although end-users have the opportunity to raise issues that lead to R&D, researchers and R&D coordinators find that these are not articulated clearly enough to guide R&D planning, and end-users are not involved in any subsequent reformulation of the matter under consideration. Queries are influenced by several actors in the R&D planning process in such a way that they do not adequately reflect farmers' innovation needs. Furthermore, throughout the R&D planning and execution process, there seems to be limited interaction with endusers and other relevant stakeholders. The chapter concludes by stating that, although end-users have the possibility of expressing their demands and of assigning budgets, there should be greater focus on raising the quality of demand articulation, and on involving end-users and other relevant stakeholders throughout the innovation process. Also awareness needs to be raised regarding the position of R&D within the broader innovation system. From an innovation systems perspective, it is argued that, in a situation where R&D provisioning has been privatized, R&D funding organizations should take the lead in adopting a more inclusive view on innovation. This calls for institutional development in the funding organization.

Chapter 4 deals with a case study on a system of delegation of R&D planning and execution to networks, in which farmers, agri-industry, and civic advocacy organization representatives and government on the demand side, and researchers and consultants on the supply side, jointly engage in research planning. An intermediary organization (Bioconnect) acts as a bridge at different interfaces in the system (e.g. between government and researchers, between researchers and end-users), at different stages of the R&D planning and execution process. This system of delegation to networks is a new way for government to operationalize demand-driven R&D provision. The purpose of this study, taking the perspective of the principal-agent relationship, was to reveal tensions that emerge in such a system of delegation at different stages of the R&D planning and execution process, i.e. the policy arena, the selection arena, and the control arena. Principals refer here to research commissioners, and researchers' agents. The results indicate that in the policy arena there are tensions between the goals that the 'master principal' (government) and the 'delegated principal' (end-users) want to achieve, and that distilling an unequivocal enduser demand is difficult. Furthermore, network participants must make a distinction, and strike a balance, between their personal return on their private investments and the private and collective returns for the broader constituency for

which they also speak. In the selection arena, information asymmetries among actors and the different actors' incompatible desired reporting formats make selection more complicated. This raises the suggestion that actors that have more knowledge about the process can exercise more power. In the control arena, the different actors' incompatible monitoring mechanisms make it more difficult for researchers to communicate about research. The intermediary's attempt to manage all these different interests in these various areas, and to maintain its position as a neutral facilitator, is complicated by its resources dependencies and its organizational mission. The conclusions indicate that in order to optimize delegation to networks the following is required: I) capacity building amongst the actors involved to be able to effectively operate in the various arenas (i.e. reducing the information asymmetries), 2) synchronization of the different expectations of different actor groups involved in the network with regard to the goals at macro (government) and at micro (user) level and related monitoring output (i.e. pay sufficient attention to mutually understandable 'boundary objects'), and 3) awareness building about the private investments network participants have to make and the collective benefits these yield.

Chapter 5 focuses on the constraints and challenges experienced by the supply side and the demand side of the market for agricultural R&D and KIBS in effecting transactions and establishing the necessary relationships to engage in demand-driven innovation processes. To mitigate these constraints and assist in tackling these challenges, a range of intermediary organizations has emerged to assist farmers to articulate demand, forge linkages with those that can provide innovation support services (i.e perform a bridging and brokerage function), and facilitate interaction between the actors involved in the innovation processes. The chapter aims to give an overview of the different kinds of so-called innovation intermediaries that have emerged in The Netherlands, as a result of which five types are distinguished: innovation consultants aimed at individuals, innovation consultants aimed at collectives, brokerage organizations that forge peer (inter-firm) networks, systemic instruments that perform foresight tasks, and internet-based portals. The chapter reports on the contributions and the tensions that are being experienced with regard to their functioning. The chapter concludes with a discussion on several design issues in relation to these innovation intermediaries (i.e. their impartial position, their funding, their mandate, their position vis-à-vis other knowledge infrastructure actors, and the role of innovation policy with regard to their establishment) in which it is argued that the government could play an important role as a market facilitator, by funding certain functions of such innovation intermediaries.

Chapter 6 presents a case study on the embedding of an innovation intermediary who acts as a bridge between demand and supply in the agricultural knowledge infrastructure. The chapter focuses on the relationships between a for-profit intermediary organization, InnoFac, and several parties for which it performs various bridging functions, i.e. coupling these parties in particular innovation processes and

channeling and facilitating their subsequent interactions. Many KIBS providers can be characterized as innovation intermediaries, but InnoFac is a 'pure' innovation intermediary (a facilitator of innovation) whereas other KIBS are also 'sources' or 'carriers' of innovation, i.e. they also sell knowledge about the technical characteristics of the innovation in question. This chapter focuses on relationships between a pure innovation intermediary and the supply side of the knowledge infrastructure, whereas in the broader literature the focus often is on interactions with end-users of knowledge and information. The findings suggest that, although pure innovation intermediation is seen as beneficial, tensions emerge regarding the innovation intermediary's governance structure, the way it generates its revenues, and the different activities it performs. One of these tensions is the emergence a 'social dilemma' situation, in which on the one hand the innovation intermediary is seen to make a contribution to the collective interest, but on the other hand stake-holding parties also want to satisfy their individual interests: this requires continuous balancing. Another tension is the generation of revenues: a for-profit orientation appears to enhance accountability and efficiency, but also entails risks, including the fact that willingness-to-pay is affected by the intangibility of the activities of the innovation intermediary. Furthermore, different parties with which the innovation intermediary is involved have different ideas about the required project size and the cost involved. A last tension is the emergence of 'function ambiguity', i.e. parties with which the pure innovation intermediary interacts cannot estimate well how the activities of the pure innovation intermediary relate to their own activities, and to what extent they add value to innovation intermediation functions they themselves claim to perform. The chapter indicates that a clearer delineation between the different activities undertaken by this pure intermediary has to be made in order to minimize competition with 'traditional' providers of R&D and knowledge intensive business services, so that its credibility and impartiality can be protected. Also, an institutional learning process is required amongst parties on both the supply and the demand side of the market for R&D and KIBS to valuate the services of an innovation intermediary. Furthermore, some tasks of innovation intermediaries appear to be best funded publicly to avoid impartiality, credibility and function conflicts, whereas others can possibly be funded privately.

