

Building knowledge systems for sustainable agriculture: Supporting private advisors to adequately address sustainable farm management in regular service contacts

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Abstract *Advisory service provisioning on sustainability issues such as the environment and food safety is considered suboptimal in privatised pluralistic agricultural extension systems. Hence policy measures have been proposed to stimulate farmer demand for such sustainable farm management advice (pull measures), and to build capacity amongst private advisors (push measures). Awareness building is a prerequisite to create demand for such services and appears more important than economic incentives. However, a lack of awareness may not be the main problem: the broader institutional context may not be conducive to a proactive approach to addressing sustainable farm management if regulatory frameworks are unclear.*

Keywords: *environmental protection, nutrient management, food safety, mastitis, public goods, advisors, sustainable farm management*

Introduction

The quest for more sustainable agriculture demands adequate agricultural extension systems which embrace complexity (Leeuwis, 2000). As a result of privatisation, in many countries demand-driven pluralistic agricultural extension systems have emerged, in which different kinds of private advisors are active in the context of a ‘knowledge market’ (Leeuwis, 2000). This influences the way extension systems address sustainability issues: whereas straightforward technical advice on production issues is generally satisfactorily provided through privatised extension systems, sustainable farm management (SFM) issues such as environmental care and food safety are insufficiently addressed (Laurent *et al.*, 2006; Botha *et al.*, 2008). Private demand for extension service provisioning on such ‘public good’ issues is generally low, because the investment does not always yield immediate economic returns (Bruges & Smith, 2008). Given its public good character it is argued that government has to remain responsible for SFM extension (Garforth *et al.*, 2003). A common way to do this is by contracting private advisors for special projects (Garforth *et al.*, 2003). However, public policy increasingly relies on private advisors to integrate SFM issues within their regular advisory services (Botha *et al.*, 2008).

Despite its potential, a number of problems emerge in relation to SFM extension through regular farmer-advisor contacts:

- Advisors may lack the right attitude and competences to proactively provide SFM extension through a facilitative interactive learning relationship (Koutsouris, 2008). They take a ‘prescriptive expert’ role, providing straightforward solutions instead of questioning the underlying assumptions, i.e. stimulating ‘double loop learning’ (Koutsouris, 2008). Mee (2007) for example reports that veterinarians see their main task as providing curative rather than preventive advice. They often lack social skills (speaking the same ‘language’ as clients, patience, and diplomacy) as opposed to technical skills (Mee, 2007).
- Advisors may be afraid that in strongly demand-driven advisor-client relationships they will lose their credibility if they provide advice farmers have not asked for. This could imply that farmers may discontinue the relationship with an advisor either when they address SFM issues when not asked to do so, or when they are asked to do so but are not able to (Mee, 2007; Ingram, 2008). It seems that they lack confidence in their ability to be good salesmen of SFM extension (Mee,

2007) or perceive a loyalty dilemma between private and public good (Garforth et al., 2003). Advisors seem to prefer to work within their ‘comfort zone’ (Ingram, 2008), despite having sufficient knowledge on the topic (Ingram & Morris, 2007). They do not offer SFM extension proactively (Bruges & Smith, 2008), and advice is limited to helping farmers comply with legislative requirements, hence staying in a ‘catch-up mode’ (Botha et al., 2008).

In view of these constraints, a number of policy measures have been proposed to tackle the non-optimal provisioning of SFM extension by private advisors through regular service contacts. They include both pull and push measures (Ingram & Morris, 2007; Botha et al., 2008), respectively oriented towards the demand and supply side of the knowledge market. Pull measures include 1) raising farmer awareness about the importance of SFM issues, to stimulate demand for services that address these issues, and 2) a specific financial incentive for farmers to create an economic demand for SFM extension. Push measures include the support for advisors in developing social skills and best practice exchange among advisors regarding how to convey SFM messages in an interactive facilitative way. Although these measures seem logical in view of the constraints they are designed to relieve, it remains an open question how to effectively shape interventions incorporating these measures to ‘manipulate’ farmer-advisor interaction in favour of SFM issues (Botha et al., 2008; Ingram, 2008).

