Upgrading small-holders in the Vietnamese Pangasius value chain

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Acronyms

AFA	An Giang Fisheries Association
AGIFISH	An Giang Fisheries Import and Export Joint Stock Company
AGSC	An Giang Seed Centre
ANVISH	Viet An Company
APFIC	Asia Pacific Fisheries Commission
APPU	AGIFISH Pure Pangasius Union
ASC	Aquaculture Stewardship Council
BMP	Better Management Practices
BOD	Biological Oxygen Demand
BRC	British Retail Consortium
COD	Chemical Oxygen Demand
DARD	Department of Agriculture and Rural Development
DoS	Department of Statistics
EU	European Union
FCR	Feed Conversion Ratio
GAA	Global Aquaculture Alliance
GMP	Good Management Practices
GVC	Global Value Chain
HACCP	Hazard Analysis and Critical Control Points
ISO	International Standards Organisation
MARD	Ministry of Agriculture and Rural Development
MSC	Marine Stewardship Council
NAVIQAVED	National Fisheries Quality Assurance and Veterinary Directorate
NGO	Non Government Organisation
SGS	Générale de Surveillance
SQF	Safe Quality Food
SSOP	Sanitation Standard Operating Procedure)
TAFISH	Thuan An Company
TSS	Total Suspended Solids
VASEP	Vietnam Association of Seafood Exporters & Producers
VND	Vietnamese Dong

Summary

Introduction

Vietnamese grown *Pangasianodon hypopthalmus* (pangasius or striped catfish) has emerged as one of the most successful globally traded aquaculture products. The diversification of international markets has led to the rapid growth of the industry in the Mekong Delta, which has in turn led to concerns over what remains largely unplanned, uncoordinated, and unregulated development. Internationally, the question of unplanned growth has also led to a series of claims that question the sustainability of the pangasius industry as a whole. Maintaining the position of pangasius in international markets, while also improving sustainable environmental performance of production, has become a clear challenge for the Vietnamese government and private sector alike.

Concerns have also been raised over the importance of maintaining the position of small holders in the global value chain because of their large number and relative importance in transferring benefits to rural communities in the most densely populated region of the country. Since 2008 the industry's growth has declined leaving small holders, with a total area of ponds less than 0.1 ha, vulnerable to a range of regulatory, economic and environmental changes. The impact to this group of farmers is clearly evident with a 37% decline in participation from 2006 to 2008. Although making up 89% majority in An Giang province, the farms with an area greater than 10 ha increased by 123% over the same period.

This study addresses how small-holders are able to maintain access and reduce their vulnerability in the global pangasius value-chain, while at the same time improving the environmental performance of production. The three action oriented research sub-objectives of the study are to:

1. Analyse the structure and function of pangasius value-chain identifying the distribution of value and the net share of vulnerable producers.
2. Identify and implement upgrading strategies that assist farmers to adapt to changing production conditions, reduce their socio-economic vulnerability and improve their environmental performance.
3. Identify what support key facilitators in the value chain can provide to family scale producers to enable them to reduce their vulnerability.

Approach

The global value chain (GVC) approach is used to understand the relationship between 'upstream' and 'downstream' actors and how incentives for improved production, or upgrading, are distributed. Upgrading is also used as an analytical tool to identify whether and how producers can increase the functions they perform, as well as negotiate the terms and conditions of incorporation (both vertical and horizontal contractualisation) in the global value chain. Conversely downgrading refers to a reduction in function and contractualisation. Outgrading refers to an exit from the GVC to alternative activities.

Within an participatory action oriented research framework the project assisted small-holders to develop upgrading (downgrading or outgrading) strategies to address the vulnerabilities of three target groups:

1. *Grow-out farmers* – This group initiated process and product upgrading aimed at: increasing collective productive area and output to a more commercially viable scale; coordinating supply and demand through improved contracts between farmers and processing companies; and finally compliance with environmental standards & food quality and safety standards.
2. *Nursing farmers* – This group initiated both downgrading and upgrading activities, including: the establishment of collective production to a more commercially viable scale; improvement of production practices through compliance with SQF1000 certification; and reduction of production risk through vertical contractualisation with An Giang Seed Centre.
3. *Household farmers* – This group was assisted to reduce livelihood vulnerability and improve environmental performance by outgrading and upgrading production practices to alternative species to pangasius, and increasing their competiveness by negotiating the terms and conditions of access to domestic chains.