Chapter 7 focuses on the peer (inter-firm) network brokerage organization, Dairy Farming Academy (DFA). This study investigates the institutional setup of a network broker, and what is the effect of this setup on farmer networking and the existing business and innovation support system. DFA aims to articulate knowledge needs of farmers and connect them with farmers with a similar interest and with other parties that can offer information on the particular topic. To execute its activities, DFA mainly receives public funds from the Ministry of Agriculture, collective funds from the Dairy Commodity Board, and a small amount in user fees. Results show that a demand-driven way of working may prevent policy-supported network brokers losing their neutrality in farmers' eyes because they are seen as a 'messenger' from government. However, a broker nevertheless can be perceived as disruptive by business and innovation support service providers. This dilemma prompts critical examination of the mandate of publicly funded network brokers. Furthermore, the study reveals that there appears to be a funding paradox: whereas network brokers aim to reduce market and system failures in inter-firm networking, their financial longevity is threatened by the very same market and system failures linked to the nature of their activities, i.e. information asymmetries and difficulties in ex ante and ex post evaluation of service value.

Chapter 8 integrates the results of the various chapters into a general discussion, centered around the research objectives set out in Chapter 1, and provides the main conclusions of the thesis. The main conclusions are the following:

- I. The term 'demand-driven' in relation to knowledge intensive service provision for the support of innovation processes is often taken as a conceptual unity, but needs to be seen as a multifaceted concept, which besides having an economic connotation (i.e. economic demand) has a strong connotation as regards the content of the service provision that it drives (i.e. substantive demand).
- 2. Demand for non-discrete knowledge intensive services is the result of an interactive process of co-creation and negotiation between demander and supplier, which in the case of multiple demanders is often oriented towards the demands of the financier, thus making service provision demand oriented (considering end-users but finally determined by the commissioner) rather than demand driven (by end-users).
- 3. Demand-driven service provision under a regime of 'public funding-private delivery' by means of demand-side financing (i.e. vouchers) appears to be less suitable to bring about KIBS provision on themes with a public interest character, but in which private interest is low or is not considered to be an issue.
- 4. Demand for innovation support services is sometimes narrowed down too soon to demand for R&D and KIBS, whereas taking an innovation systems perspective calls for responding to various demands that need to be satisfied in order to successfully bring about innovation; this calls for other activities besides R&D and KIBS provision.
- 5. Innovation intermediaries can play a useful role in articulating farmers' (endusers') demand for innovation to such an extent that it can be a starting point for network brokerage (i.e. scanning, scoping, filtering, and matchmaking). They can play a further role in guiding the process of demand articulation and actual service delivery when there is interaction between farmers (and other stakeholders) and knowledge intensive service providers in their role of knowledge broker.
- 6. In the Dutch agricultural sector, several types of innovation intermediaries have emerged at different system aggregation levels. Their emergence is usually prompted by the prevailing policy context or by research and innovation opportunities/needs at a particular point in time, and they disappear for the same

types of reason. With regard to the Dutch agricultural sector, several experiments with innovation intermediaries have been conducted, in a context of change of the agricultural knowledge infrastructure and the relationship with end-users of innovation, and a search for an apt policy instrument for the support of agricultural innovation.

- 7. Although not all types of innovation intermediaries can be characterized as purposefully set up 'systemic instruments' because they are rather targeted at facilitating innovation processes of individual farmers, they often do make a systemic contribution (i.e. articulating demand at higher system aggregation levels, informing policy agendas, fulfilling a liaison function between different innovation system and knowledge infrastructure components).
- 8. In their role as (network and knowledge) brokers who serve, and are gobetweens for, several stake-holding parties, innovation intermediaries have to balance several interests concerning the content of the innovation process (i.e. the nature and scope of the innovation), those to be involved in the innovation process, and the different interests of those involved in the innovation process. The degree to which they succeed in satisfactorily balancing these different interests appears to have an influence on their perceived impartiality and credibility, and their resource position, and hence their longevity.
- 9. The intangibility of the services performed by innovation intermediaries, and the difficulty of isolating their impact on the success (or failure) of the innovation process, has implications in terms of willingness-to-pay and justification for public spending. Despite the difficulty of justifying public spending, in view of the difficulty of funding some of their services through the market and given the perceived positive effect of innovation intermediaries on innovation in their role as facilitators of innovation and systemic instruments, some form of continued public support from government appears essential. Besides being a client of R&D and KIBS, and a market supervisor in the R&D and KIBS market, government is becoming a market facilitator.
- 10. An inherent complication of innovation intermediation is that it can be characterized as constituting a dedicated organization (i.e. a pure innovation intermediary), or be a function of an organization that also performs other activities. Whereas some functions are better performed by a specialized, dedicated pure innovation intermediary, others can be performed as functions of regular KIBS providers. Such a clear distinction appears hard to make, however, and is also dependent on the added value that a pure innovation intermediary is seen to have (i.e. a 'make or buy' decision). Valuation of the function and the added value of innovation intermediaries appears to require a learning process amongst farmers, R&D and KIBS providers, and government.
- 11. Pure innovation intermediaries have a paradoxical goal: they emerge as a result of market and system failures, but by their functioning they resolve certain market and system failures and induce institutional learning that may eliminate the reasons for their existence.

Samenvatting

Wereldwijd bevinden agrarische kennisinfrastructuren zich in een proces van fundamentele verandering. Dit is deels het gevolg van hervormingsmaatregelen die betrekking hebben op de financiering en het bestuur van deze agrarische kennisinfrastructuren. Daarnaast is deze transitie een reactie op nieuwe en heterogene vragen van een agrarische sector die steeds kennisintensiever wordt. Dit alles impliceert een verschuiving van een aanbodgedreven paradigma van dienstverlening naar vraaggestuurde dienstverlening. In Nederland hebben deze hervormingsmaatregelen geresulteerd in de volledige privatisering van voorheen publieke onderzoeks- en voorlichtingsorganisaties. Dit heeft geleid tot de ontwikkeling van een markt voor agrarisch onderzoek en kennisintensieve dienstverlening. Deze markt voorziet in kennis, ingebed in diensten, voor de ondersteuning van zowel operationele beslissingen als voor de ondersteuning van agrarische innovatie. De markt maakt deel uit van een breder innovatiesysteem, waarin ook andere elementen een rol spelen die van belang zijn voor agrarische innovatie, zoals 'harde instituties' (weten regelgeving) en 'zachte instituties' (normen, waarden, beloningssystemen), en infrastructuur in de vorm van bijvoorbeeld wegen, ICT, financieringsinfrastructuur, etc.