Background, aims and methods of the study

Background: the SFM issues at stake and the interventions

Excessive nutrient emissions due to fertiliser and manure use are considered a threat to soil and water quality. Between 1998 and 2003, the Dutch government obliged farmers to use the Nutrient Management Administration System (MINAS) as a bookkeeping system for tracking flows of nutrients on farmlands, assuming that this would encourage farmers to reduce nutrient leaching. Exceeding the norm implied paying a fine, but norms were heavily contested and the system was perceived as vague and inconsistent (RIVM, 2002). Nonetheless, cost reduction through more efficient fertiliser and manure use was emphasised by government as a positive side of MINAS.

Mastitis (udder inflammation) is considered a major health problem in dairy production (LeBlanc et al., 2006). Besides economic losses (reduced number of productive cows), issues such as food safety, animal welfare and (excessive) antibiotic usage are reasons to control mastitis (Huijps et al., 2008). The current Dutch mastitis control system is based on counting somatic cells in milk. If the geometric mean of the bulk milk somatic cell count (BMSCC) surpasses 400,000 cells/ml for three consecutive months, farmers get a lower milk price.

In order to advance knowledge on the topic of nutrient management, the Dutch government funded the so-called nitrate projects, of which the Nutrient Management Support Service (NMSS - launched in 2002) formed part (Geerling-Eiff et al., 2004), involving research projects on more efficient and effective nutrient management strategies, and pilot farms testing these strategies in practice. NMSS targeted the entire Dutch agricultural sector. NMSS ceased to exist in 2004. The Dutch Udder Health Centre (DUHC) which targets the Dutch dairy farming sector, was set up by the Dutch Dairy Organisation, Dairy Commodity Board and Farmers’ Organisation, has been carrying out a national intervention program since 2005 (to conclude in 2010) to decrease mastitis by 10%. The program includes both fundamental research and practical intervention strategies such as applied research and extension efforts. Both NMSS and DUHC had the objective of mobilising private advisors as regards SFM extension and stimulating demand for related advisory services. Participation was however not compulsory. NMSS targeted all types of specialised and embedded advisors linked to farm nutrient management. DUHC targets veterinarians as the principal advisor to reach farmers on mastitis, as a baseline survey (Jansen et al., 2004) indicated that the veterinary is the most reliable source for farmers on cattle health information. Table 1 displays the different components of the pull and push measures to promote SFM extension in NMSS and DUHC.

Table 1. Instruments used in the different SFM extension promoting measures in NMSS and DUHC.

SFM extension promoting measure	Instruments used in measures	
	NMSS	DUHC
Awareness raising about the SFM issue to create demand for SFM extension	<ul style="list-style-type: none"> - Study groups facilitated by farmers themselves with technical input by advisors - ‘Knowledge shop’ with certified ‘knowledge products’ on nutrient management optimisation - Articles in farming magazines and newsletters - Nutrient management workshops 	<ul style="list-style-type: none"> - Study groups facilitated by veterinarians - DUHC as knowledge shop with database on udder health and prevention of mastitis - Articles in farming magazines, newsletters, calendars, posters - Mass media campaigns on the use of gloves during milking and the use of a standardised treatment plan - Udder health workshops
Economic incentive to create demand for SFM extension	<ul style="list-style-type: none"> - Direct incentive: voucher to purchase knowledge on nutrient management - Indirect incentive: helping to comply with nutrient emission norms, thus preventing fines 	<ul style="list-style-type: none"> - Indirect incentive: decrease mastitis and therefore fewer costs and higher milk production - Indirect incentive: udder health awards - Indirect incentive: helping to comply with somatic cell count norms thus preventing fines
Supporting advisors in executing SFM extension	<ul style="list-style-type: none"> - Quality control and certification system for services to be eligible for voucher funding and having a place in the knowledge shop - Nutrient management decision support tools (nutrient balance calculation programs and model simulations) based on pilot projects 	<ul style="list-style-type: none"> - Lectures for veterinarians - Providing supporting materials for successful organisation of study groups - Free-of-charge distribution of educational materials to veterinary centres and on the internet - Regular contact with pilot veterinary centres, farmers’ test panel and DUHC

Goal of the study and case selection

This study aims to contribute to the knowledge on interventions to support SFM extension by assessing two interventions which integrate the abovementioned pull and push measures, with the objective of getting insight into ways to combine such push and pull measures.