Results

Grow-out farmers

Upgrading the process and contractualisation of family scale producers in the two target communes had mixed results. From 2008 to 2010 the farmers have experienced a 24% turnaround in ROI in the last two years, from -11% to 13%. This indicates the variability and 'boom crop' or 'boom cycle' expectations of farmers. Overall, however, we estimate family scale Pangasius farmers consequently made a cumulative net loss of US$1821 per ha over the course of the project.

The formation of a cooperative group was successful and increased the reputation of the farmers in the market place. The cooperative group was also successful in supporting a collective water management system in Hoa Lac commune. However, throughout there was a gradual decline in active membership. This decline is likely to continue without improved contract arrangements with processing companies.

Because SQF1000 does not reward farmers with market access or an explicit price premium for their fish, farmers are less unlikely to expend the effort in upgrading their production. However, the project was able to demonstrate improved production efficiencies of between 1 and 2%. These cost savings may be termed a 'learning dividend' given one of the most important factors appeared to be greater reflection by farmers on the process of recording production statistics.

Given pangasius ponds are not easily converted back to rice fields it is likely the majority of these farmers will remain in some form of aquaculture. This means that the industry will maintain a high latent capacity, with farmers returning to pangasius in 'boom times' and temporarily exit in periods of low demand. This remaining capacity unlikely to exit altogether and their contribution to the wider rural economy in the Delta means they attention will have to be given to their inclusion in the pangasius industry. If they cannot be included then alternative roles for exiting grow-out.

Nursing farmers

The upgrading activities for nursing farmers returned very mixed results. The difficulties experienced in forming the cooperative or satellite group was fraught with conflicting interests, leading to long delays before any further action could be taken. This stresses the dilemma many producers face in balancing higher efficiencies through collective action against maintaining their independence to capture upswings in market prices.

A two tiered model of incorporation – labeled here as a *satellite model* – can provide an alternative collective mode of action that allows for different expectations. Having a more stable individual leading the group and then poorer and/or risk averse farmers attached to this individual, allows for successful incorporation. The outcome may provide a model to allow smaller producers to maintain their position in the GVC.

The initial small number of farmers enrolled indicates the difficulty of finding suitable and willing farmers in one commune for nursing. The exit of the smallest of these farmers also indicates there is a critical size of approximately 0.5 ha for participation in nursing – a threshold already identified by the AGSC. The main constraint to these farmers is the size of land and considerable costs needed to purchase the extra land needed to build sedimentation ponds.

While nursing 40 day fry returns a modest income of only 5.2 million VND (US$327) per crop they earned nearly two times more that their grow-out farming counterparts over the course of the project. This indicates the lower overall risk associated with downgrading to nursing farming. However, lower risk is set against the potential of a 'boom cycle'. The growing realization of demand for certified fingerlings may well be a way of providing them the necessary confidence that a lower, but more steady return are favorable to the boom and bust cycles experienced in grow-out farming.

Exiting household farmers

Compared to the 2010 'boom' cycle for pangasius grow-out farmers the opportunity cost of not participating in the industry at that time is estimated at least 80.4 million VND (US$5023). However, the net profitability of the family scale pangasius farmer's average net loss of 17.2 million VND (US$1075). If we then apply the same rates of return to the household farmers, with ponds of 0.3 ha, this loss doubled to 34.4 million VND (US$2150). If the farmers are able to maintain the average incomes shown for frog, eel and snakehead, the all three species would have been more profitable from 18 million VND (US$1163) to a profit of 100 million VND (US$6263) per hectare per year.

Over the long term these smaller flows of income would benefit farmers if positioned within a wider portfolio of income sources. If the larger family scale farmers were to adopt these species, next to their already higher source of alternative income, they may well be better off overall. The question is whether family scale farmers would be willing to outgrade from the value chain, thereby incurring the opportunity cost of a 'boom cycle'. A further question is whether household families would remain 'outgraded' if they saw an opportunity to also capitalize on high demand swings in the pangasius industry. The latent capacity these farmers hold and the impact this capacity has on the cyclical nature of production, makes this balance an ongoing concern.

