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FARMERS' KNOWLEDGE MANAGEMENT IN PANGASIUS DISEASE TREATMENT

Management

Dr. Le Nguyen Doan Khoi Assoc Can Tho University

ABSTRACT

Pangasius farm smallholders in Vietnam have to deal with a lot of problems in their production process. Difficulties in disease management are perceived because of the BNP disease. Global markets stringent quality standards hinder the smallholders to participate in the export chain. Food safety, including health risks, antibiotic residues and microbial pathogens such as parasites are part of the quality standards which are becoming more severe. Antibiotic resistance is a serious problem for human global health and therefore antibiotics should be used in a responsible way. Smallholders face difficulties to control and assure quality for the export market because the disease management lacks traceability. This paper focuses on the current disease prevention and treatment knowledge of small Pangasius farming and farmers' willingness to implement new farming systems to manage diseases and take a needed step in assuring their disease management quality. Using qualitative as well as quantitative data gained during a field research in Vietnam, farmers' current and needed disease management standards are compared to measure if there is a knowledge gap. Farmers 'organisation and the extension system are examined to see how knowledge is managed by stakeholders. Results show that small farmers have a lot of knowledge about disease management but they do not have the willingness and possibilities to adapt every quality control standard. Implementation of Better Managment Practices combined with clusters is recommended to give farmers the opportunity to survive the export market. Though not all farmers can form clusters, it seems to be the only way for smallholders to get certified. The government has to be willing to support farmers by providing access to capital and by creating farmer awareness of the benefits. It is unlikely that farmers are willing to change without the support of stakeholders.

KEYWORDS

smallholders, Pangasius, market access, knowledge management

1. Introduction

Aqua-cultured fish is one of the dominant export products in Vietnam. Total aquaculture production in Vietnam covered one million tonnes in 2003 and allegedly will reach over two million tonnes by 2010 (Ministry of Fisheries- MOFI, 2003). The total aquaculture production has increased already to 2.2 million tonnes in the 2009 (MOFI, 2009). The development of this sector is a major source of foreign currency and employment Vietnam has a coastline of more than 3,200 km long with over 3000 islands, a wealth of natural inland water bodies (lakes and rivers) and seasonal flooded grounds. Since 2000, the fisheries sector is an important contributor to the economy of Vietnam and fisheries are identified as a key economic growth sector by the Vietnamese Government (MOFI, 2006). The total area of water-surface is approximately 1.7 million hectares (MOFI, 2006). The Vietnamese government expects a further increase of the aquaculture sector of more than 25% in 2010.

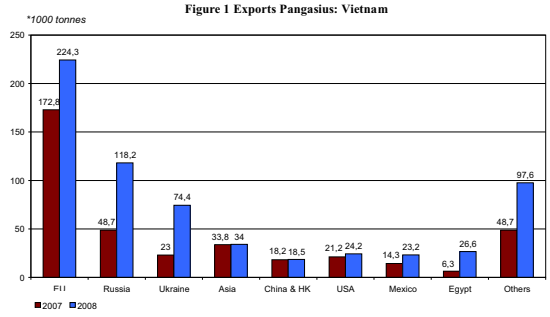
Pangasius was cultured in the Mekong Delta in Vietnam since the 1950s on a small scale. The farmers collected the fish larvae from the Mekong River during the early flood season. The larvae were nursed in small ponds and provided to local farmers. They stock larvae in the integrated farming systems which integrate livestock and fish production; and the fish were produced for local consumption. However, since the 1990s the Pangasius culture developed rapidly because of rising demand in foreign markets and improved production and management techniques like induced reproduction, feed quality, water management and pond design.

Pangasius is grown in the predominantly freshwater central and Northern provinces of An Giang, Dong Thap, Can Tho in the Mekong Delta. In 2005 the economic growth rate for Pangasius aquaculture in the Delta was 24.9% and production reached some 850,000 tonnes in 2006, contributing to the overall growth of 19.5% for Vietnam as a whole. This gave the Mekong Delta the highest overall economic growth rate in the country at 14.4%, 5.4% higher than national figure for 2005 (Loc, 2006). Export of Pangasius fillets doubled in 2006 to reach 286 thousand tonnes representing a 66.5% increase in value to US$1.15 billion (VASEP, 2006 cited in World Bank, 2006). In 2008 it is estimated 650,000 tones of fillets were exported at a value of US$1450 million (Dung, 2008). According to MOFI (2005), Pangasius production will reach up to about 1 million tones by 2010 and 1.5 million tones by 2020. However, Pangasius production has increased already to 1.2 million tonnes in the 2007 (MOFI, 2008). The most remarkable change in the Pangasius sector has been the shift to European markets after the US anti-dumping case in 2002. Exports to Europe were valued at US$ 374 million or 26.51% of the total export value in 2006, having increased 89.4% from 2005. The export value to EU in particular accounted for 20.86% of all exports or US$ 294.3 million, which was slightly lower than Japan (24.83%)and even higher than the US (18.43%) (MARD, 2008). This shift increased the EU share to 17% by 2005, representing a significant change from the traditional seafood export markets of Japan and the US each with a market share of 25%.