Research methods

This study draws mainly on previously documented evaluations. Table 2 gives an overview of the different types of data collection. Additionally, several other evaluations of NMSS were used (Oerlemans et al., 2002; Jacobs and De Wit 2003), as well as of DUHC (Valeeva et al., 2007).

Table 2. Overview of research methods.

Inter-vention	Semi-structured interviews		Survey questionnaire		Observations	
NMSS	<i>De Grip et al. (2003)/ Klerkx et al. (2006)</i>	<i>Geerling-Eiff et al. (2004)</i>	<i>De Grip et al. (2003)/ Klerkx et al. (2006)</i>	<i>Geerling-Eiff et al. (2004)</i>	<i>De Grip et al. (2003)/ Klerkx et al. (2006)</i>	<i>Geerling-Eiff et al. (2004)</i>
	8 NMSS staff 3 Advisors 4 Policy makers 9 Farmers	8 project leaders of broader nitrate projects	Random selection of 18 advisors and 39 farmers	Random selection of 43 advisors and 148 farmers	2 study group meetings, 3 project team meetings, 1 assessment committee meeting	Expert meeting with 12 participants
DUHC	<i>Steuten et al. (2008); Steuten et al. (2009)</i>	<i>Jansen (2006, unpublished data)</i>	<i>Jansen et al. (2004); Lam et al. (2007); Jansen et al. (2008a)</i>	<i>Jansen et al. (2008b)</i>	<i>Jansen et al. (2008b)</i>	
	30 dairy farmers; 10 veterinarians	Group interviews with 10 veterinary centres	Random selection of 378 dairy farmer and random selection of 374 dairy farmers	Random selection of 93 veterinarians	Workshops: 4 with dairy farmers, 2 with veterinarians, 2 with both farmers and veterinarians	

The outcomes of the NMSS and DUHC interventions on SFM extension provisioning

In this section, we first evaluate the impacts of NMSS and on SFM advice provisioning. We follow the different pull and push measures outlined: awareness raising, economic incentives, and advisor capacity building.

Awareness raising about the SFM issue to create demand for SFM extension

NMSS

In the NMSS case, lack of awareness about the negative environmental implications of nutrient seepage, and knowledge about nutrient management appeared not to be the main problem. However, this existent awareness did not install a proactive attitude on the part of farmers towards nutrient management. Many farmers did not go beyond the earlier mentioned 'catch-up mode'. The farmers (n=148) surveyed by Geerling-Eiff et al. (2004) ranked environmental legislation (74%), MINAS and the opinion of their advisor (66%) as most influential on their actions regarding nutrient management. As a measure to stimulate nutrient management practices beyond legislative requirements, and to stimulate proactive broadening of knowledge on nutrient management, a web-based 'knowledge shop' was installed. This knowledge shop displayed certified 'knowledge products' stimulating in-depth learning, and vouchers were provided as a €250 subsidy to purchase these knowledge products. However, these measures appear not to have been very influential: the voucher was used by 24,946 out of 80,812 eligible farmers, so the effectiveness of this instrument was limited, and the knowledge shop was not widely used either: 54% of a representative sample of 1,228 farmers had not used it at the time of Jacobs and De Wit's (2003) research. The knowledge shop was rated by only 16% of the farmers surveyed by Geerling-Eiff et al. (2004) as an influential factor in their nutrient management practices (n=148).

As regards another awareness raising measure, the study groups, 161 of these were formed. The study by De Grip et al. (2003) indicates that, although the main thrust of the study group program was designed beforehand by NMSS, the majority of group leaders (70%, n=8) and participating farmers (60%, n=31) indicated that there was sufficient flexibility for adapting content to reflect the desires and questions of participants. Advisors indicated in both the De Grip et al. (2003) and Geerling-Eiff et al. (2004) studies that study groups stimulated the discussion on nutrient management and made group participants learn from each other, but sometimes did not come to full potential. Advisors indicated that this was due to the sensitive nature of the matter which requires a great deal of trust. Farmers would sometimes be hesitant to openly share their farm figures to make comparisons.

