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Food Standards and Vertical Coordination in Aquaculture: The Case of Pangasius from Vietnam

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Abstract

This paper explores the interaction between food standards and vertical coordination in the Vietnamese pangasius sector. For farmers and processors alike, the adoption of standards is motivated by a desire to improve market access by ensuring high quality supply. Instead of encouraging the application of standards and contract farming, processing companies prefer to vertically integrate primary production largely due to concerns over the stable supply of pangasius with satisfactory quality and safety attributes. These tendencies increase the market dominance of industrial farming and worsen the position of small household farms.

Keywords: food standards, motivation, vertical coordination, pangasius, Vietnam

1. Introduction

Global production and trade of food products are facing important structural changes reflected in complex consumer preferences, increased sourcing from developing countries, dominance of multinational companies and retail chains, and high demand for information about products and production processes (Reardon et al. 2009). Asymmetric information between buyers and suppliers can generate an oversupply of low-quality product (Akerlof 1970) or the complete break of transactions (Rothschild and Stiglitz 1976). Consequently, the food sectors in both developed and developing countries are (i) introducing standards for assuring food safety and quality, as well as the environmentally and socially responsible production practices; and (ii) trending towards closer vertical coordination, which typically entails full vertical integration or contracting of primary production.

Engaging farmers in export sectors through contract farming, where processing companies provide production resources and guidance, has been a dominant practice in developing countries (Key and Runsten 1999; Singh 2002; Minten et al. 2009). However, contract farming is susceptible to moral hazard problems. Both suppliers and buyers can default on contract obligations in various ways (Glover 1987).

Certified standards are another popular response to imperfect information. These standards can disclose different product attributes¹ and the elements of the production process, which must be identified and preserved as the product moves along the value chain. The initiatives to require certified standards and product traceability are attributed to the increasing dominance of retailers in the food sector (Henson and Reardon 2005; Dolan and Humphrey 2000). By requiring certified standards, the retailers are able to shift the costs of monitoring food safety and quality to their suppliers (Hatanaka et al. 2005). While standards can bring competitive advantage and secure market access, assuring compliance is costly and raises the bar for smallholders to enter the export value chains. Indeed, a large number of studies investigate the exclusion of smallholders from value chains due to standards (for an overview, see Reardon et al. 2009) or the marginalisation of developing countries in supplying global markets (Ponte 2012).

¹ Agri-food products carry at the same time: search, experience and credence attributes. For additional information, see Nelson (1970), Darby and Karny (1973) and Tirole (1988).

Nonetheless, even with contracts and standards, some processors or marketers still decide to fully integrate primary production. The parallel existence of standards and vertical integration raises additional questions that are crucial for understanding the producers' role in export value chains. What motivates farmers and processors to implement standards? Can farmers use standards to their advantage in an environment with increasing vertical coordination? Why do standards and vertical integration co-exist in a single value chain? How are the relations between the value chain actors modified by the introduction of standards as compared to vertical coordination? Exploring the rationale for pursuing vertical coordination and/or standards may be critical for improving socio-economic outcomes of producers from developing countries engaged in production of high-value export commodities.

Although rich and varied, previous literature on the motivations for vertical coordination and food standards has tended to adopt an *ex post* perspective on the interaction of motivations and the implications for producers from developing countries (for example, Asfaw et al. 2010; Kersting and Wollni 2012; Bellemare 2012b; Rao and Qaim 2011; Barrett et al. 2012; Bolwig et al. 2009)². So far, it has not been common to ask producers directly about their motivation. Motives are usually inferred from the observed effects in the context of prevailing production and market conditions (Masakure and Henson 2005). This paper thus departs from previous studies by attempting to identify the range of motives to pursue vertical coordination and to apply standards for both farmers and processors that constitute the key actors at the pre-export segment of the Vietnamese pangasius value chain.

Several studies have illustrated how a high demand for international standards leads to increased vertical integration in agri-food value chains (Gibbon 2003; Maertens and Swinnen 2009; Maertens et al. 2012; Schuster and Maertens 2012). However, it is argued in this paper that although standards improve market access, they are not the most decisive factor in determining the organisation of the value chain. This is what holds for the Vietnamese pangasius sector, where the need to assure stable supply coupled with the weak contract-enforcing environment is the main driver of vertical integration.

² Although, see Masakure and Henson (2005) for the analysis of contract farming in Zimbabwe and Swinnen (2005) for the analysis of vertical coordination in Eastern Europe and Central Asia.

The Vietnamese pangasius sector is an excellent case for studying the implications of vertical coordination and standards in a global value chain (GVC). The sector has established a global presence in the past decade, supplying more than 100 countries worldwide. The total production surpasses one million tons per year and the export turnover was USD 1.85 billion worth in 2011 (Dzung 2012). A growing number of vertically integrated farms has been reported (Bosma et al. 2011). The sector has, as the intensive aquaculture sectors elsewhere, attracted considerable international attention in terms of safety, environmental and social aspects of production practices. The negative media attention in the EU (Bush and Duijf 2011) and the NGO pressure for improved accountability (WWF 2010b) have led to a burgeoning number of different standards in the sector. The introduction of standards and the increase of vertical integration in the sector have, however, attracted only a modest research interest. Bush et al. (2009) focused on examining the potential of various standards to assure sustainable production and Belton et al. (2011) investigated whether standards can improve local environmental conditions. This paper supplements the earlier research by drawing attention to the interplay between vertical coordination initiatives and safety and quality aspects of pangasius production, which are considered equally relevant (Bush and Duijf 2011; Little et al. 2012).

This paper illustrates that processing companies rely on vertical integration, rather than standards or contracts, to address the pervasive market failures. Three findings from the pangasius sector corroborate this argument. First, farmers and processors in the pangasius sector have a dual perception of standards, both as a way of upgrading and securing market access. Second, contract farming is not a preferred choice in the pangasius sector because it is easy to avoid responsibilities specified in the contract. Third, the concerns over the stable supply of pangasius with satisfactory quality and safety attributes considerably induce processing companies to conduct primary production internally. While previous studies have mainly focused on the issues of exclusion and welfare outcomes of standards in GVCs, this study draws attention to the supply concerns, which are as important as quality and safety of food products. Instead of encouraging the application of standards and contract farming, processing companies organise production internally, thus increasing the market dominance of industrial farming and aggravating the position of small household establishments.

The paper is organised as follows: Section 2 offers a brief discussion on standards and vertical coordination in the context of GVCs. Section 3 describes the methods used for data collection, whereas Section 4 informs on the structure of the Vietnamese pangasius value chain. The analysis of the factors that motivate the adoption of standards and vertical coordination is in Section 5. The main findings and their policy implications are summarised and discussed in Section 6.

2. Vertical coordination and standards in global value chains

The incentives for closer vertical coordination arise as a response to market imperfections (Williamson 1975; Hennessy 1996), whereby higher transaction costs, i.e. higher information, search and monitoring costs related to purchasing in spot markets induce firms to internalise or contract production. Moving away from spot-market transactions improves the ability of processing companies to address the information asymmetry problem and secure enough supply of raw materials while minimising production and transaction costs.