Environmental impacts of the alternative species remains unclear. The ongoing reliance on wild caught seed for eel is a major constraint to ongoing sustainability. Feed also remains a general concern that was only partially addressed in the project. The collection of golden snail does address directly mitigate the expansion of an exotic species in the Mekong Delta and reduces reliance on marine forage fish which brings an important benefit. If such practices prove too successful they could quite ironically lead to reduced stocks of the snail (which is perhaps already apparent), and the need for 'sustainable harvesting'.

Recommendations

- Despite the challenges observed in this study, the scale of farming alone does not appear to pose a barrier for entry into the industry. Horizontal contractualisation of small producers into cooperative groups remains an option for upgrading family scale producers. To be successful government intervention is needed to create and enforce contracts and agreements between groups and processing companies.
- An alternative representative body to AFA, with the specific aim of representing family scale producers and cooperative groups in contract negotiations, would create greater leverage for improved terms and conditions. For this both private sector and political support for including family scale producers is required.
- To address high interest repayments faced by family scale farmers, pressure from European importers is required to ensure contracted payment schedules are adhered to.
- Current initiatives of the government to promote quality standards should be careful not to isolate themselves from market demand – such as currently the case with the government BMP and SQF 1000 standards.
- The small holder programmes of GlobalGAP and ASC should take into consideration both explicit and implicit (efficiency based) premiums both need to promoted in partnership with both exporters and importers.
- Policy recognition needs to be given to the latent capacity family scale producers who have exited production hold for the industry. Programmes are needed to direct and support family and household scale farmers to find profitable alternative uses, such as the aquatic species trialed in this study, for their aquaculture ponds.
- Collective forms of water management as shown in this project show potential for Pangasius as well as other aquaculture systems. Supporting cooperative groups to develop the necessary skills required to develop these management systems should be supported at the provincial level.

1 Introduction

1.1 Problem statement

Pangasianodon hypopthalmus (pangasius) has emerged as one of the most successful aquaculture fish in the world, having more than increased Vietnam's profile in global fish and seafood markets. The fish is grown in the predominantly freshwater provinces of the Mekong Delta of An Giang, Dong Thap, Can Tho and Vinh Long. Pangasius production has grown at an average of 24.9% per year since 2003, compared to 19.5% for Vietnamese economy as a whole. In 2009 the industry produced 1.2 million tonnes of fish, worth an estimated US$ 1.5 billion (GLOBEFISH 2009a). Approximately 90% of this production is sold to export markets as fillets.

The pangasius industry has been labeled as a 'Cinderella story' (Dung 2007) as it emerged as the fastest growing aquaculture sector in the world. However, much of the growth has emerged out of responses to crisis. The main driver has been the diversification of international consumer markets following a US anti-dumping case lodged by the Catfish Growers Association of America in 2003. The case led to import tariffs of between 36 and 64% on farmers in a market that, at the time, accounted for approximately 75% of all pangasius exports (Brambilla et al. 2007). As a result, many farmers in Vietnam went bankrupt. In response processing companies began diversifying their markets to the EU, Canada and Australia. Further diversification to more than 50 countries by 2009 has led to the enormous growth of the industry in Vietnam.

The rapid growth of the pangasius industry has meant production remains largely unplanned, uncoordinated, and unregulated. To improve planning and efficiency the government had set a production target of 600,000 tones by the year of 2010. However, the production in the same year already reached approximately 1 million tonnes. In July 2008 the Ministry of Agriculture and Rural Development (MARD) estimated that production will reach 1.5 million tonnes by 2010 and 2 million tonnes by 2020 (World Bank 2006). Pangasius is an important part of the government's five-year plan to 2010 to develop an export-led economy, and there has been concern within Vietnam as to whether and how the industry can maintain its growth. Internationally, the question of unplanned growth has also led to a series of claims over the sustainability of pangasius farming and, as such, the industry as a whole (Mansfield 2003; Bush and Duijf 2009). Maintaining the position of the industry in international markets, while also improving sustainable environmental performance of production, has become a clear challenge.