De overgang naar een markt voor agrarisch onderzoek en kennisintensieve dienstverlening brengt verschillende uitdagingen met zich mee voor actoren in de agrarische kennisinfrastructuur, aan zowel de vraagkant (eindgebruikers van innovaties zoals boeren, en de overheid) en de aanbodzijde (aanbieders van onderzoek en kennisintensieve dienstverlening). Deze uitdagingen komen neer op 1) het adequaat articuleren van vragen, vóór en tijdens de dienstverlening (om richting te geven aan kennis- en technologieontwikkeling), 2) het ontwikkelen van adequate middelen en competenties om innovatie mogelijk te maken (om nieuwe kennis en technologie te kunnen implementeren), 3) omgaan met elementen van marktfalen (zoals informatieasymmetrie, 'adverse selection' van samenwerkingspartners, negatieve spillover, substitutie- en uitsluitingsrisico's), 4) het financieren van onderzoek en intensive dienstverlening, en 5) het oplossen van elementen van systeemfalen (het tegengaan van geslotenheid van het systeem en ontbrekende verbindingen tussen systeemcomponenten). Om de verschillende actoren in de agrarische kennisinfrastructuur te ondersteunen bij het hanteren van deze uitdagingen zijn er nieuwe organisatorische arrangementen ontstaan. Deze helpen met vraagarticulatie, vervullen een makelaarsrol om geschikte samenwerkingspartners te vinden en deze aan elkaar te koppelen, en helpen om cognitieve, culturele, financiële, legislatieve en praktische barrières te slechten gedurende de samenwerking in het innovatieproces. Deze nieuwe organisatorische arrangementen proberen dus vraag en aanbod in de agrarische kennisinfrastructuur bij elkaar te brengen.

Dit proefschrift gaat over dergelijke nieuwe organisatorische arrangementen. De doelstelling van het onderzoek is drieledig:

- 1. Het beschrijven van pogingen tot operationalisering van vraaggestuurd onderzoek en kennisintensieve dienstverlening (hoofdstuk 2 en 3).
- 2. Het verkennen van, en inzicht verschaffen in, het functioneren van nieuwe organisatorische arrangementen in de agrarische kennisinfrastructuur voor het verbinden van vraag en aanbod van onderzoek en kennisintensieve dienstverlening (hoofdstuk 4 en 5).
- 3. Het evalueren van de inbedding van deze nieuwe organisatorische arrangementen in de agrarische kennisinfrastructuur, met een nadruk op eindgebruikers (met name boeren), onderzoeksorganisaties en kennisintensieve dienstverleners, en de overheid (hoofdstuk 6 en 7).

Hoofdstuk 2 verkent de operationalisering van vraaggestuurde kennisintensieve dienstverlening met betrekking tot een publiek thema, door financiering van de vraagzijde door middel van een voucher systeem (zogenaamde 'kennisbonnen'). De casus betreft het Steunpunt Mineralen (SPM), een door de Nederlandse overheid gefinancierde 'kennismakelaar' die vraag en aanbod bijeen moest brengen van 'kennisproducten' die betrekking hadden op het reduceren van mineralenemissies naar het milieu. De activiteiten van SPM waren vierledig: (1) het verstrekken van kennisbonnen aan boeren, (2) het realiseren van mechanismes voor kwaliteitscontrole van kennisproducten, (3) het articuleren van de vragen van eindgebruikers (boeren), en (4) het bevorderen van markttransparantie. Geanalyseerd wordt in hoeverre SPM heeft bijgedragen aan een vraaggestuurde markt in kennisintensieve dienstverlening op het gebied van mineralen management. De studie laat zien dat de financiële prikkel in de vorm van de kennisbonnen, in plaats van het tot stand brengen van een autonome vraag naar kennisdienstverlening op het gebied van mineralen management, eerder tot gevolg had dat de kennisdienstverleners (dus de aanbodzijde) geprikkeld werden en hun klanten informeerden over mogelijkheden om de bon bij hun te besteden. Het creëren van markttransparantie door middel van certificering van kennisproducten heeft er evenmin toe geleid dat boeren op zoek gingen naar de 'beste koop'. De reden is dat ze vaak trouw bleven aan hun reguliere dienstverlener. Ook bleek dat boeren niet zozeer een tekort hadden aan kennis over mineralenmanagement, maar dat de verstoorde relatie tussen boeren en overheid en de onduidelijkheid over regelgeving rondom mineralenemissie boeren ervan weerhielden actief met mineralen management aan de slag te gaan. Het project bleek er niet toe te leiden tot een flexibele omgang met de behoeften van de boeren, omdat het zich moest richten op de wensen van de financier, dat wil zeggen de overheid. En hoewel SPM als 'markt facilitator' ook waardering oogstte, kon het zich in de hoedanigheid van een project niet duurzaam inbedden in de kennisinfrastructuur. Het hoofdstuk eindigt met de constatering dat de 'vraag' naar kennisintensieve dienstverlening niet alleen betrekking heeft in economische zin (dat wil zeggen het verlangen om te kopen en de noodzakelijke middelen hiervoor), maar ook een inhoudelijke betekenis heeft die te maken heeft met het proces van co-creatie van de gewenste dienst. Met name de economische dimensie werd met het project gestimuleerd, de inhoudelijke dimensie niet of in geringe mate. Ook geeft de studie aan dat het duidelijk aangeven van het aanbod niet voldoende is om de markt in kennisintensieve diensten adequaat te ondersteunen, omdat daarmee onvoldoende aanknopingspunten worden geboden voor een uiteindelijke selectie. Ten slotte geeft de studie aan dat als er een gering privaat belang is, dat het gebruik maken van financiering van de vraagzijde in een systeem van 'publieke financiering-private verstrekking' van kennisintensieve dienstverlening niet de meest geschikte manier lijkt om kennisuitwisseling en leren over een publiek thema tot stand te brengen.