Facing the challenges of the imperfect information transfer, firms can also use certified standards to improve consumer's information about product quality, thus building the consumer loyalty and the value of firm's reputation (Fulponi 2006). Standards arise from the need to increase coordination of the activities between different agents due to the need to exchange high amount of complex and non-market information. The emergence of public and private standards is important not only for the safety of products in consumer markets, but also for the organisation of value chains (Reardon et al. 1999). Gibbon and Ponte (2005) argue that quality grades and standards are a prominent governance mechanism in modern agri-food chains. In GVCs, standards induce both supply- and demand-side effects. On the demand side, investments in standards are a way to build consumer loyalty and increase reputation (Fulponi 2006). As they bring information about the production processes and the traceability of products, standards can help consumers in evaluating the quality of products. Signalling various aspects of product quality thus reduces consumers' uncertainty and information asymmetry³. In this way, the trust in certified products is increased (Raynolds 2002). These factors are crucial in gaining and keeping market access, especially for producers from developing countries (Henson and Humphrey 2010). On the supply side, standards can improve competitiveness. Adoption of standards can decrease price competition and increase profits through

³ Consumers' uncertainty is closely linked to the risk defined as the probability that the product does not meet consumer expectations about product quality and safety. Consumers are assumed to react to the perceived rather than the actual level of risk (Polinsky and Rogerson 1983).

product differentiation (e.g. Spence 1976; Tirole 1988). Direct positive externalities of applying standards, such as the improved control and increased efficiency can create competitive advantage (Henson and Caswell 1999; Caswell et al. 1998). In addition, the incentives to implement standards can come from the regulatory side in the form of public regulation for quality and safety.

Further, the incentives for the adoption of standards can be classified in two groups based on two main types of benefits. First, producers may adopt standards as a way of securing economic rents, which can materialise in higher retention of value added, product differentiation, price premium and higher competitive advantage. This is consistent with the concept of upgrading in Humphrey and Schmitz (2002) in which upgrading refers to increasing the value added of products and production processes. Second, producers may adopt standards as a way of gaining access to (or remaining in) a particular market. The market access here refers to ensuring participation in a specific value chain, while responding to market requirements and aiming to improve reputation.

In practice, standards facilitate the search for suppliers by reducing the time and resources needed to identify eligible suppliers, inspect quality and enforce contracts. Thus, by applying standards farmers can improve the position in the market and be eligible for supplying to more buyers. In this situation, previous relationships that were based on the exchange of private information are altered as the information becomes codified through standards, rendering the once private information between farmers and processors into public.

By decreasing specificity, standards lead to a lower degree of coordination, which is what Gereffi et al. (2005) propose – by codifying the product information, standards reduce transaction costs and shift the form of governance from hierarchy to more flexible, i.e. market-based or modular relations between suppliers and lead firms⁴. However, this outcome may not occur because a wider application of standards may induce concerns over stable supply for individual buyers warranting the quantity and price adjustments in the light of changing market conditions. So even with standards, vertical integration and contracts may still be an attractive option if the concerns about assuring enough supply persist.

⁴ Yet, some value chains show a high degree of vertical coordination even in the presence of standards (Maertens and Swinnen 2009) implying that there still may be the need to exchange substantial amounts of information beyond standards (Muradian and Pelupessy 2005).

Global standards have had conflicting impacts for small-scale farmers. For farmers who manage to comply with standards, this can result in product differentiation and competitive advantage, but those who do not possess the necessary capital, skills or knowledge to meet the requirements of buyers risk exclusion from the value chain (Farina and Reardon 2000; Reardon et al. 2009). Thus, even if the farmers were aware of the potential benefits of standards, the implementation can lag due to financial constraints.

In sum, standards affect not only the organisation of GVCs, but also the socio-economic outcomes of the value chain participants as they dictate the terms and relations of participation. However, little is known about the nature of motives responsible for the adoption of standards. An aspect that has so far been neglected in the GVC literature is *how* producers and processors perceive standards, i.e. what motivates them to comply with standards and what induces them not to. Where an understanding of the implications of increasing prevalence of standards in global value chains is the object of enquiry, the incentives behind the application of standards should be a focus of research.

3. Methods and data

This study involves a combination of qualitative and quantitative data. The data come from semi-structured face-to-face interviews, which were accompanied by informal and email interviews; farmer survey; field observations and review of published secondary material. The scoping study took place in January 2011, whereas the main part of the primary data collection took place from April to June 2011 in three provinces in Mekong River Delta (MRD) with the highest intensity of pangasius production: Can Tho, Dong Thap and An Giang. The data include 52 qualitative, semi-structured interviews and a questionnaire-based survey of 276 pangasius farmers. A combination of qualitative and quantitative research was chosen because the desired information relates to both the willingness of the pangasius sector members to apply standards and the motivations and barriers that play a role in determining the willingness to adopt standards. While the quantitative approach provides the statistical analysis of the pragmatic reasons for adopting standards, the qualitative part of this research enabled for some of the subtler issues to be explored.

Lacking a complete list of pangasius farmers, the sample for the survey was created by a random selection of 25 communes from Dong Thap province. This was based on the 2006 Vietnam Agricultural Census that contained information about 100 farmers producing pangasius in 2005.

The estimated number of pangasius farmers in the selected communes was 254 (Interview G8), of which 198 were surveyed. In addition, 79 farmers from 2 communes in Can Tho province and 3 communes from An Giang province were also surveyed. The survey questionnaire contained questions on basic socio-economic indicators; production inputs, assets and costs; marketing and support institutions; contract details; application of standards, perceptions about standards, motivation to apply standards and open-ended questions about the views on the sector. Identifying farmers' motivation involved first, listing all the reasons that were relevant for the decision to start applying standards and second, assessing the importance of the relevant factors using a three-point Likert scale from "most important" (1) to "least important" (3). Based on this information, it was possible to calculate the mean score for each motivating factor and analyse the relationship between different factors. Where appropriate, questions allowed the 'Don't know' category to be selected and space was provided for recording answers that were not among the offered categories. For the questions where it was important that farmers choose the most important category or when they needed to rank attributes that affect their choice, the enumerators used choice cards.

Face-to-face semi-structured interviews in duration from 30 to 90 minutes were held with key informants with knowledge of the pangasius industry (Table 1). The interviews comprised open-ended questions, which ensured breadth of responses. The interview guide contained sections on sector performance and organisation, certification of standards and institutional framework. Processing companies and exporters could discuss their position in the value chain and reflect on the terms and conditions of pangasius production, processing and marketing. This enabled examining forward and backward linkages, as well as their strategies for securing the position in the value chain. The interviewees were asked about the changes over time, which gave qualitative information on sectoral trends and dynamics.

Two of the qualitative interviews were informal, as dictated by the circumstances and respondents' preferences. The interviews were conducted in English or in Vietnamese with the aid of an interpreter when an informant could not speak English. Qualitative information was in some cases obtained through electronic mail exchange as this way of communication fit better with respondents' schedules.