The vulnerability of small holders to regulatory, economic and environmental changes is evident by their recent exodus from production (see Figure 1 and Figure 2). The Department of Agriculture and Rural Development (DARD and DoS 2008) reports the number of pangasius farms in An Giang increased 10% from 4969 to 5459 ponds between 2006 and 2008. However, the number of 'family scale' farms, with a total area of ponds less than 0.1 ha, decreased 37%, as did their prevalence, decreasing from 59% of all ponds in 2006 to 34% in 2008. There was also high fluctuation in the number of ponds less than 0.5 ha, with a 47% increase in this category between 2006 and 2007, followed by a net decline of 29% between 2007 and 2008. Despite the fluctuation, the total number of smaller producers remained relatively stable with a net 4% increase since 2006, emphasizing the continued interest of rural households to enter the industry. Smaller farmers continue to make up an 89% majority in An

Giang province. However, the relative increase in large-scale farms (greater than 10 ha) of 123% between 2006 and 2007 indicates a larger shift in the pangasius industry.

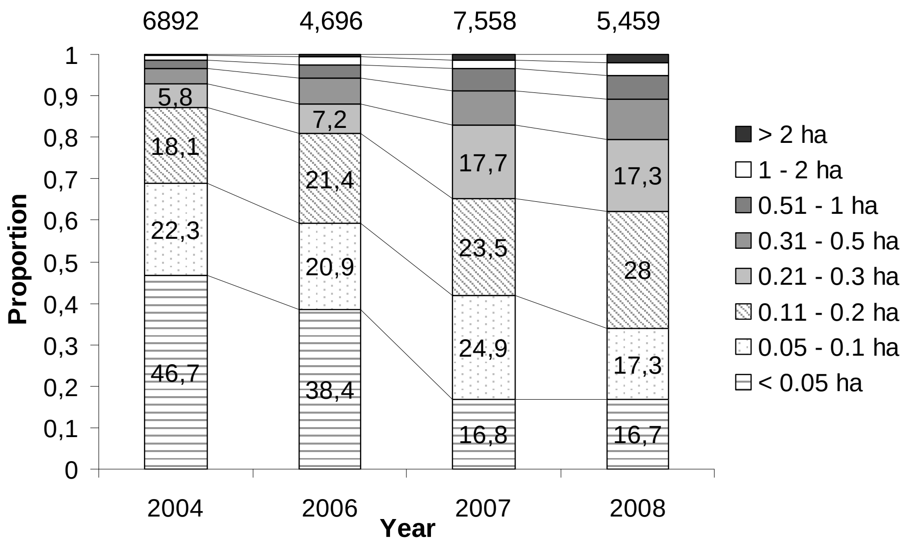


Figure 1. Industry composition of farms by size class in An Giang Province, 2006-2008
Based on data from DARD and DoS (2008)

Figure 2. Success and failure rate of Pangasius producers 2007-2009

Based on data from Sinh and Hien (2008), Ngo (2008) and government estimates made at the Pangasius Aquaculture Dialogue July 2009, Can Tho University

The shift towards larger farms is also evident in the provisioning practices of processing companies. As competition has increased product quality and safety have become imperative. Four of the largest processing companies report they receive approximately 80% of their fresh fish from producers with pond area larger than 0.5 ha. From the perspective of these companies, the large producers are lower risk than smaller producers in terms of food safety requirements, as well as more consistently producing higher value 'white' meat. To reduce their exposure to low quality products many of the processing companies are innovating by developing their own associations of preferred suppliers.

In 2009 the industry faced continuing uncertainty in international markets as food scares around pangasius in Europe, Russia and Egypt led to periodic declines in demand. There is also speculation that the industry has now past its peak. In An Giang province the production area decreased 9% in 2009 and production decreased by 10% (An Giang People's Committee 2009). It is difficult to attribute any change in general wealth levels of the province but the provincial government indicated that while poverty decreased from 7.8 to 7%, malnutrition in children below the age of 5 increased from 18 to 19.4%. Again, it is unlikely this is attributable to any changes in the pangasius industry over the same period, but does give a general impression of growing social inequality.