In hoofdstuk 3 wordt een studie gepresenteerd naar onderzoeksplanning in een systeem van privaat-collectieve onderzoeksfinanciering. Om landbouwonderzoeksystemen vraaggestuurd te maken moet het onderzoek worden aangestuurd door de behoeften van eindgebruikers van innovaties, van de boeren dus. De grote uitdaging is dan het institutionaliseren van vraaggestuurde werkwijzen in landbouwonderzoeksystemen. Deze studie betreft de collectieve onderzoeksfinanciering door boeren die heffingen afdragen aan het Productschap Zuivel, welke worden gebruikt om landbouwonderzoek te contracteren. Met dit systeem van 'contractuele onderzoeksplanning', is eindgebruikersturing en -controle van het onderzoeksplanningsproces geïnstitutionaliseerd. Voorstanders van participatief onderzoek zien dit doorgaans als de hoogste vorm van participatie in onderzoek. De resultaten laten zien dat de onderzoeksvragen die eindgebruikers indienen, door onderzoekers worden beoordeeld als onvoldoende gearticuleerd om als basis voor onderzoeksplanning te dienen. Eindgebruikers worden vervolgens doorgaans niet betrokken in de verdere articulatie. In plaats daarvan wordt de vraagarticulatie bepaald door andere actoren in het onderzoeksplanningsproces, op een zodanige manier dat de vragen de innovatiebehoeften van boeren niet meer adequaat weergeven. Naast beperkte interactie in het vraagarticulatieproces is er in het verdere onderzoeksplannings- en onderzoeksuitvoeringsproces eveneens sprake van beperkte interactie tussen onderzoekers en beleidsmakers enerzijds en eindgebruikers anderzijds. De conclusie is dat, ondanks het feit dat boeren de mogelijkheid hebben om hun vragen kenbaar te maken en dat hun eigen vertegenwoordigers beslissen aan welk onderzoek het geld wordt besteed, er aandacht moet worden besteed aan de kwaliteit van het vraagarticulatieproces door eindgebruikers en andere stakeholders gedurende het gehele innovatieproces te betrekken. Ook dient er bewustwording plaats te vinden over de rol van onderzoek binnen de bredere context van het innovatiesysteem. Vanuit een innovatiesysteem-perspectief zou, zeker in een situatie waarin onderzoek is geprivatiseerd en wordt gecontracteerd, de financier een leidende rol moeten hebben in het ontwikkelen van een bredere kijk op innovatie. Voorwaarde is dat er institutionele ontwikkeling plaats vindt bij de financier.

Hoofdstuk 4 beschrijft een studie naar de delegering van onderzoeksplanning en begeleiding aan een netwerk waarin vertegenwoordigers van boeren, leveranciers en afnemers, maatschappelijke organisaties en de overheid aan de vraagkant, en onder-

zoekers en adviseurs aan de aanbodkant, gezamenlijk onderzoek plannen. Een intermediaire organisatie (Bioconnect) heeft een makelaars/brugfunctie tussen verschillende componenten in het systeem (bijvoorbeeld tussen de overheid en onderzoekers, en tussen onderzoekers en eindgebruikers), op verschillende momenten in het onderzoeksplannings- en onderzoeksuitvoeringsproces. Deze delegering van onderzoeksplanning naar een netwerk is een nieuwe manier voor de overheid om vraaggestuurd onderzoek te organiseren. Om spanningen te kunnen identificeren in een dergelijk delegeringsysteem wordt gebruik gemaakt van het economische perspectief van de principal-agent relatie. De principals zijn de opdrachtgevers (de overheid via het eindgebruikersnetwerk) en de agents zijn de onderzoekers en adviseurs. Spanningen worden geïdentificeerd aan de hand van verschillende 'arena's' in het onderzoeksplannings- en onderzoeksuitvoeringsproces. Dit zijn de zogenoemde 'doelformuleringsarena', de 'selectiearena' en de 'controle arena'. Uit de resultaten blijkt dat er in de doelformuleringsarena spanningen zijn tussen de doelen die de 'hoofd principal' (de overheid) en de ' gedelegeerde principals' willen bereiken. Daarnaast blijkt het lastig om een uniforme vraag uit het heterogene eindgebruikersnetwerk te distilleren. Ook moeten de vertegenwoordigers van de eindgebruikers in het netwerk een onderscheid maken tussen, en een balans zien te vinden in, wat zij zelf investeren met hun deelname aan het netwerk, en wat ze er voor terug krijgen in de vorm van private en collectieve baten. In de selectiearena maken informatieasymmetrie tussen de verschillende actoren en de verschillende voorkeuren voor rapportageformats de selectie lastiger. Door deze informatieassymetrie kan de perceptie ontstaan (terecht of onterecht) dat degene die meer kennis in en over het selectieproces heeft meer invloed kan uitoefenen. Wat de controlearena betreft wordt het vanwege ongelijke (voortgangsmonitoringscriteria van de verschillende actoren lastig voor onderzoekers om effectief te communiceren over het onderzoek. De poging van de intermediaire organisatie om, met behoud van de positie van een neutrale facilitator deze uiteenlopende belangen te managen wordt bemoeilijkt doordat deze zelf niet alleen bepaalde financiële afhankelijkheden heeft, maar ook een specifieke missie. De conclusies geven aan dat voor een effectieve delegering van onderzoeksplanning- en uitvoering aan een netwerk aandacht moet worden besteed aan de volgende zaken: 1) competentieontwikkeling onder de betrokken actoren om effectief in de verschillende arena's te kunnen opereren (om informatieasymmetrie te reduceren), 2) synchronisatie van de verwachtingen van de verschillende actoren in het netwerk met betrekking tot de doelen op macro (overheids) en micro (eindgebruikers) niveau, en 3) bewustwording van de private investeringen (in tijd en moeite) van deelnemers in het netwerk in verhouding tot wat deze terug krijgen in de vorm van baten voor het collectief.