Table 1. An overview of the interviews with participants of the pangasius value chain

Respondents	Selection Criteria	Method used	Number	Coding
Exporter	Employed for international trading companies	Semi-structured interviews	5	E1 to E5
Farmer	Owning or working on a pangasius farm	Participant observation, Informal and semi-structured interviews	7	F1 to F7
Government	Staff at different levels of provincial or commune-level governance responsible for pangasius sector	Group and semi-structured interviews	8	G1 to G8
Input supplier	Supplying inputs, such as fry, fingerlings, feed, supplements and veterinary medicines to pangasius farms	E-mail, informal and semi-structured interviews	5	I1 to I5
Processor	Employed for a processing company in managing, technical or quality assurance positions	Participant observation, e-mail, structured and semi-structured interviews	14	P1 to P14
Researcher	Representing various research institutions and universities Directly involved in research on pangasius sector	Semi-structured interviews	5	R1 to R5
Service	Providing various kinds of support to the sector, e.g. financial services, consultancy, development projects, certification	Semi-structured interviews	8	S1 to S8

Source: Interviews.

The selection of interviewees proceeded through snowball sampling. The first interviewees were identified through Internet search representing educational and research institutions, governmental and non-governmental actors, exporters and processors. In terms of qualitative interviews with farmers, the choice was somewhat constrained by the non-transparent bureaucratic rules that dictate the terms of research in Vietnam (also mentioned in Belton, Little, et al. 2011; Scott et al. 2006), but it was possible to visit both processor-owned and independent farms, including farms in remote locations, to avoid potential bias from interviewing only the most accessible farmers. As farm size potentially matters for the adoption of standards, it was essential to make sure that a range of farm sizes was represented.

The majority of respondents were located in An Giang, Can Tho and Dong Thap provinces. These locations are illustrative of pangasius production in Vietnam, together accounting for 70% of the total production volume (VASEP 2012). In addition, nine interviews took place in Ho Chi Minh City, which is the business and administrative centre of the MRD region. This was due to the fact that several research and service centres, consultancies and exporters who operate across several

MRD provinces are based in Ho Chi Minh City. Therefore, the study respondents represent not only the different parts of the pangasius value chain, but also traditional producing and business regions, allowing for rich data collection and research validity.

4. The pangasius value chain

Pangasius has been produced since 1960s in several provinces of Mekong River Delta, Vietnam. The farming area reached 6,000ha in 2011 with a value of around USD 2 billion (Dzung 2011). The production area increased 35 times and the export value 45 times since 2000 (Dzung 2011). Pangasius is exported in the form of frozen fillets and sold in a broad range of retail outlets, restaurants and local marketplaces. Over 90% of the fish is exported to more than 100 different countries (Loc et al. 2010; VASEP 2012). Figure 1 shows that the main markets are the US, the EU, Russia and Ukraine. Pangasius fillets receive 30-50% higher price in the US and the EU markets than in Russia (Khoi 2011).

Production of pangasius in Vietnam reached over 1 billion tons in 2010, which is almost 80% of the total world production (FAO 2012a). Pangasius contributes by more than 40% to Vietnam's total aquaculture value (DERG and CIEM 2010). The average annual growth rate was 37% in value terms between 1997 and 2008 with a record growth of 63% in 2006-2007 (Figure 2). Some decrease (16%) in production output and value occurred between 2008 and 2009, while the export value and quantity decreased by 7.5% and 5% in the same period, respectively. A slow recovery in production and trade are registered since then.

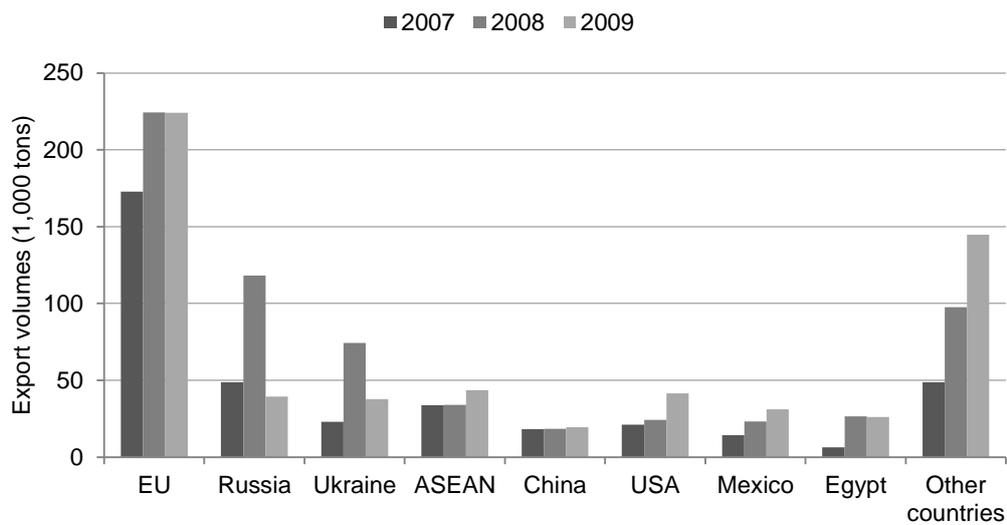


Figure 1. Exports of pangasius by destination country

Source: FAO (2010).

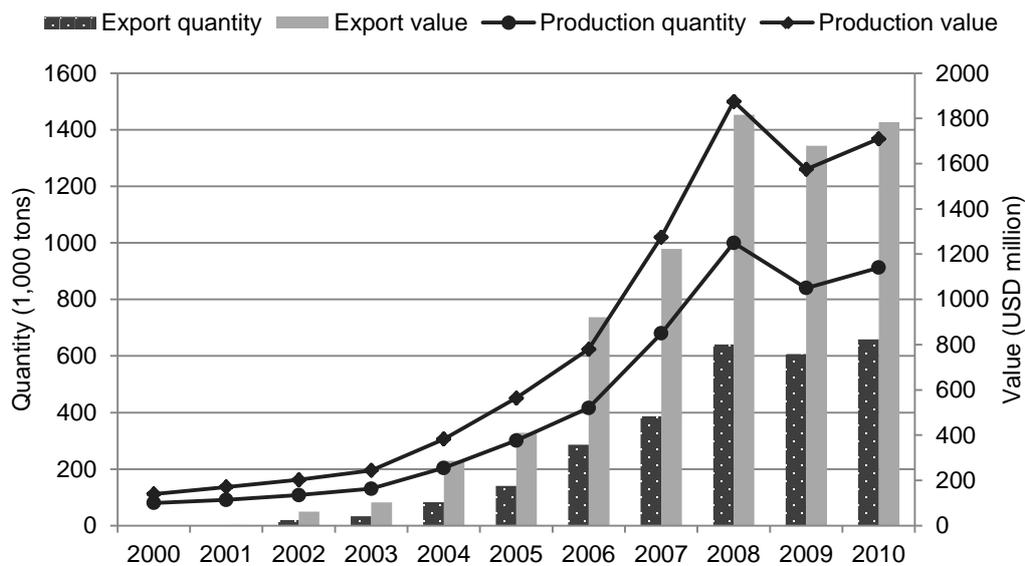


Figure 2.

Quantity and value of pangasius production and export 2000-2010

Sources: FAO (2012), Nguyen (2010) and Dzung (2011).