In 2008, Vietnam exported 640.000 tons of Pangasius at a value of USD 1,45 billion. The increase in Pangasius export, compared with 2007, was 48% in value and 66% in quantity. In reaction to the worldwide economic crisis growth slowed down a bit in the last quarter. The total of 2008 export stayed below the earlier forecasts (Figure 1)

Vietnamese Pangasius farmers are suffering from reduced prices. The price of Pangasius is around USD 0,92 / kilo in the Mekong Delta region. This makes the production uneconomic. As a reaction to this, farmers are refraining from selling fish and restocking their ponds. Most of the breeders of Pangasius suffered from losses in the year 2008, and between 40 to 50 percent of breeding ponds are lying empty in the Mekong Delta region. From here the forecasts of production in 2009 will be half of what it was in the year before. This is in contrast with the official forecast of increase in production to almost 1,5 million tonnes in 2009.

Figure 1 Exports Pangasius: Vietnam



Source: www.globefish.org

This research will focus on the current disease prevention and treatment knowledge of small Pangasius farming and the farmers' willingness to implement new farming systems to manage diseases and take a needed step in assuring their treatment and prevention

quality. The focus area is Chau Phu region in the An Giang province, which has the best developed Pangasius industry in the Mekong River Delta in Vietnam at this moment.

Little has been said about the knowledge management (KM) of small Pangasius farmers and institutions. Whereas the current assurance of Pangasius production does not seem to work due to lack of traceability, KM offers an approach which could improve quality of fish disease treatment through developing awareness and willingness among farmers about quality control measures. It is assumed that knowledge sharing and application will lead to improved farming skills on a broader scale and Pangasius farmers' quality awareness of disease prevention and treatment.

2. Theoretical Approach

This section focuses on the main theory applied in this research.

2.1 Farmer knowledge

The knowledge of small farmers with limited resources should not be underestimated. For example, current agricultural disciplines seem unable to handle the heterogenic characteristics of rain fed farming under demographic pressure. Heterogeneity does often impede universal solutions for farming issues. Scientists tend to prefer universal knowledge over location-specific knowledge (Brouwers, 1993). According to Brouwers (1993) rural people's knowledge can be characterised as integrated across disciplines. A technical aspect as well as a social and cultural aspect seems essential in rural people's knowledge. Scientists tend to overstress general universal knowledge compared to location-specific knowledge. However, rural knowledge alone does not suffice in solving the present problems farmers face. This has been determined by rural people themselves. Rural farmers often experiment, which strengthens the observation mentioned before (Van der Ploeg, 1991; in Brouwers, 1993).

Interesting to know is whether the two different groups of Pangasius farmers (independent and FA) also face these kind of problems and if they have a lot of rural expertise about fish disease treatment. Furthermore it is interesting see if the local rural knowledge is easy to adapt to or match current treatment and prevention standards for export products. Brouwers (1993) mentioned rural knowledge systems that support knowledge processes. Knowledge systems might be individuals as well as organisations who share one or more qualities.

2.2 Food Quality Control and Quality Assurance

During the last half of the twentieth century the complexity of agro-food supply chains has increased considerably. Raw materials are obtained from sources worldwide, an ever-increasing number of processing technologies are used, and a broad range of products is produced. In addition, consumer expectations are continuously changing, with customers demanding more convenience and fresher foods with more natural ingredients. Food quality management has become increasingly important in the agro-food sector (Spiegel et al., 2003), due to changing consumer requirements, increasing competition, environmental concern, and governmental interests. Higher consumer demands regarding quality, traceability and environmental friendliness pose challenges for primary producers, especially smallholders in developing countries (Henson et al. 2000; Humphrey and Oetero, 2000).