An important observation is that NMSS's stimulating measures to encourage farmers to proactively acquire advice to overcome a knowledge gap appeared not to be the main determining factor motivating farmers to improve nutrient management. Awareness about the need to address nutrient management appeared to be already high: Jacobs and De Wit's (2003) large baseline survey shows that 70% of farmers were confident that they were complying with the MINAS norms, and 75% claimed to have acquired knowledge on nutrient management (n=1,228) before NMSS started. It appeared that it was a lack of policy consistency and clarity that prevented farmers from taking action on the topic of nutrient management and caused low policy acceptance (Geerling-Eiff et al., 2004). Nevertheless, for those that made use of NMSS facilities and related nitrate projects, the increased attention to nutrient management has been useful. Of the 148 farmers surveyed by Geerling-Eiff et al. (2004), 53% made use of the nitrate projects in which NMSS participated, and 31% of these farmers (n=78) indicated that acquiring knowledge helped them to better understand the environmental importance of nutrient management. Also, of the surveyed advisors, 69% stated that they had fully contributed to increased awareness on the environmental importance of nutrient management in the context of NMSS and the broader nitrate projects, and 18% that they had partly contributed (n=41).

DUHC

Most of the DUHC activities focused on raising farmer awareness as regards the importance of reducing mastitis incidence, to stimulate proactive demand for advice. However, similar to the NMSS project, farmers' awareness did not seem to be the main problem. A baseline survey before the start of the DUHC project showed that 92% of the farmers already wanted to decrease mastitis on their farms, 58% of the respondents worried about mastitis and 60% had changed some of their management practices because of udder health problems in previous years (Jansen et al., 2004). In addition, 79% of the farmers were interested in the prevention of mastitis. Therefore, farmers already seemed to be aware of mastitis as an important issue. However, only 38% of the respondents agreed that they should do more about mastitis prevention. Although most farmers perceive mastitis as a serious problem, it appears that it will be difficult to make improvements as only 32% of the farmers perceived that they had enough knowledge to prevent mastitis problems. Within the knowledge acquisition strategies of these farmers, regular advice from veterinarians (96%), farm magazine articles (93%), the Animal Health Service (81%), fellow farmers (72%) and suppliers (62%) were the top five sources from which the farmers gained more information about mastitis before the start of the DUHC project (Jansen et al., 2004; Kuiper et al., 2005).

As a result of this baseline survey, DUHC was established both as a knowledge shop (but different from NMSS in that it only acted as a database for written material and ICT based tools, and did not offer knowledge products such as advisory services), and as a knowledge system broker. Being the most used knowledge source about udder health, DUHC focused on veterinarians as the main communication channel to reach farmers, by mobilising veterinarians to organise study groups for farmers to further increase farmers' awareness and to provide practical and effective solutions for mastitis problems. These study groups were effective in decreasing the average BMSCC to 170,000 cells/ml (compared to 200,000 cells/ml for the control group) (Lam et al., 2007). Although these study groups were quite successful and highly appreciated by both farmers and veterinarians, only 14% of all Dutch dairy farmers participated in these groups. Veterinarians complained that the farmers who really needed the study groups because of udder health problems did not participate (Jansen, 2006, unpublished data). As the study by Steuten et al. (2008) showed, similar to observations in the NMSS case, confidentiality concerns relating to disclosure of mastitis data prevented farmers from joining a study group. Therefore, DUHC looked for different methods to create farmers' demand for knowledge.

To encourage farmers to approach their veterinarian, all 22,000 dairy farmers received a standardised treatment plan for mastitis which they could fill in together with their veterinarian. However, evaluation of this strategy showed that farmers did not know what to do with these forms, and veterinarians did not proactively ask for them. It was noticed, though, that direct communication efforts by DUHC, such as magazine articles, created awareness and hence created demand from farmers for advice from their veterinarians. Hence, different kind of communication channels appeared to be equally important, despite veterinarians being targeted initially as the default channel. The survey by Jansen et al. (2008a) showed that 91% of the farmers are familiar with DUHC, most of them via farm magazines (67.6%), veterinarians (61.4%), the DUHC website (21.8%) and colleagues (8.8%).