As visible from Figure 3, the pre-export segment of the pangasius value chain is composed of four main functions: seed production at hatcheries, fingerling production at nurseries, grow-out of market-sized fish in ponds and processing of raw fish into various value-added products in processing plants. Grow-out, nursery and hatchery farms usually operate as different entities, procuring inputs from local traders specialised in delivering feed, chemicals or medicines. Pangasius farming is based on small-scale farms that typically have less than 1ha of aquaculture

area; yet the farm size is highly dispersed (Belton, Little, et al. 2011; Phan et al. 2009; Sinh and Hien 2010; Loc et al. 2010). The trend for vertical integration of farms with processing is highly pronounced (Bosma et al. 2011; De Silva and Phuong 2011).

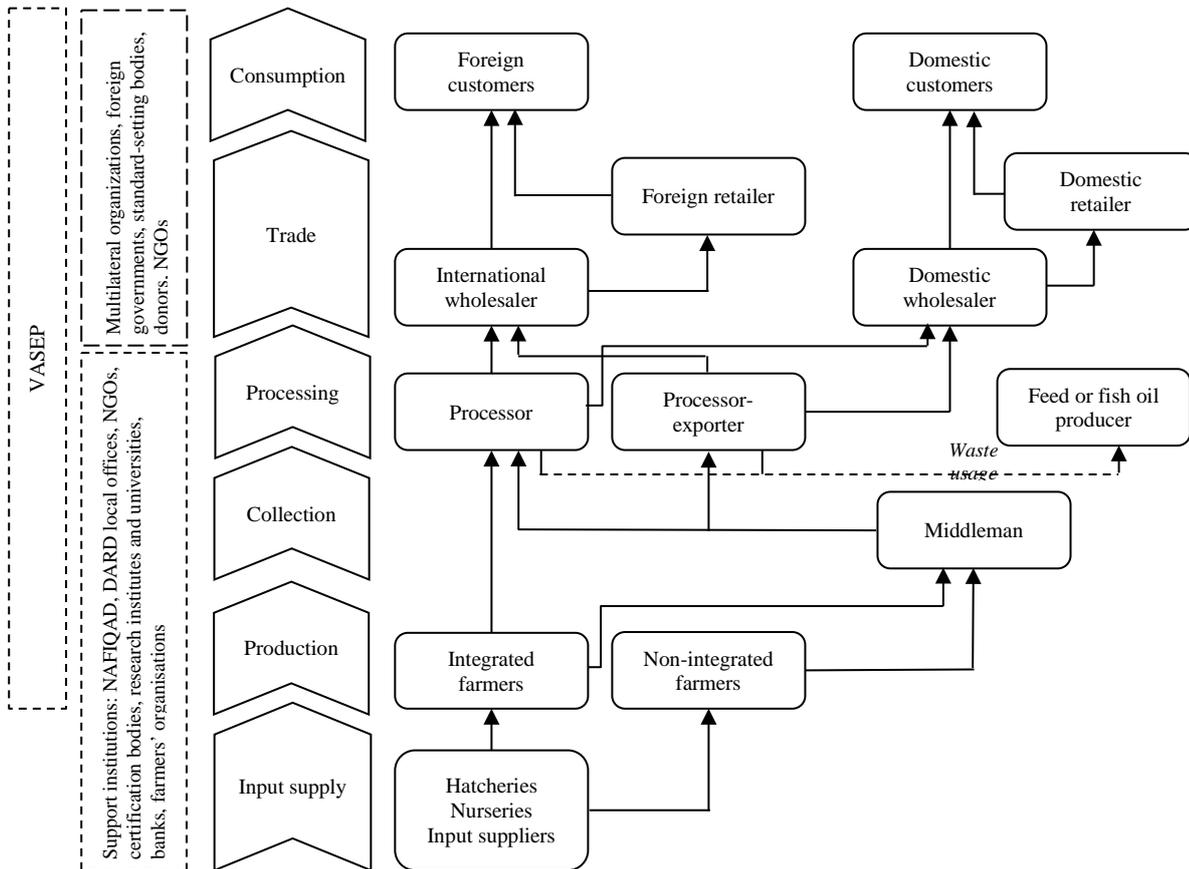


Figure 3. The Vietnamese pangasius value chain

Source: Interviews.

Being export oriented, the pangasius value chain is dominated by processing companies, which either export directly or collaborate with international traders. International traders and retailers require that farmers and seed producers conform with the consumer preferences not only about the specific product characteristics such as colour and size, but also about the specific properties of the production process, be it the application of environment friendly practices or the compliance with specific foreign-market regulation. Each of the retail groups has their individual product specification, which for example includes requirements about weight, product colour and packaging. More commonly, retailers require certification against specific standards through third-party certifiers, which would ensure compliance with national regulation and reduce susceptibility

to liability claims. Farmers are under strong pressure for applying standards such as GlobalGAP, Best Aquaculture Practice (BAP) and Aquaculture Stewardship Council (ASC) (Belton, Haque, et al. 2011) and thus guaranteeing socially and environmentally sound production practices and fish quality and safety. When involved in the transaction, traders communicate these requests further upstream (towards processors and farmers), as they are trying to match a particular product to retailer's specifications. In order to secure sales, traders can also enforce their own specifications, or specific governance regimes set by the retail chains. For example, one of the pangasius traders has introduced their own quality standard Panga Trace (Interview E3); another demands that its pangasius suppliers adhere to the SA 8000 standard for social accountability (Butler's Choice 2010), and one German trader has been successful in securing the supply of organic pangasius from Vietnam for this niche market (Interview E1).

A number of state and private organisations facilitate pangasius production and trade: Ministry of Agriculture and Rural Development (MARD) manages and enforces regulation on quality of pangasius production, National Agro-Forestry-Fisheries Quality Assurance Department (NAFIQAD) controls the quality and safety of fishery products intended for export through inspections and Vietnam Association of Seafood Exporters and Producers (VASEP) supports businesses in terms of trainings, market access, information sharing, production and legal advice. Local offices of the MARD have organised a series of trainings about standards for farmers in the past, but the efficiency of these endeavours was judged as unsatisfactory (Bush et al. 2009).

5. Standards and vertical coordination in the pangasius value chain

5.1. Standards

The pangasius sector exhibits a strong heterogeneity when it comes to the application of standards at the farm level. Only 25% of farmers in the survey area apply standards, as Table 2 shows. Neither processor-owned nor household-owned farms show full compliance with standards. The prevalence of standards on processor-owned farms is 35%, while it is only 20% on household-owned farms. Exactly 40% of the sampled contract farms apply standards. Table 3 shows that among the household-owned farms, GlobalGAP is the most frequently applied, followed by ASC and SQF1000. Processing companies regularly apply more than one standard, with ISO 9001, HACCP and BRC being the most prevalent.

Table 2. Prevalence of standards among pangasius farms

	Whole sample	Not applying standards					Applying standards				
		Farm size					Farm size				
		No.	No.	(%)	<1 ha (%)	1 – 3 ha (%)	>3 ha (%)	No.	(%)	<1 ha (%)	1 – 3 ha (%)
All farms	276	207	75	61	21***	17***	69	25	20	28*	36***
Processor-owned	88	57	65	28	35	35	31	35	36	20	46
Household-owned	189	150	80	73	16***	11***	38	20	17	33**	16
<i>Contracts (household-owned)</i>	85	56	66	75	17***	7***	29	34	63	21***	11***

Notes: Differences in size of farms that apply standards are tested using t-test. Significant differences are indicated with * p<0.10, ** p<0.05, *** p<0.01. Source: Farmer survey.