** Quality control*

Quality control (QC) involves determining what to control, establishing units of measurement for gathering data, establishing standards of performance, measuring actual performance, interpreting the difference between actual performance and the standard, and taking action on the difference in order to prevent quality problems in the next batch/production. Improvement is a form of control in the control process where attention is paid to structural causes and solutions (Luning et al., 2006).

** Quality assurance*

Quality assurance (QA) encompasses all planned and systematic actions necessary to ensure that a product complies with the expected quality requirements. It also provides customers and consumers with the assurance that quality requirements will be met. Quality assurance focuses on system quality instead of product quality. The system must be audited to ensure that it is adequate both in the design and use. Food products are not only tested on their product characteristics, but also on production, packaging, handling and distribution. Quality control is embedded in quality assurance. Control activities form the basis of QA systems, such as HACCP (safety guarantee by using critical control points). The implementation of quality assurance systems, especially in the agricultural-food business, is an issue of the greatest importance.

2.3 Knowledge and knowledge management

The concept of knowledge is a complex one. The differences between data, information and knowledge are often confusing. People use knowledge when they do not base their decisions on the available information only, but also on experiences from the past, intuition, ethic, and so on. For example: somebody knows that there are many taxis in town, but because it is a holiday many people want to travel by taxi. Based on an earlier experience the person will travel by train instead of taxi (Dalkir, 2005).

Knowledge management (KM) is a field that can be described as bipartite. The first is the knowledge sharing part (or first generation KM) and the second is the knowledge making part. Frederick Taylor states that "the knowledge sharing side of KM (1) is all about capturing, codifying, and sharing valuable knowledge, and (2) it is all about getting the right information to the right people at the right time." The creating and sharing of knowledge has been described as the second generation knowledge management. The mission for second generation knowledge management is the creation of new knowledge by people in organisations (McElroy, 2003).

In this research we only focus on the first generation of knowledge management. This is still the most applied form of knowledge management by organisations and businesses.

KM consists of three variables. These are (1) knowledge acquisition and application, (2) knowledge capture and/or creation and (3) knowledge sharing and dissemination (McElroy, 2003; Dalkir, 2005). For individual farmers the knowledge acquisition and application is very important, while organisations like the Fishery Association (FA) and governmental institutions like the DARD might have to focus more on the capturing of knowledge and the sharing of it with its members. Other possibilities of sharing are between farmers themselves. If there is a local knowledge sharing culture between farmers more farmers are able to obtain the right disease treatment and/or prevention possibilities. The creation of knowledge is done by individuals in universities and research centers but knowledge is also discovered through the experimenting by local farmers (e.g. Brouwers, 1993). These institutions have to disseminate the knowledge to the FA and farmers in order to keep fish disease prevention and treatment up to date.

3. The conceptual framework

The conceptual framework is to stress the importance of farmers' knowledge and the knowledge dissemination in relation to the awareness and willingness of smallholders to close the quality gap (Figure 2)

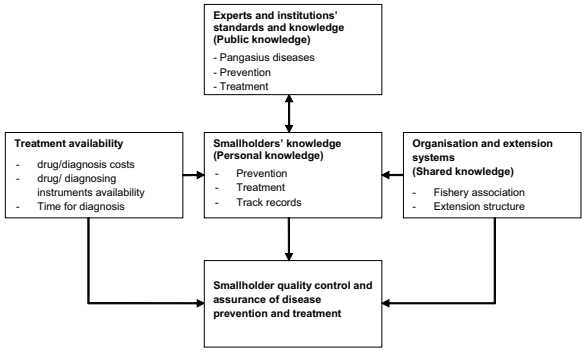
Farmers' knowledge is only one factor that could contribute to a better quality among disease treatment and prevention. Firstly, drugs' availability and the right diagnosing instruments are needed to effectively prevent and reduce disease impact. Next to that, the costs of drugs and diagnosis are of importance. When the right drugs are unavailable or too costly this would significantly reduce the quality of the treatment. Moreover, if a diagnosis is inaccurate this can lead to a wrong drug prescription which could affect quality. Furthermore, the availability and use of illegal drugs affect quality of the product. A laboratory can provide farmers with the right diagnosis. The question is, however, whether there are sufficient laboratories available for small farmers and whether laboratory costs do not raise the production price for small farmers. Also, time is of importance. If the amount of days needed for diagnosis is high it would affect the utility for farmers to use the laboratory as a diagnosing tool.