Hoofdstuk 5 gaat over de uitdagingen die worden ervaren vanuit de vraag- en de aanbodzijde van de markt in agrarisch onderzoek en kennisintensieve dienstverlening bij het realiseren van transacties en het tot stand brengen van relaties om vraaggestuurde innovatie processen tot stand te brengen. Een gamma van intermediaire organisaties is ontstaan die boeren (en andere actoren) ondersteunen bij vraagarticulatie en bij het tot stand brengen van relaties met diegenen die innovatieondersteunende diensten verlenen (dat wil zeggen, een makelaarsfunctie vervullen), en die de interactie faciliteren tussen actoren die bij het innovatieproces zijn betrokken. Een overzicht wordt gegeven van verschillende types innovatie intermediairen. Vijf types worden onderscheiden: innovatieconsultants gericht op individuele ondernemers, innovatieconsultants gericht op collectieven van ondernemers, netwerkmakelaars die netwerken van gelijkgestemden helpen vormen, systeeminstrumenten die scenariostudies en experimenten uitvoeren die tot systeeminnovaties moeten leiden, en internetportals. Het hoofdstuk eindigt met een discussie over de organisatorische opzet van innovatie intermediairen (betreffende hun neutrale positie, hun mandaat, hun positie ten opzichte van andere actoren in de kennisinfrastructuur, en de invloed van innovatiebeleid op hun totstandkoming). Beargumenteerd wordt dat de overheid een belangrijke rol kan spelen als facilitator van de onderzoeks- en kennisdienstverleningsmarkt doorbepaalde functies van deze innovatie intermediairen te financieren.

In hoofdstuk 6 wordt een studie gepresenteerd naar de inbedding van een innovatie intermediair die een brugfunctie vervult tussen vraag en aanbod in de agrarische kennisinfrastructuur. Gefocused wordt op de relatie tussen een for-profit innovatie intermediair, InnoFac, en de verschillende partijen waar deze brugfuncties voor vervult. Het betreft het koppelen van deze partijen en het faciliteren van de interactie tussen deze partijen gedurende het innovatieproces. Waar andere kennisintensieve dienstverleners deels ook 'bronnen' of 'overdragers' van innovatie zijn, is InnoFac een 'pure' innovatie intermediair, aangezien deze organisatie geen technische kennis betreffende de innovatie verkoopt maar enkel de interactie tussen de betrokken partijen tracht te faciliteren. In deze studie gaat het om interacties tussen de innovatie intermediair en de aanbodzijde van de agrarische kennisinfrastructuur. De resultaten geven aan dat, hoewel de betrokkenheid van een pure innovatie intermediair als nuttig wordt gezien, spanningen optreden die betrekking hebben op de organisatiestructuur van de innovatie intermediair, met name de manier waarop deze inkomsten verwerft en de verschillende activiteiten uitvoert. Zo doet zich een 'sociaal dilemma' situatie voor: de aandeelhoudende partijen zien in dat de innovatie intermediair een bijdrage levert in het belang van iedereen, maar zien tegelijkertijd graag hun eigen belang bevredigd. Dit vereist een voortdurend balanceren van belangen. Een andere spanning betreft de inkomstenverwerving: een marktgedreven winstgeoriënteerde insteek vergroot verantwoording ten aanzien van de klanten over behaalde resultaten en efficiëntie, maar heeft ook risico's. Zo kan de betalingsbereidheid worden belemmerd doordat de activiteiten van de innovatie intermediair in het innovatieproces nogal ongrijpbaar zijn. Ook hebben de verschillende partijen waar de innovatie intermediair mee te maken heeft verschillende ideeën over de benodigde projectomvang en de bijbehorende kosten. Een laatste spanning is dat 'functie-ambiguïteit' zich manifesteert, wat wil zeggen dat de partijen waarmee de innovatie intermediair werkt niet goed in kunnen schatten hoe de activiteiten van de innovatie intermediair zich verhouden tot hun eigen activiteiten, en in hoeverre deze activiteiten een toegevoegde waarde hebben ten opzichte van de innovatie intermediaire functies die zijzelf vervullen. De studie laat zien dat een beter onderscheid tussen de activiteiten van de innovatie intermediair en die van 'traditionele' onderzoeksorganisaties en kennisintensieve dienstverleners noodzakelijk is, om de geloofwaardigheid en neutraliteit van de innovatie intermediair te waarborgen. Een institutioneel leerproces bij partijen aan zowel de vraag als aanbodzijde van de markt voor onderzoek en kennisintensieve dienstverlening is nodig om de diensten van de innovatie intermediair op waarde te schatten. Om neutraliteits-, geloofwaardigheidsen functieconflicten te voorkomen lijken de resultaten te suggereren dat sommige activiteiten van innovatie intermediairen het beste publiek en andere privaat kunnen worden gefinancierd.

In hoofdstuk 7 wordt gekeken naar organisaties die een makelaarsrol vervullen in de vorming van boerennetwerken. De Melkvee Academie vormt het object van een studie naar opzet en de organisatorische structuur van deze netwerkmakelaar, en wat het effect daarvan is op boerennetwerkvorming en de bestaande kennisinfrastructuur. De Melkvee Academie articuleert kennisvragen van boeren, en verbindt boeren met een gedeelde belangstelling met elkaar, en met andere partijen die informatie kunnen bieden over het onderwerp in kwestie. De Melkvee Academie wordt gefinancierd uit publieke en privaat-collectieve middelen, naast een lidmaatschapsbijdrage van deelnemende boeren. Uit de resultaten blijkt dat een vraaggestuurde werkwijze kan voorkomen dat overheidsgesteunde netwerkmakelaars hun neutraliteit ten opzichte van boeren verliezen omdat ze als een boodschapper van de overheid worden gezien. Dat neemt overigens niet weg dat bestaande kennisintensieve dienstverleners de netwerkmakelaar als storend beschouwen. Dit dilemma vraagt om een kritische evaluatie van het mandaat van publiek gefinancierde netwerkmakelaars. Bovendien laat de studie zien dat er zoiets is als een 'financieringsparadox': terwijl netwerkmakelaars proberen om sommige manifestaties van markt en systeemfalen die netwerkvorming bemoeilijken op te lossen, wordt hun eigen financiering en daarmee bestaansrecht ook bedreigd door manifestaties van marktfalen, te weten informatie assymetrie en moeilijkheden in ex ante en ex post evaluatie van de dienstverlening.