The overall distribution of standards is skewed towards larger pangasius farms, as illustrated in Figure 4. While 36% of farms with aquaculture surface larger than 3ha apply standards, less than 20% of farms smaller than 1ha do the same. This observation is in line with other global value chains, notably the green bean export sector in Kenya, where a high number of smallholders finds it challenging – both in terms of finances and capabilities – to comply with different requirements of food standards (Okello and Swinton 2007). Experience elsewhere has also revealed that small producers, who find it difficult to meet the stringent requirements, get easily excluded from certified markets and that such developments contribute to the emergence of vertical integration in export chains (Dolan and Humphrey 2000).

Table 3. Standards and certification schemes in the Vietnamese pangasius sector

Standard	Scope and certifier	Number	Per cent
(a) Standards applied at the farm level			
GlobalGAP	Good agricultural practices, environmental and social responsibility. Developed by major European retail chains.	53	76
SQF 1000	Safe Quality Food Program for safety and quality management developed by The SQF Institute, a division of the Food Marketing Institute founded by food retailers and wholesalers.	5	7
ASC*	Aquaculture Stewardship Council standard for sustainable aquaculture developed through Pangasius Aquaculture Dialogues by WWF (World Wildlife Fund) and IDH (Dutch Sustainable Trade Initiative).	2	3
BAP	Best Aquaculture Practices standard for environmental and social responsibility, animal welfare, food safety and traceability. Developed by Aquaculture Certification Council.	1	1
No answer		10	15

Total		71	100
(b) Standards for processing companies			
HACCP	Hazard Analysis and Critical Control Points is a risk management tool that ensures product safety from biological, chemical and physical hazards. Developed by Pillsbury company. Application guidance by International HACCP Alliance and Codex Alimentarius Commission.	14	100
BRC	<i>Global Standard for Food Safety assuring</i> Safety and quality management. Developed by British Retail Consortium, a UK trade organisation that represents retailers' interests	10	71
SQF 2000	Safe Quality Food Program for safety and quality management developed by SQF Institute, a division of the Food Marketing Institute founded by food retailers and wholesalers.	10	71
ISO 9001	Quality Management System developed by International Organisation for Standardisation (ISO).	9	64
IFS	International Food Standard for safety and quality management developed by European retailers mostly from Germany and France.	6	43
ISO 14001	ISO standard for environmental management.	3	21
ISO 17025	ISO standard for the competence of testing and calibration laboratories.	3	21
Halal	Practices permitted under the Islamic Law. Religious bodies in each market carry out oversight without international consensus.	2	14
ISO 22000	<i>ISO standard for food safety management.</i>	1	7
Total		14	-

Note: Panel (a) shows standards applied at the farm level. Panel (b) shows standards that processors apply. * Certification against the ASC standard was not possible during the period of data collection, so the information refers to the farms applying the guidelines proposed in Pangasius Aquaculture Dialogues. All other information relates to certified standards. Source: Farmer survey, interviews, SQF (2012), IFS (2012), BRC (2012), GlobalGAP (2012), GAA (2011), WWF (2010a), NZTE (2010).

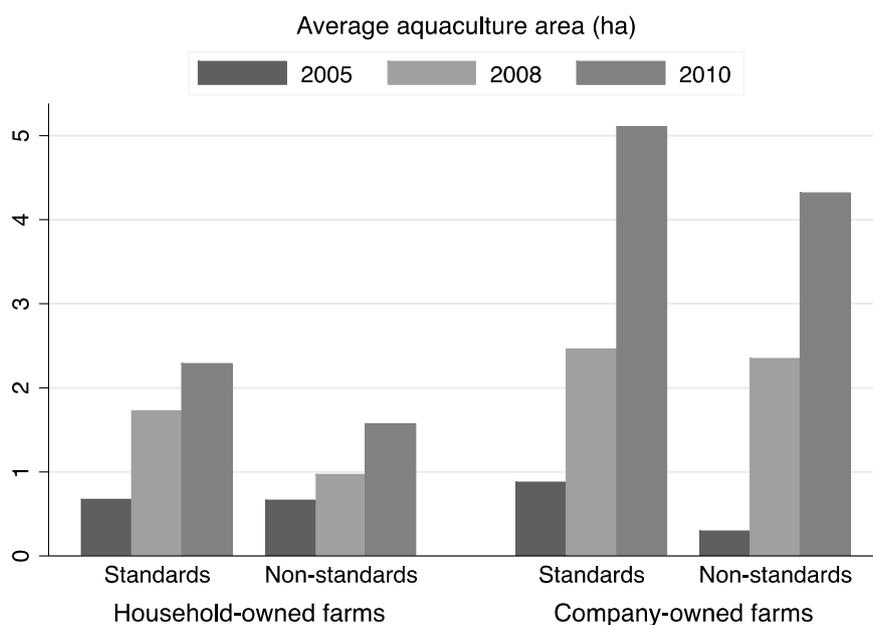


Figure 4. Average size of production area on pangasius farms, 2005-2010

Source: Farmer survey.

Farmers' motivation to apply standards

The overview of farmers' motives to adopt standards, grouped as *economic rents (upgrading)* and *market access* motives, is shown in Table 4. The key motivation choices comprise the desire to improve product quality and to decrease the occurrence of fish diseases, both in terms of frequency of the response and ranking. Over 60% of farmers who apply standards chose quality improvement as a reason to start applying standards. The same number of farmers stated that by applying standards they hope to decrease the occurrence of fish diseases on the farm. As one of the farmers stated, 'there is less illness' when standards are applied (Interview F5). Standards were seen as a 'guarantee of quality' (Interview P3). Processing companies are interested in 'quality product that does not contain antibiotics and prohibited substances' (Interview F6). This finding is noteworthy because it implies that farmers have dual perception of standards – both as a signal of good product quality and as a risk management tool, which can act to increase the income security.

Table 4. Why pangasius farmers apply standards?

Category	Motivation	Number	Per cent	Chosen most important	Mean score
<i>Economic rents (upgrading)</i>					
	To enhance product quality	24	63	12	2.33
	To decrease occurrence of fish diseases	24	63	8	2.1
	To sell at higher price	14	37	4	2.3
	To sell in better-paying markets	14	37	4	1.92
	Because competitors will have it	5	13	0	2
	To reduce production costs	1	3	1	2
	To reduce number of inspections and/or testing	3	8	–	–
	To improve management capacity	3	8	–	–
<i>Market access</i>					
	To meet domestic client requirements	14	37	4	2.17
	To meet international market requirements	8	21	1	1.43
	To increase sales in domestic market	9	24	1	2.22
	To increase export	8	21	2	1.5
	To improve reputation	9	24	–	–
	Popularized by government	1	3	–	–

Note: Farmers were asked to rank their motives by choosing the appropriate value from 1 (extremely important) to 3 (least important). For the ease of exposition, the ranking scale is reversed so it can be interpreted as follows: the higher the average rank, the more important the reason for adopting standards. Motivation choices are sorted by the most frequently chosen option. N = 38; multiple options possible. Source: Farmer survey.