Secondly, experts and institutions' (like universities and government) current knowledge affects the smallholders' knowledge. Current experts' knowledge concerning all diseases affects smallholders in the sense that if there is no treatment available yet this affects quality. Standards which are set by experts of disease treatment and prevention contain the needed knowledge for farmers to control and assure quality. On the other hand, smallholders' knowledge could also contribute to the experts' knowledge about Pangasius that Brouwers (1993) defined as location specific knowledge. In this research the experts and institutions' knowledge can be seen as public knowledge.

This means that farmers, organisations and everyone interested in disease treatment and prevention have the ability to access the knowledge of the experts and institutions. A lot of this knowledge is stored in books, articles, papers and is relatively accessible.

The smallholders' organization is an important third factor which affects smallholders' knowledge in general. A solid smallholders' organisation is more likely to be able to disseminate knowledge among farmers and could create scale advantages or other forms of cooperation between farmers. The smallholders' organization and extension structure is seen as a place where shared knowledge is located. Extension systems contain knowledge that is only accessible by the farmers who get extension, and farmer organisations have expertise about technologies that could be shared with other farmers. A structured farmers' organisation makes it easier to reach smallholders by governments' extension systems.

Figure 2: Conceptual framework



4. Research Design

To collect the necessary data, both qualitative (case study) and quantitative (survey) research methods were utilized. the data collection involved conducting a survey of 100 farmers (50 independent farmers and 50 FA members). The Chau Phu district of An Giang province was selected for performing research for several reasons. First, Chau Phu district was one of the early adopters of Pangasius pond aquaculture. Hence, this district has a large number of Pangasius ponds, many of which have been in use for over 15 years. Choosing an established area like Chau Phu gave us an opportunity to evaluate potentially more established and stabilized farming practices. Second, Chau Phu was chosen because of the high percentage of small farmers in the area. Smallholder farmers are a major focus of this investigation. In the Chau Phu district, Vinh Thanh Trung and Thanh My Tay communes, which house both traditional farmers and FA members, were selected.

More in-depth interviews for the qualitative research were conducted by six farmers in two different villages in the An Giang province. Three independent farmers in were interviewed in Vinh Thanh Trung and three FA farmers in the village of Thanh My Tay.

5. Results and discussion

During farmer interviews both independent and FA farmers declared to have enough knowledge to prevent and treat Pangasius diseases. Consistent to what experts stated, farmers' got their knowledge mainly from neighbours, vet shop technicians, television, training and experiences obtained through trial and error. FA farmers also get the monthly FA magazine. Differences between farmers are also present. One independent farmer showed some documents about disease prevention while the other farmer could not show any manual because he 'lost' it. No real differences are noticed between independent and FA farmers when comparing the knowledge acquisition. Therefore the best way to measure farmers' knowledge is to look at the knowledge application.

Both farmer groups are using chemicals that are certified for use **(Table 1).** All six interviewed farmers used lime and chlorine once a week. Furthermore most farmers anticipate on sudden weather changes by adding additional vitamin C to the feed.

Certified or legal drugs are used by 75 percent of all farmers. More independent farmers are included in the 25 percent of farmers that are still using non-certified drugs. Out of 50 independent farmers 30 percent sometimes use non-certified drugs for treatment or prevention. This compared to 20 percent of the 50 FA farmers that use non certified drugs now and then. It is uncertain whether all farmers are speaking the truth about the use of illegal antibiotics. In most cases local government staff will accompany the interviewer and therefore it is difficult to value the outcomes of such delicate questions.

Table 1 Farmers perception about drug use

	N (Sample)	Yes	No	No opinion
Are certified chemical used for treatment	100	100,0	0,0	0,0
Are certified drugs used for treatment	100	75,0	25,0	0,0
Are drug track records being recorded	100	10,0	90,0	0,0
Are legal drugs are better than illegal	100	43,0	53,0	4,0

Source: Survey data, 2010

Only 10 percent of the farmers have drug track records. All of the users are FA members. Farmer interviews confirm this questionnaire result but even the three FA farmers did not have track records.

However drug track records are only available by ten percent of the farmers. Farmers that are using track records are all FA members.

Differences between FA and independent farmers are noticed. FA farmers scored relatively better on almost every question concerning disease treatment and prevention. This strengthens the assumption that the FA could play an important role in achieving these results. It could also be that FA farmers become a member because they are more willing to change. Nevertheless FA members seem to have more knowhow to prevent and treat diseases.