Considerable speculation remains over what the exact environmental and social impacts of pangasius are in the Mekong Delta. The main concerns, expressed widely in the media, are relate to negative environmental impacts on water quality and forage fish used in homemade feed mix, as well as food safety issues related to chemical and drug residues in the meat (Bush et al. 2009). Despite the growing number of claims, there is relatively little evidence to show that production is leading to major problems in water quality (Bosma et al. 2009). Nevertheless, a range of other environmental issues related to drug, chemical, feed and land-use continue to be debated. Drug and chemical use has been shown to be largely unregulated and in many cases misused within Vietnam (Sarter et al. 2007), despite any serious contamination being picked up in markets such as the EU (Bush and Duijf 2009). Particular concern has also been expressed about the impact the industry has had on coastal fisheries, also important as a source of protein for people throughout the Mekong Delta (Sinh 2007), and globally with fish meal transported from Peru (Bosma et al. 2009). The point of departure for our study is not how true these claims are, but rather to better understand the new forms of regulation they engender, and how these forms of regulation impact the production practices and market access of producers.

A combination of state and private regulation has emerged which have extended quality standards away from the factory and onto the farm. This shift from 'factory to farm' has been based largely on environmental and social 'credence' issues (Reardon and Vosti 1995), that exposed a series of challenges for both regulatory bodies and farmers alike. The Vietnamese government has developed Best Management Practices (BMP) and Good Aquaculture Practice (GAqP) standards which form the basis of HACCP based farm management systems such as SQF and GlobalGAP. International third party certification standards, GlobalGAP, GAA, Anova Trace Panga and the WWF Pangasius Aquaculture Dialogue have developed additional environmental and social standards. Organic certification has also been developed through Naturland certification but represents approximately 0.001% of total production (Bush et al. 2009). However, very few farms across any of these systems have been certified to date – perhaps with the exception of ANOVA's Trace Panga, which create essentially closed chains of custody with very large farms, including those owned by processing companies and feed mills.

The global nature of pangasius has led to increased risk and regulation through quality standards, and consequently, rapid change and uncertainty for the majority of farmers. As this report goes on to demonstrate, it is wrong to characterize pangasius farmers as poor when profit margins range from $16000 to $45000 per crop (Phuong et al. 2007; Loc et al. 2010).

Nevertheless, the exodus of family scale farms from the industry, has exposed the high vulnerability of small holders who do not have the social capital to maintain favour with processing companies during market downturns (see Belton and Little Forthcoming; Bush and Belton Forthcoming), and/or the capacity to negotiate better contract conditions. In order for these farmers to overcome the series of vulnerabilities they face, they will have to develop coping or adaptive strategies to either maintain or upgrade their position in the global value chain. Alternatively, those farmers that are unable to maintain their position will be forced to either downgrade or exit production altogether.

There is also a low capacity of the government to deal with changes in global market market-based regulation. The Vietnamese government has faced considerable challenges in dealing with the changes in international value chains. National departments and associations, as well as international support have all turned to facilitating improved performance of the industry. The government is keen maintain growth. However, they also explicitly recognize the importance of maintaining the position of small holders because of their large number, and relative importance in transferring benefits from a globally integrated production system to the rural communities in the most densely populated region of the country. The ability of national organizations to support farmers to adapt to changing market conditions is therefore considered a clear challenge for providing the conditions under which sustainable growth can continue.

Against this backdrop, this report presents the results of an action research study investigating the potential of upgrading strategies to reduce the vulnerability of family scale pangasius farmers to perturbations in global value chains. The main results of the study revolve around a set of key assumptions; 1. the poor bargaining power of the pangasius producers with buyers; 2. their limited access to capital for investing in improved management practices; 3. the absence of contractualisation of family scale producers leading to poor market coordination, and; 4. periodic oversupply with low unit prices and variable income. Based on these assumptions various upgrading strategies were designed in negotiation with the producers and processing companies. This report focuses on those that were ultimately implemented: improving their capacity for collective bargaining power, improved contractualisation with processing companies to ensure more stable provisioning, and improving their capacity to meet the requirements of production quality standards.