In case of pangasius, the application of standards is understood as a way of improving product quality as specific requirements of various standards that are applied at the farm level focus precisely on achieving better quality (Belton, Haque, et al. 2011). The emphasis on quality is important because farmers get paid according to the quality grades set by processors. Pangasius products are marketed as high or low grade, corresponding to higher and lower product quality (Interview E3). Higher quality products are light-coloured trimmed fillets that are sold in Western markets. Lower quality products are untrimmed with more intensive tissue colour, and they are sold in markets with lower purchasing power. If the conditions during production were not optimal (i.e. if the stocking density were too high or if the water in the pond were changed infrequently), the flesh will have darker colour and be judged as inferior grade, thus receiving the lower price. Also, the fish is checked for presence of antibiotics and other chemicals before the purchase. Too high content of antibiotics or the presence of prohibited substances is also penalised. Contracts signed between processors and farmers in the pangasius sector typically contain clauses related to quality.

Belonging to the same group of motives are the farmers' aspirations to obtain higher profits. Stating that the adoption of standards was motivated by a desire to achieve higher price was relevant for 37% of farmers and it was almost as important as the intentions to improve product quality. The profit-related motives also appeared during the in-depth interviews. For one farmer, applying standards means that he can 'sell at a good price' (Interview F2). Caring about competitors, however, was not common among the surveyed farmers. Only 13% considered applying standards due to the competition. Other factors that were relevant for farmers include improving the management capacity and reducing the number of inspections and/or testing. Although better management practices can result from following the standard guidelines and may contribute to product quality improvement, none of the farmers included these factors in the top three most important motives.

The expectations of better market access are also important for the application of standards. These motives are expressed as a desire to increase sales and they were ranked highly by 24% of farmers. Farmers are also motivated by the need to meet the requirements of their buyers in various markets. Buyers are accepting the product better if the standards are applied (Interview F5). Around 35% of farmers had focus on domestic clients and 21% had foreign clients in mind. In addition, 24% of farmers indicated that they apply standards in hope of improved reputation. The sales-related

motives were the most prominent in the in-depth interviews with farmers. With standards, it is ‘easy to sell’ (Interviews F5 and G4) and ‘production will go smoothly to market’ (Interview P1). In addition, one farmer stated that the extension work of the local MARD staff influenced his intentions to apply standards, but this factor was not ranked as important.

Overall, the analysis of pangasius farmers’ responses shows that the decision to start applying standards comes from the need to upgrade, as well as to gain and maintain access to markets. Farmers are taking into account not only the commercial factors, such as positive financial returns and improved position in the market, but also the risk-mitigating factors, such as quality improvement and fish disease prevention. The focus on the improvement through standards could be a direct consequence of two mechanisms. First, the prevailing market conditions in which farmers can directly observe that the higher quality of fish is financially rewarded may induce farmers to seek better ways of managing the production process. Second, farmers are aware that if they can prevent or manage the fish disease outbreaks in a way that is suitable for buyers, they will have higher yields and consequently, higher revenue from pangasius production.

a) Motivation for not adopting standards

As only 20% of household-owned farms apply standards, it is important to understand why the majority has not adopted standards (for the time being). The survey responses suggest four main prohibiting factors in the implementation of standards: (i) financial constraints, (ii) lack of personal capacity, (iii) no guarantee of price premium and (iv) insufficient demand for certified production (Table 5).

The main prohibiting factor in the implementation of standards is the lack of finance. The capital constraints were expressed in several ways. Most of the farmers (41%) indicated that high costs of farm upgrading were a constraint, 18% of farmers stated that the certification costs too much and 15% stated that consultancy costs related to the implementation of standards were too high. Costs of standards are high mostly because farmers need to hire experts, attend expensive trainings, change farm structure and modify daily farming practices. Drawing attention to the farm properties, one farmer responded: ‘Structure of the farm doesn’t fit to standard’s requirements. We need another system to put medicines into feed. We also need a system of water intake and discharge into ponds and to rebuild the house.’ (Interview F1). A very rough estimate of certification costs for various standards including fees for registration, annual inspection and certification is USD 5-7,000

depending on the farm size, while the farm improvement costs for the implementation of GlobalGAP can easily go over USD 4,000 per hectare (DERG and CIEM 2010). Considering the low margins for pangasius (Bush et al. 2009), the costs for standards seem substantial.

Then, 37% of farmers stated that the lack of competences is the main inhibiting factor for the implementation of standards. While 23% of farmers are not aware of any benefits related to standards, the same number of farmers finds them impractical. For a subgroup of farmers, applying standards is simply not necessary: 17% indicated that standards are not demanded locally and 5% stated that standards are not needed. Providing a counter to the farmers who adopted standards due to customer requirements, one of the farmers said that he is not taking action because: ‘Companies use no enforcement on this farm’ (Interview F3). In addition, farmers are convinced they do not need to certify standards if they can supply fish that fulfils basic quality requirements – that the fish is white and that they do not use antibiotics during the production process.

Table 5. Why pangasius farmers do not apply standards?

Reasons for not adopting standards	Number of farmers	Per cent	Ticked most important	Mean score
Establishment upgrade costs	40	40.82	17	2.34
Lack of competence/experience	36	36.73	15	2.25
Not aware of benefits	20	20.41	6	2.05
Impracticality	20	20.41	6	2
Not demanded locally	18	18.37	7	2.29
Cost of certification	18	18.37	3	1.59
Costs of consultancy	15	15.31	2	1.92
No consultancy capacity	14	14.29	7	2.54
Low commercial return	9	9.18	1	1.50
It takes long time to obtain certificate	5	5.10	1	2
Not demanded in foreign markets	3	3.06	0	1.50
No management commitment	2	2.04	1	2
Do not know	11	11.22	6	3

Note: N = 151; multiple options possible. Source: Farmer survey.

Speaking directly against positive market opportunities related to the application of standards, professionals from the sector stated ‘certification does not give higher price’ (Interviews S4 and R4) or the ‘premium is not paid for certification’ (Interview E3). Although the price premium is not guaranteed by most of the standards applied at the farm level⁵, farmers who apply standards have

⁵ The ASC is an exception in this regard, but the implementation is only just beginning.

experienced a higher price⁶ possibly because having better quality with standards, their product gets classified as high grade at the time of purchase. Thus, a possible mechanism for increasing the rate of adoption of standards among farmers could be a higher price guarantee.

The experts in the sector believe that the majority of farmers do not see standards as a beneficial market tool. Standards are perceived as ‘very complex and difficult’ for farmers (Interview G4). Indeed, a significant portion of farmers does not apply any standards (Table 2) and 27% of the surveyed farmers stated that they have not heard about standards, illustrating that the Vietnamese situation is different from experiences in other global value chains where total compliance for all farmers is mandatory (see, for example Maertens and Swinnen 2009; Okello and Swinton 2007). This information shows the need to increase the understanding of standards not only among the farmers, but also among the experts in the sector emphasising the need for more assistance in terms of technical support and training.