In Hoofdstuk 8 worden de resultaten uit de verschillende hoofdstukken geïntegreerd in een algemene discussie, en gekoppeld aan de onderzoeksdoelstellingen die in Hoofdstuk I zijn geformuleerd, en worden een aantal algemene conclusies getrokken. Deze conclusies zijn:

 In het kader van kennisintensieve dienstverlening voor de ondersteuning van innovatieprocessen wordt de term 'vraaggestuurd'vaak als een conceptuele eenheid gezien. Belangrijk is zich te realiseren dat het een concept betreft met vele facetten, dat naast een economische connotatie ook een sterke inhoudelijke connotatie heeft.

- 2. De vraag naar kennisintensieve diensten is het resultaat van een interactief proces van cocreatie en onderhandeling tussen de vrager en de aanbieder, met een sterke oriëntatie op de vereisten van de financier. In het geval van meerdere vragers maakt dit de dienstverlening eerder vraaggeoriënteerd (de vraag van eindgebruikers wordt in ogenschouw genomen maar uiteindelijk bepaalt de opdrachtgever) dan vraaggestuurd (de vraag van eindgebruikers is bepalend).
- 3. Vraaggestuurde dienstverlening in een systeem van 'publieke financieringdienstverlening door private bedrijven' door middel van financiering aan de vraagzijde (dat wil zeggen door middel van vouchers) lijkt minder geschikt om kennisintensieve dienstverlening tot stand te brengen rondom publieke thema's waarbij het private belang grotendeels afwezig is of het betreffende thema door de eindgebruiker niet als een belangrijk issue wordt gezien.
- 4. De vraag naar innovatieondersteuning wordt soms te snel vertaald in een vraag naar onderzoek en kennisintensieve dienstverlening, terwijl vanuit een innovatiesysteem perspectief het ook van belang is om aan andere voorwaarden te voldoen. Dit vraagt om andere activiteiten naast onderzoek en kennisintensieve dienstverlening.
- 5. Innovatie intermediairen kunnen een zinvolle rol hebben bij de vraagarticulatie in het kader van innovatie. Dit kan het startpunt vormen voor netwerkmakelen (dat wil zeggen het verkennen van mogelijke samenwerkingspartners, het filteren hiervan, en het koppelen van partijen). Ze kunnen verder een rol spelen in het begeleiden van het proces van verdere vraagarticulatie en dienstverlening, met name wanneer interactie plaatsvindt tussen boeren en andere stakeholders enerzijds en kennisdienstverleners anderzijds in een rol van 'kennismakelaar'.
- 6. In de Nederlandse agrarische sector zijn verschillende types innovatie intermediairen opgezet op verschillende aggregatieniveaus. Hun ontstaan is mede bepaald door de heersende beleidscontext en door innovatiemogelijkheden en behoeften op dat moment; wanneer deze context en behoeften veranderen verdwijnen ze ook weer. Verschillende experimenten hebben plaatsgehad met innovatie intermediairen - en vinden nog plaats - in de context van veranderingen in agrarische kennisinfrastructuur en de relatie met eindgebruikers van innovaties, dit met het oog op het zoeken naar een geschikt beleidsinstrument voor de ondersteuning van agrarische innovatie.
- 7. Hoewel niet alle types innovatie intermediairen kunnen worden aangemerkt als doelbewust opgezette 'systeeminstrumenten' omdat ze gericht zijn op het faciliteren van innovatieprocessen van individuele boeren, leveren ze vaak wel een systemische bijdrage in de vorm van vraagarticulatie op hogere systeemaggregatieniveaus, het voeden van beleidsagenda's en het vervullen van een verbindingsfunctie tussen verschillende innovatiesysteem en kennisinfrastructuur componenten.
- 8. In hun rol van makelaars die diensten verlenen aan, en bemiddelen tussen vele belanghebbende partijen, moeten innovatie intermediairen veel belangen met elkaar verzoenen. De mate waarin ze slagen om deze belangen op een bevredi-

gende wijze te verzoenen lijkt een invloed te hebben op de gepercipieerde neutraliteit en geloofwaardigheid, de verwerving van bestaansmiddelen, en dus hun duurzame voortbestaan.

- 9. De ongrijpbaarheid van de diensten die door innovatie intermediairen worden verleend, en de moeilijkheid van het isoleren van hun impact op het succes (of de mislukking) van het innovatieproces, heeft implicaties zowel voor de betalingsbereidheid van private partijen als voor de verantwoording voor de besteding van publieke gelden (aan innovatie intermediairen). Ondanks dat het lastig is om publieke financiering te verantwoorden, lijkt een bepaalde vorm van gecontinueerde overheidsfinanciering essentieel. Redenen hiervoor zijn de moeilijkheid van het financieren van sommige van deze activiteiten via de markt met private gelden, en het gepercipieerde positieve effect van innovatie intermediairen in hun rol als facilitators van innovatie. In de context van een markt in agrarisch onderzoek en kennisintensieve dienstverlening betekent dit dat de overheid, naast het uitoefenen van de rol van klant van onderzoek en kennisintensieve dienstverlening te waarborgen), ook een marktfacilitator wordt.
- 10. Een inherente complicatie van innovatie intermediairen is dat hun diensten een samenhangend pakket kunnen vormen dat zich richt op de facilitatie van innovatie waardoor ze kunnen worden aangemerkt worden als een 'pure' innovatie intermediair, maar ook deel uit kunnen maken van de diensten van 'traditionele' onderzoeksorganisaties en kennisintensieve dienstverleners (die ook 'bronnen' en 'overdragers' van innovaties zijn), zij het vaak op een minder integrale wijze. Waar sommige functies het beste kunnen worden uitgevoerd door een pure innovatie intermediair, kunnen andere functies ook door 'traditionele' aanbieders worden uitgevoerd. Het lijkt lastig om hier een helder onderscheid te maken. Dit is ook afhankelijk van de mate waarin het als een toegevoegde waarde wordt gezien dat dit door een 'pure' intermediair wordt gedaan (dat wil zeggen dat het een bewuste keus is om innovatie intermediairen te kunnen bepalen lijkt een leerproces nodig onder boeren, onderzoeksorganisaties en kennisintensieve dienstverleners en de overheid.
- II. Pure innovatie intermediairen hebben een paradoxaal doel: zij komen op als reactie op sommige manifestaties van markt en systeemfalen, maar omdat zij bepaalde manifestaties van markt en systeemfalen oplossen en partijen leren om hiermee om te gaan en 'innovatievaardigheden' te ontwikkelen, kunnen zij hun eigen reden van bestaan wegnemen.