The majority of farmers is willing to use legal chemicals (100% of FA and independent farmers) and certified veterinary drugs (80% of FA members and 70% of independent farmers) **(Table 2).** Most farmers use chemicals for disease prevention such as lime, salt, yuca, enzymes, pro-biotics, which are legal chemicals

Farmers are aware that obtaining knowledge about fish disease treatment through training is achievable. Most farmers (100% of FA members and 64% of independent farmers) are aware of the importance of training, and they received training about the use of chemicals/antibiotics from the veterinary drug companies or local authority. However, proper disease treatment based on laboratory diagnosis is lacking (10% of independent farmers and 16% of FA members are aware of the importance). Most of farmers (88% of FA members and 62% of independent farmers) are willing to share knowledge with their neighbors in term of disease symptoms and veterinary drug usage and dosage. Moreover, FA members can share knowledge and get more training than independent farmers. The FA magazine is usually updated with new information on fish disease prevention and treatment as well as new diseases occurring in the crop.

Table 2 Farmers' awareness of using and willingness to use chemicals/veterinary drugs

Farmers	*Items (%)*	Awareness of chemicals/veterinary drugs used				Willingness to cooperate		
		Certified drugs are better than non-certified drugs	Keeping all records of drugs used is considered important	Diagnosing fish disease at laboratory is considered important	Training in disease treatment and prevention	Use certified chemicals	Use certified veterinary drugs	Share disease treatment knowledge
Independent farmers (N=50)	Yes	30.0	0.0	10.0	64.0	100.0	70.0	62.0
	No	64.0	100.0	88.0	36.0	0.0	30.0	30.0
	No opinion	6.0	0.0	2.0	0.0	0.0	0.0	8.0
FA members (N=50)	Yes	56.0	20.0	16.0	100.0	100.0	80.0	88.0
	No	42.0	80.0	84.0	0.0	0.0	20.0	4.0
	No opinion	2.0	0.0	0.0	0.0	0.0	0.0	8.0

Source: Survey data, 2010

To conclude, about half of the farmers questioned are aware of the importance of using legal chemicals/ veterinary drugs for fish disease prevention and treatment. This result implies that a large group of farmers is still not yet convinced that the use of recommended drugs leads to the best outcome. The challenges that small-scale encounter are access to certified veterinary drugs and proper disease treatment based on laboratory diagnosis. We found that small-scale farmers lack records of brand names and application protocol of antibiotics and chemicals/ veterinary drugs used. Most farmers are willing to cooperate to share knowledge in disease treatment.

Figure 3 shows the types of farmers' personal knowledge. The factual knowledge is discussed in the above. These are the farmers' procedures, experiences and know-how about disease treatment and prevention. Furthermore farmers have a lot of location specific knowledge. Farmers' concept to improve their farming systems is based on trial and error and location specific characteristics (conceptual knowledge). Farmers' expectation knowledge concerns investments in quality control. When farmers invest in quality control they are unsure if they will get a premium price for their product. Meanwhile many smallholders think the costs to control quality are higher. Short term investments are needed to control quality. This issue is likely to affect farmers' willingness to change their farming systems and can be qualified as farmers' expectation knowledge. The methodological farmers' knowledge is to be found in the focus on disease treatment instead of prevention. This tendency is unlikely to change unless farmers are forced or convinced.

Figure 3 Personal KM matrix

Form of Knowledge	Type of Knowledge			
	Factual	Conceptual	Expectational	Methodological
Personal (Smallholders)	Farmers' procedures, experiences and knowhow about disease treatment and prevention. Location specific knowledge.	Farming improvement through trial and error and based on location specific characteristics.	Quality control costs are high. Farmers cannot get a premium price for their product.	Focus on disease treatment instead of prevention.

6. Conclusion and Recommendations

This research is derived from the fact that Pangasius smallholders face difficulties in surviving the export market due to increasingly stringent standards concerned with health risks and sustainability.