Some of the interviewed farmers stated that they plan to implement GlobalGAP already next year (Interview F1) or in the next three years at the latest (Interview F2). Companies and government extension services encourage farmers to implement standards, but ‘it is not obligatory [to apply]’ (Interview G4). This is probably a consequence of different requirements in the multiple markets the pangasius sector supplies. Indeed, not all processor-owned farms apply standards either, illustrating a huge role of the final markets in the demand for standards at the farm level. Further developments with respect to certification in the sector will thus depend on changes in export markets. As Figure 1 shows, demand for pangasius is stagnating in the EU, but increasing in the emerging economies and the US. As long as the sales in exigent markets continue, the need for certification will increase. If the bulk of sales diverts to less demanding markets, there will be no need to increase compliance with standards among farmers, that is, as long as customers in these markets do not start demanding more accountability and information about the production process.

Unlike farmers, processors have a longer experience with standards and they are at the point of satisfactory compliance. One of the managers in a processing company said: ‘At first, it is difficult to apply. The procedure is complex, but when [one] get[s] used to it, it’s easier’ (Interview P1).

⁶ The average farmgate price for the farmers applying standards was significantly higher (t-value = 3.38, p=0.00) at 21,171 VND/kg than for the non-applicants who received on average 18,479 VND/kg (VND stands for Vietnamese Dong; 1 VND ≈ 20,200 USD).

This does not mean that processing companies have overcome all the challenges related to compliance with standards. Apart from difficulties in finding qualified personnel and training workers about standards, processors face costs of educating farmers and staff on their farms (Interviews P3, P6, P12 and P13) and costs of hiring experts, local consultants and foreign auditors for the implementation of standards (Interviews P5, P7 and P8).

b) Processors' motivation

Processors' perceptions about standards show slightly different pattern of motives as compared to farmers. The most commonly voiced motives relate to meeting the customer requirements with respect to standards and subsequently increasing consumer confidence and trust.

Processors need to apply standards in order to fulfil requests of their buyers in numerous markets. In the words of one of the processors, standards prepare them 'to serve all of the difficult requirements of customers' (Interview P7) thus improving the confidence of consumers (Interviews P10, P11 and P14). Certification of standards is crucial for better market access as it leads – in processors' opinion – to improved export opportunities, increased sale volumes and increased number of customers (Interviews P5, P7, P9 and P10).

With standards, processors can potentially improve competitiveness, achieve better reputation and increase customer trust. Some processors believe that strengthening competitiveness and brand name can be accomplished through standards that are applied at the production stage on farms and at the processing stage in the plant. In this way, standards can serve as a means of impartial validation of good production practices. For example, processors responded: 'this is ... the way to build company's brand name' (Interview P7) and 'to improve the enterprise's prestige and image' (Interview P10). 'GlobalGAP or ASC can help sector and give trust for quality product to customer' (Interview P3).

Finally, standards are applied as they enable 'improving the control of main process and product quality' (Interview P12). For processors, standards mean reduced risk of purchasing an unsatisfactory product and lower costs through reduced monitoring of production on farms, quality inspections and product rejection at the export stage. In terms of risk management, standards enable 'detecting the risk of food security early' (Interview P11) and 'limit the damage caused by the risks' (Interview P9). Standards can prevent financial loss, as they 'reduce costs associated with the risks

of product recall and compensation for consumers' (Interview P6). These motives were identified as important in other studies. For example, a study on the implementation of HACCP in the Philippine seafood industry suggests that small reductions in rejection rates can lead to substantial cost savings and financial benefits (Ragasa et al. 2011).

In deciding to apply standards, processors are mostly governed by the need to improve market reach through increased customer satisfaction. For processors, standards can be a means to affect demand by signalling better quality of products and a more transparent production process. To a smaller extent, risk reduction and better management of the production process are relevant. This confirms previous findings that standards can generate positive externalities for processors, such as increased production efficiency and competitive advantage (Caswell et al. 1998).

c) *Benefits from standards*

Reducing price variation was ranked as the most important benefit from standards. Farmers have experienced that due to standards they receive higher price for fish in 47% of cases and observe lower price variation in 42% of cases. Thanks to standards, some farmers receive fewer complaints from buyers (25%) and some are able to sell to more buyers (19%) or in more markets (17%). One of the processors stated that with standards 'production will go smoothly to market' (Interview P1). In this way, standards signal good quality and enable better market access. For some farmers, standards translate into less disease outbreaks, higher output, less worker injuries, environmental improvements and more confidence in the production process. Standards are beneficial, as they 'encourage not using poisonous medicine when producing, which can harm the quality of fish' (Interview G4). An industry expert summarizes experiences of the pangasius sector with standards: 'Farmers become more professional...' through '... improved management of diseases, monitoring and quality of fish' (Interview S5). These findings corroborate some of the previous studies in which the most important benefits of standards primarily come from the improvements in traceability and product quality (Maldonado et al. 2005; Fouayzi et al. 2006).

For processing companies, the expected benefits of standards relate to improved market access. Standards are also a way to reduce production and distribution costs. They are 'preventive mechanisms of detecting the risk of food security early' (Interview P11) and they 'reduce costs associated with ... product recall and compensation for consumers' (Interview P6). The results are

comparable to other studies in the agri-food sector in which standards improve the ability of firms to maintain current customers and attract the new ones (Bai et al. 2007; Henson et al. 1999).

5.2. Vertical coordination

The analysis shows that 32% of the farms in the sample are owned by processing companies. Among the interviewed processing companies, the majority sources the unprocessed pangasius from own farms at a rate between 55% and 95% (Interviews P1-P3, P8 and P14). Processing companies responded that it was very important to organize primary production internally. Vertical integration enables ‘active control and planning of production’ while increasing the power vis-à-vis competitors (Interview P3). All of the interviewed processing companies emphasised that the main driver of integration is the need for stable supply of the unprocessed fish that conforms to strict food quality and safety requirements. It is important to ‘ensure adequate and timely material supply for the company’ (Interview P13) Companies are concerned that ‘when price increases, farmers may switch company’ (Interview P1). To the same degree, processors are aiming to decrease production costs or to achieve the most competitive price (Interviews P4 and P14). Some companies have emphasised their know-how over the farmers’ capabilities (Interview P2). The companies that partly rely on the spot market purchase stated that they would prefer sourcing the entire supply from their own production. One of the companies plans to ‘have 100% own input by next year’ (Interview P2).