Dankwoord

Als ik sommigen mag geloven, heb ik wel eens gezegd dat ik nooit een promotieonderzoek zou gaan doen. Maar als je aan het einde van je studie eindelijk hebt ontdekt dat je sociale wetenschap het leukste vind, je daarin nog veel te leren hebt, je gevraagd wordt om te solliciteren, en je ook op korte termijn een baan nodig hebt om te zorgen dat je vriendin een verblijfsvergunning kan krijgen, dan is de keus snel gemaakt. Het is een goede keus geweest: gelukkig heb ik weinig gemerkt van het promotieonderzoek als een eenzame lijdensweg waarbij aanzienlijke partner- en kinderverwaarlozing plaatsvindt. Het is een zoektocht, dat zeker, maar die kan zeer plezierig verlopen. Hieraan hebben een groot aantal personen bijgedragen.

Om te beginnen, mijn promotor, Cees Leeuwis. Cees, in de geest van dit proefschrift sprekend, heb ik jouw vraaggestuurde begeleiding altijd als zeer waardevol en ondersteunend ervaren. In het begin gaf je me de ruimte om mijn eigen zoekproces te doorlopen, je faciliteerde genoeg om te zorgen dat ik aan de gang kon, en later gaf je me waardevolle feedback op de stukken die ik schreef. In innovatietheoretische termen sprekend was er sprake van een proces van co-evolutie en co-creatie.

Natuurlijk heeft ook de omgeving waarin ik dit promotieonderzoek heb gedaan een belangrijke rol gespeeld. De sectie Communicatiewetenschap varieert weliswaar qua bemensing, maar altijd is er een gezellige, open sfeer waarin het goed werken is, en waar de lunches iedere keer weer leuke en interessante conversaties opleveren. Hoewel ik al mijn collega's hartelijk hiervoor wil bedanken, verdient mijn voormalige kamergenote Joyce hier een speciale vermelding. Zij heeft altijd gezorgd voor een constante stroom van snoepjes, wat erg belangrijk is om productief te blijven. Mooi om te zien dat dit nu op meerdere plekken op de vakgroep onderkend wordt!

Om een proefschrift te kunnen schrijven moet er wel iets te onderzoeken zijn. Toegang tot organisaties en mensen verkrijgen is daarvoor essentieel. Een groot aantal mensen betrokken bij de intermediaire organisaties die ik heb bestudeerd wil ik bedanken voor hun medewerking. Dit zijn in het bijzonder Rinus van de Waart en Trudy van Megen van KnowHouse, Catharinus Wierda, Carel de Vries, Jolien Koole en René Schepers met betrekking tot Melkvee Academie, Willem Koops van het Productschap Zuivel, Arjan Monteny met betrekking tot Bioconnect, en Rob van Mechelen van het AKC Noord Holland/Syntens Agro. Overigens wil ik ook alle andere personen die mij als respondent te woord hebben gestaan bedanken. Maarit Junnikkala heeft een grote bijdrage geleverd in het benaderen van respondenten, waarvoor hartelijk dank. Een aantal mensen hebben als mede-onderzoeker een belangrijke bijdrage geleverd aan dit proefschrift. Karin de Grip komt een groot deel van de eer toe met betrekking tot de Steunpunt Mineralen studie. Ik heb erg prettig samengewerkt met Hans Buster en Hilde van Dijkhorst in het onderzoek rondom het Productschap Zuivel. Ook Linda Hoekstra die een afstudeervak over Melkvee Academie heeft gedaan wil ik bedanken voor haar inzet. I wish to thank Catherine O'Dea for her editing services and the pleasant cooperation, as well as Rhiannon Pyburn.

Als promovendus draait je leven op een gegeven moment om één ding: artikelen. Voor buitenstaanders zijn dit minder interessante discussies, maar gelukkig kon ik dit delen met een lotgenotencontact van promovendi bestaande uit Petra en Birgit. En natuurlijk is er ook nog een leven buiten het werk. Zeker in de periodes dat Ninoska in Chili zat en ik alleen hier in Nederland hebben de mensen om mij heen mij de nodige afleiding bezorgd. Ik wil hiervoor mijn inmiddels ex-buren Karin en Remco, en Amber en Arjen bedanken, en de leden van de voormalige rommelrockband Bemanning, Jos, Bas en Harm. Ook mijn vrienden Michiel, Michiel en Martijn, en hun partners, waren een grote steun. Mooi om te zien dat het contact met oud-studiegenoten die zich (weer) in Wageningen vestigen als natuurlijk weer wordt opgepakt, zoals met Renske die meehielp op de tuin en in het nieuwe huis. Y por supuesto también quiero agradecer a todos nuestros amigos latinos para la buena onda latina.

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List of publications

Articles in peer reviewed journals

- Klerkx, L., De Grip, K., Leeuwis, C., 2006. Hands off but strings attached: the contradictions of policy-induced demand-driven agricultural extension. Agriculture and Human Values, 23(2), 189-204.
- Klerkx, L., Leeuwis, C., forthcoming. Balancing multiple interests: Embedding innovation intermediation in the agricultural knowledge infrastructure. Technovation, in press.
- Klerkx, L., Leeuwis, C., forthcoming. Matching demand and supply in the agricultural knowledge infrastructure: experiences with innovation intermediaries. Food Policy, in press.
- Klerkx, L., Leeuwis, C., forthcoming. Institutionalizing end-user demand steering in agricultural R&D: farmer levy funding of R&D in The Netherlands. Research Policy, in press.
- Klerkx, L., Leeuwis, C., forthcoming. Institutionalization of inter-firm network brokerage organizations: a case study from Dutch agriculture. Submitted for publication.
- Klerkx, L., Leeuwis, C., forthcoming. Delegation of research governance to networks: experiences with a multiple goal boundary organization in organic agricultural research. Submitted for publication.