The quality of disease treatment and prevention needs to be controlled and assured as a part of the total quality demands for the exports market

Treatment availability

Fish quality standards recommend laboratory diagnosis before treatment but this is impractical for smallholders. There are only two laboratories at Universities in two provinces. Diagnosing time usually takes up to three days. BNP clinical signs can be spotted just before the infected Pangasius die. Hence, if BNP is spotted in a pond, farmers have to act swiftly to prevent high mortality rates. This is impossible when first sending a sample to a laboratory for diagnosis. Disease technicians from local vet shops are the diagnosing specialists for farmers. They do not have a lot of diagnosing instruments, but normally have a degree in veterinary studies. The interviewed vet shop technician and farmers mentioned illegal drugs are relatively easy to obtain. However, in the last two years local government control on drugs and chemicals has become more stringent. Nevertheless it can be concluded that illegal drugs can still be purchased by smallholders if they want to. All farmers mentioned it was no problem to get chemicals and drugs they need for treatment and prevention.

Farmer organisation and extension structure

Major farmers' knowledge sources of disease treatment and prevention are the neighbour farmers and disease technicians. Also the media have an important role in providing information to farmers. A television program is used as platform for Pangasius experts to provide information. Many farmers watch the television program about farming practices and learn from it. FA farmers also mentioned the FA as a major source of information. Training sessions are organized by the DARD, private businesses, Universities and NGOs. Government strategic focus is to give extension to advanced farmers. These farmers are expected to share their knowledge with the other farmers. In the field research experts mentioned there is lack of capital and extension officers to effectively disseminate new policies and quality standards to every farmer. Results show that around fifty percent of the farmers per year get training. This will likely affect the knowledge of most farmers about new farming practices and better standards.

Farmers' disease knowledge

The interviewed farmers all thought they had enough knowledge to prevent and treat diseases. A great deal of knowledge is gained from former experiences, other farmers' knowhow and the local vet shop technicians. Also location specific knowledge about the climate, soil, and water are established into farmers' minds. Most farmers do not perceive a lot of problems in raising their Pangasius and a lot of treatment knowledge was available by farmers. Of the diseases BNP is the only disease that is really difficult to treat and is a real threat to farmers. Most other diseases can be treated with relative ease. Although some farmers know that some antibiotics are illegal they still apply them when major diseases occur. The illegal antibiotics are just stronger and more effective. Also, one farmer mentioned to use antibiotics to prevent diseases. When applying a withdrawal period of one month before harvest it is very difficult to trace any residues. On average, FA farmers seem to know more about disease treatment than independent farmers. On the other hand a lot of differences between farmers are a result of differences in farmer experience, farmer relations with other farmers, and farm size.

Quality gaps and possible solution

Smallholders seem to have enough knowledge to treat their diseases well, and they are still profitable. Nevertheless, there is a noticeable gap between current farming practices and quality standards. For many farmers there are other factors that influence the farming practices besides their knowledge of disease management. Presently smallholders' focus lies more on treatment than prevention. This is caused by the farmers' inability to invest in higher quality inputs and investments like a waste water treatment system. It is hard to obtain certified fingerlings and, because of the costs, most farmers still use homemade instead of industrial feed. Track records of feed, fingerlings, water quality, and drugs were not kept so it impossible to assure quality at this moment. Hence, processing firms do not offer a fixed price per kilogram of fillet. Therefore smallholders cannot risk to investments, and do not see the need to control quality.

Improvement of knowledge management matrix

To simplify the quality control issue, Public knowledge is known by experts and accessible by others. However the degree of farmers' accessibility partially depends on the extension system. Here, the shared knowledge is seen as the link between farmers and experts. Although it is a simplification of the reality, the matrix is a nice overview for spotting differences in knowledge.

Figure 4 Knowledge Management matrix

Form of Knowledge	Type of Knowledge			
	Factual	*Conceptual*	*Expectation*	*Methodological*
Public (Experts, PAD, MOFI)	BNP is the biggest problem. Diagnosis in laboratory before treatment. Focus on prevention instead of treatment.	The PAD standards.	PAD implementation improves quality which is essential for human health and social environment.	BMP as a tool to implement the PAD standards.
Shared (DARD, FA, advanced farmers)	FA Market information. - Government extension. - Expert lectures- or seminars. Advanced farmer experiences.	Extension system: AFA Advanced farmers Extension officers Media	Advanced farmers' willingness is key for knowledge dissemination and FA growth.	The FA could succeed as a platform to spread BMPs.
Personal (Smallholders)	Farmers' procedures, experiences and knowhow about disease management.	Farm improvement through trial and error and based on location specific characteristics.	Quality control costs are high. Farmers cannot get a premium price for their product.	Focus on disease treatment instead of prevention.

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