Contributing to the concerns over supply can be the recent decrease in the number of pangasius farmers. Figure 1 illustrates that a huge drop in production and export volumes occurred in 2009. This period, immediately after the onset of the world financial crisis, was marked by a large decrease in farmgate prices⁷ and financial difficulties for farmers. It is estimated that around 70% of all pangasius farmers had negative returns in 2009 (Belton, Little, et al. 2011) and subject to location, 30 to 50% of households stopped farming pangasius since 2009 (Vina Seafood 2009a; Seaman 2011). The reduced number of farmers meant supply shortages, which have caused interruptions in processing activities of nearly two thirds of export and processing companies (Vietnamnews 2011). It is possible that in this case, a sudden drop in demand was coupled with the

⁷ In 2007, pangasius price was 0.92 USD/kg (Loc et al. 2010). For the first half of 2008, Khoi (2007) mentions the price of 14,320 VND/kg (approximately 0.86 USD/kg) and the interviewees from this study recall that the farm gate price decreased to 0.79 USD/kg in 2008 (Interview F5). The price decreased to around 0.75 USD/kg in August 2009 (Vina Seafood 2009b), which is the lowest value since the pangasius sector expansion. At that time, production costs were surpassing the farm gate price, so the majority of farmers were operating with losses.

inability of producers to supply the product of desired quality to other markets has led to severe instabilities in the sector.

A combination of standards and contracts, as another form of vertical coordination could be relied upon to secure sufficient amount of pangasius. However, they do not seem to be particularly relevant for the pangasius sector. Our sample shows that 31% of surveyed farmers sign market specification or resource providing contracts with processing companies. The market specification contracts dominate over the resource providing contracts, which are signed with only 17% of farmers from the sample. Processors do not support farmers financially. Only 4% of farmers reported receiving credit from the buyer in the past year. This goes against the evidence in many other countries, where processors are a significant source of credit to farmers (Swinnen 2005). Such a low prevalence of resource providing contracts in the pangasius sector corroborates the argument that the preferred processors' choice is to vertically integrate the on-farm production to avoid the excessive risk and costs from outsourcing.

The main purpose of contracts is, in the view of the interviewees, to assure stable supply and quality of the unprocessed fish. For one processor, contracts serve to 'avoid price risks' (Interview P9). Contracts specify, at minimum, fish quantity, payment mode, fish size, time of purchase and quality that is verified at the end of the production cycle (Interviews P1-P14, G1-G3, F1, F3 and E5). At the time of purchase, technicians employed by a processing company check the quality and safety of the unprocessed fish on farm (Interviews P1, P2, F3 and G4). Based on the inspection results the company decides whether to complete the purchase or not. The quality inspection consists of the size and flesh colour checks, while the safety inspection includes testing for the presence of antibiotic residues and fish diseases. If farmers are unable to meet quality and safety requirements, the processing company will not purchase from them, passing the consequent losses to farmers. Although some contracts specify the price, it is usually determined only after the inspection results. The quality inspections are costly for processors. In one estimate, they can amount to 10-15% of total production costs (Interview P3), which is one of the reasons for advocating a wider application of standards at the farm level. But at the same time, the need to circumvent high inspection costs can also induce vertical integration or contracting (Hennessy 1996).

Around 50% of farmers responded that they are motivated to contract in order to reduce price variation. This theme was also emphasized in the qualitative interviews. Contracts are also a way to obtain more credit and insurance for around 30% of farmers. Just around 15% of farmers strive to obtain higher price and income through contracts. Very few farmers use contracts primarily to fulfil buyers' requirements.

The practicality of contracts is not positively assessed. Around 17% of farmers believe that contracts have no effect. 'Contract terms are flexible and easy to change' (Interview F1). It appears that contracts can be broken without grave consequences for either party. Among the surveyed farms that have contracts with processing companies, 26% reported that the contract between them and their buyers has been broken in the past. Processing companies said that farmers would break the contract when they were offered higher price by traders or other companies. Farmers also tend to prolong the sale while waiting for the price to increase. An industry consultant said: 'When the price is low, and a factory works with contract farmers, it happens that farmers want to wait for a few days to sell, so factory has to stop working for a few days' (Interview S4). Processing companies are also reported to be neglecting their contract obligations. Belton et al. (2011) found that it is not uncommon for processing companies to extend the time between product inspection at the farm and product acceptance for even a month, which incurs huge feeding costs for farmers; or to coerce farmers into accepting lower prices and delayed payments. Depending on the size of the damage from contract violation, a contract breach does not always abrupt co-operation, but the co-operation can continue under new contract terms. Until the institutional solutions for contract enforcing are established to ensure supplies for processors or payments for input suppliers, the contracts in the pangasius sectors will not be a good solution for assuring the supply base.

That processors carefully select farmers for contracting as 20% of farmers responded that they could not obtain contracts with processing companies due to small size or the lack of experience with pangasius production. In addition, as a high share of farmers does not apply standards due to financial constraints, it appears that producers are able to be more cost-effective in setting-up certified production.

6. Conclusion

This paper has explored the interaction between food standards and vertical coordination in the Vietnamese pangasius sector. First, it has assessed the factors motivating farmers and processing companies to start applying standards. The results show that the motivation to adopt standards is closely linked to the perceived outcomes of the adoption, not only in terms of the benefits of applying standards, but also in terms of possible consequences of not applying. For farmers and processors alike, the adoption of standards is motivated by a desire to improve market access by ensuring quality supply. There is a high variation in the rate at which different farm types (in terms of ownership and size) apply standards, whereby the lack of finance and farmer capabilities constrain smaller household farms. The implications of standards for participation of producers in GVCs were a focus of several studies (Nadvi 2008; Gereffi et al. 2005; Fischer et al. 2009; Humphrey and Schmitz 2002; Ponte and Gibbon 2005). While their findings suggest that the introduction of standards in a GVC would increase the reliance on spot market transactions for sourcing, this study finds hierarchy as the outcome. Even though the application of standards is taking place at the farm level, it is not sufficient for mitigating the quality supply concerns that processors have. With the implementation of standards, the bargaining power of quality suppliers can increase substantially after the investment relative to the processor. In turn, the competition between processors can increase in terms of demand for high quality suppliers, thus leading to a higher degree of vertical coordination.

Second, contracts are routinely employed in many GVCs involving production in developing countries. They enable obtaining high product and process quality and implementing food safety standards and controls (Young and Hobbs 2002). Yet, this study finds that if the use of contracts is undermined by the weak enforcement mechanisms the preferred outcome for processors is to organise production internally.

Third, this paper illustrates that vertical integration is a preferred organisational structure at the pre-export segment of the Vietnamese pangasius value chain, as determined by the gap between processing capacity and supply. Primarily for reasons of assuring sufficient supply of high quality and safety products, processing companies have shifted away from spot market to vertical coordination including both full vertical integration and contracts with pangasius farmers. To this extent, this study supports the findings in other high-value sectors where vertically integrated farming on large-scale farms is preferred to smallholder contract farming (Maertens and Swinnen

2009; Gibbon 2003; Dolan and Humphrey 2004). Such a decisive influence of processing companies in the sector leads to assuming that in the future the industrial farming will increase its market advantage even more to the detriment of small household farms.

Findings from this analysis should be interpreted to represent the experience of different actors in the Vietnamese pangasius value chain that are more knowledgeable about standards and vertical coordination. The limited number of farmers who apply standards and the limited information about the processing companies has prevented a more thorough statistical analysis on the comparison of gains between different vertical coordination arrangements and standards. However, the results may offer significant insight about how standards and vertical coordination interact in one of the most intensive aquaculture sectors in developing countries. This information can assist policy makers and regulatory agencies in facilitating decisions that are aligned with farmers' socio-economic goals, beliefs and concerns about participation in high-value markets.

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