Economic incentives to create demand for SFM extension

NMSS

As mentioned earlier, a central pillar of NMSS was the knowledge shop, and an incentive to use it. However, as stated in the previous section, the voucher was used by only about one third of the eligible farmers. Also, rather than stimulating demand, the voucher stimulated supply: as De Grip et al. (2003) found in their interviews (n=3) and survey (n=18) amongst advisors, advisors were motivated by this financial incentive and tried to frame regular service provision as being eligible for voucher funding (so that it would pass the selection committee who judged knowledge products upon eligibility for purchase with the voucher). Furthermore, they actively informed their clients that

the voucher could be spent with them, with the consequence that most vouchers were spent within existing relationships with trusted and familiar service providers. Jacobs and De Wit's (2003) survey shows that 72% of the farmers who applied for the voucher (n=1,228) spent it within established relationships.

Despite the voucher not having the intended direct effect of motivating farmers to act to inform themselves on nutrient management, its indirect effect of spurring advisors to act can be seen as a significant achievement, especially given that several earlier studies found that the service provisioning network surrounding farmers did little to encourage farmers to take nutrient management seriously (Oerlemans et al., 2002).

As regards the indirect incentive, having to pay no fines because the rules were complied with, the major counteracting disincentive was the previously mentioned uncertainty about the actual norms against which nutrient management performance would be measured. Nonetheless, the surveyed advisors who indicated that awareness was raised due to the intervention (87%, n=42) noted that it was nevertheless positive that participating farmers came to see the advantage of nutrient management as a cost saving strategy that could be integrated in overall farm management, and not only as regulatory mechanism (Geerling-Eiff et al., 2004).

DUHC

DUHC did not employ direct financial incentives to stimulate demand for SFM extension, such as the vouchers in the NMSS case. The Dutch Udder Health Awards, a prize of €500 for five farmers who successfully deal with udder health, are an appreciated incentive though.

The most important indirect and positive incentive for farmers to address udder health is the decrease in mastitis, as it costs on average €210 per case (Huijps et al., 2008). Research by Jansen et al. (2004) showed that 95% of farmers perceive mastitis as a costly disease and 69% of farmers worry about the costs of mastitis. However, if farmers were asked about the most annoying aspects of mastitis, the costs were mentioned third place (20%), after the extra labour to treat the animal (24%) and the uncertainty about a cow's recovery (31%). Consequently, the direct costs do not seem to be an important issue for farmers. This is supported by Valeeva et al.'s (2007) research showing that farmers do not perceive the cost of mastitis as the main problem resulting from mastitis. Therefore, it can be suggested that these indirect incentives do not play a major role either.

Regarding the other negative indirect financial incentive, the fine level for BMSCC did seem to influence farmers' behaviour as 65% would try to improve udder health if the existing fine level decreased from 400,000 cells/ml to 350,000 cells/ml. In addition, 67% of respondents would then treat mastitis cows sooner. This is supported by Valeeva et al.'s (2007) research showing that fines in relation to milk quality seem to have more impact on behavioural change than bonuses. However, lowering the fine level in the Netherlands is not an option, because European legislation on milk quality prohibits such amendments.

Supporting advisors in executing SFM extension

NMSS

The Geerling-Eiff et al. (2004) survey amongst advisors (n=41) indicates that these have assumed roles that correspond to both 'prescriptive expert' and facilitative roles. Advisors indicated that they mixed several roles, depending on the farmer's learning process, but advisors ranked the facilitative role as most ideal (74%, n=41). They saw it as a major flaw that NMSS was a policy-induced, top-down intervention, but indicated that in their contacts they aimed to come to a good fit with the needs of their clients. In this respect, Geerling-Eiff et al. (2004) note a paradox: although the ambition of NMSS was to fit nutrient management into an overall bigger picture of farm management and advisors to support this, farmers indicated that they mostly appreciated advice on concrete technical measures at an operational level.