Papers in conference proceedings

- Klerkx, L., Leeuwis, C., De Grip, K., 2003. Contradictions of supply side induced demand driven extension: The case of the mineral management liaison service. In Kozari, J (Ed.), Rural extension and training/education as the missing elements in rural development projects (pp. 253-258). Godollo: Szent Istvan University Godollo.
- Leeuwis, C., Klerkx, L., 2006. New knowledge arrangements in the Dutch agro-ecological innovation system: Tension between privatisation and innovation discourses. In Langveld H., Röling, N.G. (Eds.), Changing European farming systems for a better future. New visions for rural areas, Wageningen, The Netherlands, 7 11 May, 2006 (pp. 340-344). Wageningen: Wageningen Academic Publishers.

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- Klerkx, L., Leeuwis, C. Balancing multiple interests: innovation brokers in the market for agricultural innovation support services. (Poster presentation) 7th edition of the International Conference on Management in AgriFood Chains and Network.1-2 June, 2006. Ede, The Netherlands.
- Klerkx, L., Leeuwis, C. Embedding innovation intermediation in the Dutch agricultural knowledge infrastructure. (Oral presentation) Knowledge network for System Innovations and Transitions (KSI) - annual scientific meeting. I June 2007. Eindhoven, The Netherlands.
- Klerkx, L., The Dutch Agricultural Innovation System. Matching demand and supply in the privatized agricultural knowledge infrastructure. (Oral presentation) I servizi di sviluppo agricolo in Italia: le sfide per il futuro (Agricultural development services in Italy: challenges for the future). Regione Puglia/INEA. 19-20 September, 2007. Bari, Italy.

Published research reports

- Klerkx, L., Buster, H., Leeuwis, C., 2006. Effectiviteit en benutting collectief gefinancierd onderzoek melkveehouderij. (Effectiveness and use of collectively financed research in the dairy sector) Wageningen: Communicatie en Innovatie Studies, Wageningen Universiteit.
- Klerkx, L., Van Dijkhorst, H.K. Leeuwis, C., 2006. Experimenten met nieuwe wijzen van vraaggeneratie en vraagarticulatie voor het Productschap Zuivel (Experiments with new ways of demand articulation for the Dairy Commodity Board) Wageningen: Communicatie en Innovatie Studies, Wageningen Universiteit.
- Klerkx, L., Leeuwis, C., 2007. Professionalisering van participatie in kennisontwikkeling en -verspreiding. Ervaringen met het kennisnetwerk Biologische Landbouw (Bioconnect) (Professionalising participation in research and extension. Experiences with the Bioconnect network). Wageningen University, Communication and Innovation Studies, Wageningen.

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- Leeuwis, C., Smits, R., Grin, J., Klerkx, L., Van Mierlo, B.C., Kuipers, A., 2006. Equivocations on the post privatization dynamics in agricultural innovation systems In: Smits, R.E.H.M. (Ed.), The design of an innovation-enhancing environment (Transforum Working papers, 4) (pp. 3-5). Zoetermeer: Transforum Agro & Groen.
- Klerkx, L., Proost, J., 2007. Overview of innovation practices in the Netherlands. Draft report for working package 2, INSIGHT programme, EU.

Curriculum Vitae

Laurens Klerkx was born on 20 March 1977 in Schijndel, The Netherlands. After completion of his secondary education at Gymnasium Beekvliet in Sint Michielsgestel in 1995, he enrolled at Wageningen University to study tropical land use. As part of these studies, in 1997 he participated in an exchange program under which he spent four months at Michigan State University in East Lansing, Michigan. In 1999-2000 he spent a seven-month internship at the Centro de Gestión Empresarial Pelarco (Farm Management Centre Pelarco) near Talca, Chile. During this internship he studied views of small-scale farmers on the conversion to organic agriculture. A second visit to South America brought him to the Universidad de La Republica in Montevideo, Uruguay, where in 2001 he spent three months doing fieldwork for his masters thesis studying stakeholders' views in relation to an explorative land-use computer model. In 2002 he obtained his MSc, with a major in Plant Production Systems, and a minor in Communication and Innovation Studies. Hungry to learn more about the latter subject, he started to work on a PhD project within the Communication and Innovation Studies Group of Wageningen University, with the original title 'Understanding the functioning of emerging knowledge and information markets, and their capacity to support innovation processes towards knowledge intensive forms of agriculture', which, with some deviations from the original proposal, resulted in the current thesis. From November 2007 onwards Laurens has been working as a postdoctoral researcher on the project 'Selforganization in innovation networks. Implications for enhancing resilience in agrosystems'.

Name of course	Institute / Department	Year	ECTS *
Mansholt Introduction course	Mansholt Graduate School of Social Sciences (MG3S)	2003	1,5
Governance Crossing Borders	MG ₃ S	2003	4,2
Research methodology; designing and conducting a Ph.D. research project	MG3S	2003	2,8
Techniques for writing and presenting a Scientific Paper	MG3S	2004	I,2
Thesis supervision	Onderwijsondersteuning Wageningen Universiteit	2004	I,4
Sustainable development in Latin-America: Macro policy and micro response	Centre for Latin American Studies, UvA, Amsterdam	2004	8,6
New Institutional Economics	MG ₃ S	2004	2,8
Interviewing skills	Rural Sociology Group, Wageningen University	2004/2005	6
Career Orientation	Wageningen Graduate Schools	2005	2
Presentations at conferences and workshops			
16th European Seminar of Extension Education, Eger, Hungary		2003	I
7th edition of the International Conference on Management in AgriFood Chains and 2006 Network, Ede, The Netherlands			Ι
Mansholt Multidisciplinary seminar	2007	I	
Teaching and supervision activities			
Supervision of two MSc thesis students, contributions to the organisation of a course, 2005-2007 and three guest lectures. Wageningen University, Communication Science			3
Total (minimum 30 ECTS)			36,5

Completed training and supervision plan

* One ECTS on average is equivalent to 28 hours of course work.