1.2 Research Questions

The central aim of the project was to assist marginalized vulnerable farmers in the pangasius value chain to respond to the existing and future challenges of maintaining access and reducing their vulnerability in domestic and global markets, while at the same time improving the environmental performance of production. Based on this three action research oriented sub-objectives were identified:

4. Analyse the structure and function of pangasius value-chain identifying the distribution of value and the net share of vulnerable producers.
5. Identify and implement upgrading strategies that assist farmers to adapt to changing production conditions, reduce their socio-economic vulnerability and improve their environmental performance.

6. Identify what support key facilitators in the value chain can provide to family scale producers to enable them to reduce their vulnerability.

How the external pressure of global markets impacts and enables producers to improve their livelihood requires a clearer understanding of the capacity of farmers to respond and adapt to both gradual and abrupt fluctuations of price and market access. Building knowledge about these capabilities is an important first step to identifying what support can be provided to strengthen both their *ex-ante* strategies for gradual market risk and *ex post* coping mechanisms for catastrophic events such as the anti-dumping case. More importantly, this knowledge also assists in determining the willingness of pangasius farmers and a wider group of dependent actors to strengthen or improve their position in global value chains through various diversified, specialized or collective production strategies.

The specific detail of the communes where the project was implemented is introduced in chapters 5, 6 and 7. For a general orientation the location of these study areas are given in Figure 3.

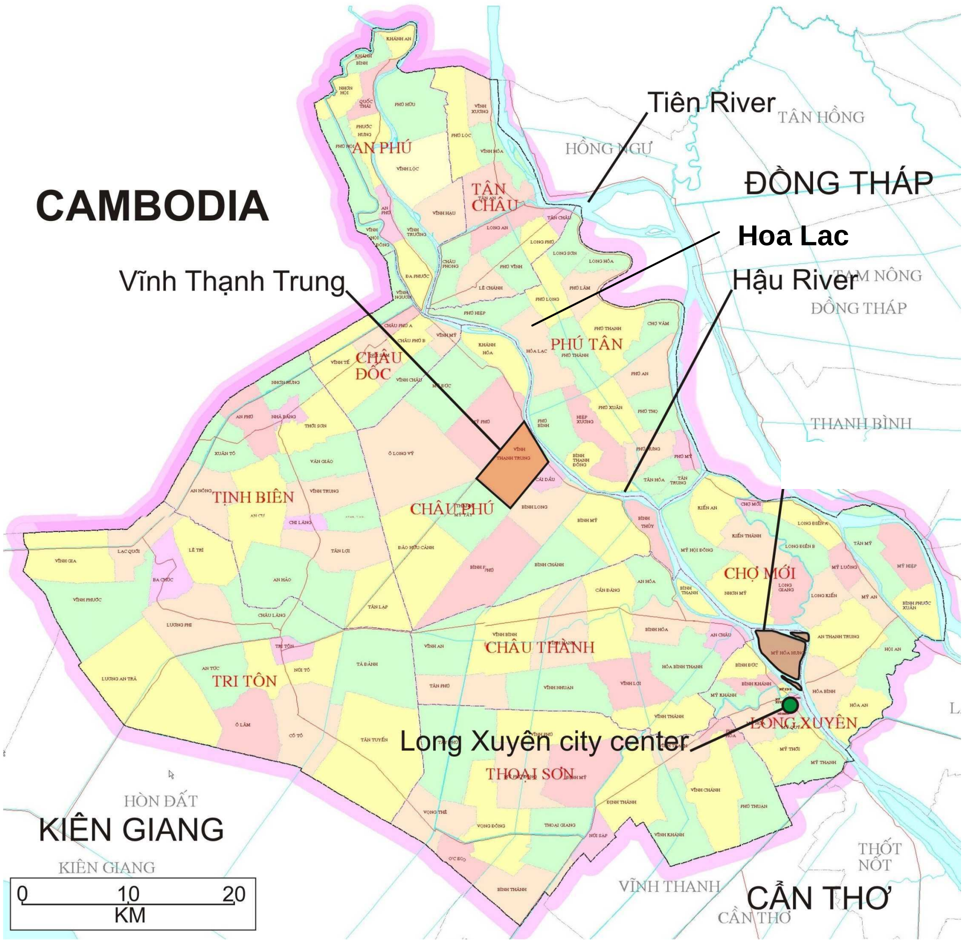


Figure 3. Location of two main study communes in An Giang Province.
Source: Schut (2009)