As regards this bigger picture ambition, one of the premises of NMSS was that extension service provision would more proactively consider nutrient management issues. To achieve this goal, a committee assessed the quality of knowledge products which should enlarge and develop knowledge on the subject, and go beyond the catch-up mode. However, as stated above, service advisors indicated that they did not have to adapt their services much to make it pass the quality assessment; this suggests that they already were adequate. However, a major criticism on the part of some advisors was that the assessment was too permissive and allowed services that did not incorporate up-to-date information and had insufficient quality to stimulate in-depth learning (Geerling-Eiff et al., 2004). Hence, some of the surveyed advisors suggested that, instead of all types of advisors, specialised nutrient management consultants should be employed in a separate intervention, instead of trying to incorporate this within regular service provision.

To help advisors to improve their advice, from the broader nitrate projects several (computer model based) management tools were made available. Use of these management tools was evaluated as useful by about half of the advisor respondents in the survey by Geerling-Eiff et al. (43%, n=48). However, despite the tools making it possible to explicitly identify the nutrient flows, they were considered to be user-unfriendly and as 'black-box' models.

DUHC

Similar to the NMSS management tools, DUHC developed free-of-charge educational materials for veterinarians to use during study group meetings (and also when giving individual advice), and veterinarians had the opportunity to attend study group facilitation workshops. In 2008, 205 veterinary centres with 17,210 clients participated in the project, which is about 78% of all Dutch dairy farmers. However, participating veterinary centres differed substantially in the percentage of farmers they could motivate to participate in study groups (ranging from 5 to 95%). Small veterinary centres, in particular, had more involved farmers than larger ones. In in-depth interviews, veterinarians acknowledged that some veterinarians were more enthusiastic than others, and that it was difficult to develop a standard practice to be implemented by all. Moreover, most veterinarians thought that they lacked the competence to pro-actively persuade farmers to join study groups (Steuten et al., 2009).

Despite being intended to empower veterinarians in individual advisory encounters, most of the educational materials developed were not used by veterinarians (Jansen et al., 2008a). The results of a survey among veterinarians indicated that veterinarians perceived the provision of udder health advice as important, but some thought that they were not so highly influential on the udder health of a farm. Moreover, when a farmer did not perceive a problem, only 24% of the veterinarians initiated a conversation about udder health (Jansen et al., 2008b). This is supported by Steuten et al.'s (2009) interviews, which showed that veterinarians are prepossessed with the idea that farmers do not want to be bothered by udder health information. In addition, bad farm management is for some veterinarians not regarded a good reason to start talking about udder health: it seems that they stick with the curative role that prevails in veterinarian-farmer contacts.

Discussion

In this section, we provide some concluding reflections on interventions aimed at optimising extension service provision on SFM issues by stimulating demand (pull measures) and supply (push measures) in a knowledge market setting. Both NMSS and DUHC interventions have caused farmers and advisors to act upon SFM issues, but not always as intended by the intervention.

Stimulating demand is dependent on a wider set of conditions than lack of awareness and low autonomous demand for advisory services on issues

As regards pull measure awareness raising, an overriding observation is that the premise that improved knowledge provision by itself raises awareness about the public good issues involved, and

hence installs a more active demand for advisory services, needs to be nuanced. As the results have shown, it was not only lack of knowledge that prevented farmers from implementing farm-level measures to improve nutrient and mastitis management, but a broader set of stimulating and inhibiting conditions, such as the relative cost of the damage caused by the problem, disagreement with policies, and clarity and enforcement of regulations. For SFM extension to be effective, it hence seems to be a precondition that there is clear, integrated and stable policy – a point that has also been noted elsewhere (Leeuwis & Van den Ban, 2004).

Nonetheless, the results suggest that the measures did activate farmers and advisors to become more conscious about addressing, respectively, nutrient management and mastitis issues on their farms. Both group methods and personal interaction with advisors played a role in that. In line with findings from the literature about the potentially important role of group learning structures in addressing sustainable practices (Bentley et al., 2003) in the case NMSS and DUHC it was also found that these can have beneficial effects. However, our observations show that only a small group of farmers can be reached by such methods, and, given that these groups are often self-selected, it is likely that these farmers are already more motivated. Furthermore, externally induced group structures may hinder the build-up of trust and a shared goal, and consequently may impair sustained action (Guijt & Proost, 2002). This indicates the importance of using the advisor network around farmers to address public good issues through regular advisory service provision, and in fact the NMSS and DUHC interventions have raised the awareness of advisors on the importance of addressing public good issues, which in turn has influenced their clients.

This touches upon the pull measure of economic incentives, intended to stimulate demand for advisory service provision. However, in the case of NMSS, the vouchers encouraged advisor-induced demand for SFM extension, and they hence seem not to be an effective measure to incentivise farmers to autonomously demand SFM extension. Similar results are found with the DUHC udder health awards, as they rewarded people who were already intrinsically motivated, but did not stimulate farmers' demand for udder health advice. As regards indirect economic incentives, such as cost reduction and avoidance of fines, from the case of both NMSS, where cost reduction seemed to be a fruitful entry point for discussing sustainable nutrient management practices, and DUHC, in which lowering the cell count level at which a fine would have to be paid, this seemed to be a more promising approach: in this regard the stick seemed to work better than the carrot (see also Valeeva, 2007). This supports the previously mentioned notion that policy instruments other than extension (e.g., laws, subsidies, fines) may contribute to the creation of problem awareness (Leeuwis & Van den Ban, 2004), but, as the DUHC case shows, higher lever legislative bodies (such as the EU) may prevent such legislative amendments from being implemented. However, as Bruges and Smith (2008) also note, a risk arising from such a focus on adopting SFM measures because of economic benefit is that these, instead of fundamentally challenging underlying perceptions on environmental issues and food safety, may undermine the very philosophy behind special interventions designed to stimulate advisory services to go beyond the catch-up mode.

Interventions can create a more conducive environment for advisors to provide SFM extension

With regard to the push measure of supporting advisors in SFM extension to go beyond the catch-up mode, both projects show that many advisors already appear to apply facilitative methods in their interactions with farmers; such methods are found to be most promising for sustainability and complexity learning (Ingram, 2008), in addition to a prescriptive expert role. However, when quality requirements for service delivery in terms of in-depth attention to nutrient or mastitis management issues are low, it is questionable whether these contacts have left their comfort zone. This indicates that interventions such as NMSS and DUHC do not necessarily improve the quality of SFM extension. One problem is that there remains a dichotomy between the kind of services farmers demand (easily applicable and straightforward) and those that are intended to be provided through the intervention (in-depth learning trajectories), as both cases show. However, as the NMSS case shows, the intervention provided an excuse to address the broader picture of nutrient management, despite the policy controversy. As especially the DUHC case shows, advisory service provisioning on public good

issues needs to be embedded within a wider context of (mass medial) communication efforts induced by the interventions. Thus, farmers are primed so that advisors have a better chance of providing this advice without having to fear that the commercial relationship will be damaged because they provide unwanted advice – a situation which Ingram (2008) indicates as an prohibitive factor.

Another problem is that those who are, in theory, the ideal advisors may have lasting difficulties in executing SFM extension. This is clearly shown in the DUHC program which targeted veterinarians as the main information channel for farmers regarding mastitis, despite their being novices in providing preventive mastitis advice. The results suggest that veterinarians have not yet become engaged in a proactive discussion of public good issues, although they acknowledge their need to be more proactive (Noordhuizen, 2001). This concurs with the observations made by Mee (2007) on the difficulty of engaging the curatively and reactively oriented veterinarians in proactive and preventive actions. The observation that veterinarians do not see themselves as having influence on farmers' decision making means that substantial attention should be paid to building the perception of veterinarians as regards their professional role and competences (and for that matter of other advisors); this would need to start when these are receiving their academic training (following Koutsouris, 2008).

Conclusion

All in all, it appears from the cases that special interventions such as NMSS and DUHC to support SFM extension through regular advisory contacts have an impact, and may manipulate farmer-advisor relationships towards fostering SFM extension and address sustainability issues, and hence are in line with assumptions formulated by Ingram and Morris (2007) and Botha et al. (2008). However, this impact is limited and depends on a wider set of institutional conditions, both 'hard' institutions such as stability and clarity of environmental and food safety regulations, and 'soft' institutions such as norms and values of what an advisor perceives as his or her task. Some of these conditions lie outside of the scope of the interventions. Given issues such as advisor competences and power relations pertaining to expertise and contractual positions, this calls for overarching attitude change towards sustainability which most likely is a long-term affair.

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