1.3 Upgrading in global value chains

1.3.1 Global value chains

Global value chain (GVC) analysis is a means of understanding the integration of firms and farms in globalised markets (Gereffi 1994). A key objective of GVC analysis has been to identify how these firms and farms, especially in developing countries, can upgrade their position in these markets (Humphrey and Schmitz 2002). To achieve this aim the approach describes the location of actors within a broadly defined set of vertical and horizontal political, social and economic relations (Fine et al. 1996; Leslie and Reimer 1999). More specifically GVC analysis provides a better understanding of the what enables or constrains participation of producers in these markets, the power and control of 'upstream' over 'downstream' chain actors, the incentive structures and the distribution of value as commodities move from between globally linked sites of production and consumption.

A strength of the GVC approach is its focus on the strategies of actors to 'upgrade' their position in global, regional or local markets. This strategic focus draws attention to the embeddedness of value chain actors within their social, political and economic milieu (Granovetter 1985). Identifying how upgrading strategies can succeed or fail in improving the conditions of production and trade, are therefore intimately tied to the wider context within producers operate. At a local (or national) level such conditions may include credit relations, resource access, and patronage networks, or more structural issues such as public subsidies, spatial planning and environmental policy.

The GVC approach also draws our attention to the role of global forces or drivers that play a role in determining product characteristics and increasingly also production process characteristics. The gradual 'quality turn' in global value chain governance is representative of attempts to govern concerns over product and process. In the trade of fresh produce, quality has been closely tied to safety issues. Fish products have been a particular focus of these food quality and safety systems – the best known of which are HACCP based management systems. The certification and labelling systems that enforce these systems are now increasingly being converted to govern 'credence' issues such as sustainability and fair trade (Reardon et al. 2001). Within fisheries alone there are more than 50 such sets of standards, covering a range of credence issues related to organic, fair and sustainable production (e.g. Corsin et al. 2007; Ponte 2008b). A new line of questions has now turned to what impact these standards might have over small-holders in global value chains.

Quality standards have the potential to both include and exclude small-holders from global value chains. In the context of transitional economies, such as Vietnam, the role of these standards to determine access to global markets has a significant impact on rural development. Understanding the nature and extent of these impacts requires close attention to how standards are developed (e.g. Henson and Reardon 2005; Belton et al. 2009), what decisions are made to comply (e.g. Taylor 2005; Ponte 2008b; Hatanaka Forthcoming), and what enforcement structures are in place within communities, the state and private sector auditing (e.g. Mutersbaugh 2005; Ponte and Gibbon 2005; Vandergeest 2007). As Bolwig et al (2010)argue, while growing attention has been given to standard development and enforcement, less has been given to the decisions made by producers to enter into and comply with a standard certification process. Moreover, little attention has been given to changes or barriers in trade relations within value chains in developing countries, the implications of certification for rural livelihoods, and the specific improvements (especially those related to environment) brought by quality standards.

The inclusion of small holders in GVCs therefore requires addressing their social and economic embeddedness in a given production context. Governance mechanisms such as quality standards that seek to define not only what is produced, but also how it is produced "covering production process, including technology, quality systems, and labour and environmental standards" (Humphrey and Schmitz 2002). However, if we reconsider Gereffi's (1994) description of GVC governance as "authority and power relationships that determine how financial, material, and human resources are allocated and flow within a chain" (p. 97), then a broader understanding of 'process' is required, which extends simplistic technocratic understandings of compliance and enforcement. Gerrefi et al identify five modalities of GVC governance depending on the position of actors, the structure of chains and the 'legibility' of their interrelations (see Box 1). At one extreme is market governance where information complexity and the cost of switching buyers and suppliers is low. At the other extreme, a hierarchical governance relates to vertical integration where there is high informational complexity and low capabilities amongst suppliers. There is a shift within these different modes of governance with respect to the position of small producers. Maintaining the independence of small holders in GVCs has proven difficult given: 1. the constraints they face in accessing and processing information; 2. developing adequate production and managerial capacity; 3. accessing finance; and 4. improving their bargaining power considering their poor economy of scale. Improving the position of small holders and thereby reducing their vulnerability to market perturbations, therefore requires a better understanding of what governance modes best assists producers to maintain their livelihoods.

Box 1. Typology of GVC governance modes

1. *Market* - spot or repeated market-type inter-firm links characterized by low informational complexity, ease of codification of information, and high supplier capabilities; both parties' costs of switching to new partners are low.
2. *Modular* - inter-firm links involving somewhat more specialized suppliers who finance part of production on the part of the customer, but whose technology is sufficiently generic to allow its use by a broad customer base; characterized by high informational complexity, ease of codification and high supplier capabilities.
3. *Relational* - inter-firm links involving multiple inter-dependencies, often underwritten by close social ties; characterized by high informational complexity, low ability to codify information and high supplier capabilities.
4. *Captive* - inter-firm linkages involving one-way dependency of suppliers, high levels of supplier monitoring and high costs of switching for suppliers; characterized by high informational complexity and ease of codification, but low supplier capabilities.
5. *Hierarchy* - classical vertical integration; characterized by high informational complexity, difficulty of codification and low capabilities amongst independent suppliers.

Source: Gereffi et al (2005)

1.3.2 Vulnerability and global value chains

The exposure of small holders to international markets through global value chains has in many instances increased their earning power, as well as their exposure to what for many are new forms of economic risk. In many value chains small holders are considered those that are powerless to avoid exploitation. Marginal groups in global value chains are therefore often considered those that are systematically disadvantaged within increasingly globalized relations of production (Nadvi 2004). These groups may well be 'poor' in either or both national or international 'a-dollar-a-day' quantitative terms. However, more importantly they are those that are restricted within their wider political, social and economic factors and relations of production to develop the necessary capabilities to improve their livelihood (Bebbington 1999). Following this logic, those technically labeled as 'poor' are not the only vulnerable group in the context of GVCs.

In this study we consider the vulnerability of producers as a powerful analytical concept in understanding the marginalization of value chain actors. Vulnerability provides a more considered appraisal of the contextual factors that determine the capability of producers to upgrade their position in value chains (Nadvi 2004). Taking our lead from Bolwig et al (2010) we use the concept of vulnerability to: 1. identify the dynamics, patterns, arrangements and processes that may lead to durable inequality and marginality; 2. understand the sensitivity of livelihood systems to external shocks and the factors that reinforce their resilience; and finally, 3. analyse the degree of leverage producers have to access and control resources in GVCs, change the terms of market access, and respond to governance arrangements such as quality standards.

Using these lines of analysis the vulnerability of value chain actors, and small holders in particular, is framed in terms of inclusion and exclusion. However, drawing on Ponte's (2008a) review of the 'adverse incorporation' literature, we argue vulnerability in GVCs "is not necessarily shaped by 'exclusion', but rather by the terms and conditions of incorporation" (p.4). Instead of focusing on the internal and external dimensions of chronic poverty Ponte goes on to argue a case for incorporating the vertical dimensions of GVCs. In doing so he draws attention to the specific elements of exclusion or adverse incorporation of groups or individuals in value chains. This approach not only focuses on structural exclusion, but also "*voluntary non-participation* and/or *partial inclusion*" (p.6, emphasis in original). Addressing the vulnerability of chain actors in these terms allows for an agency based approach to understanding, not only the wider causes of inclusion and exclusion in value chains, but also the decision making 'pathways' that farmers make faced with the risk and uncertainties associated with access to global markets.

1.3.3 Upgrading strategies

Upgrading refers to strategic change of products or the production process which enhances rewards and/or reduces exposure to risks for a chain actor (Gibbon 2008; Bolwig et al. 2010). Upgrading can occur by shifting to more functional positions in the chain or producing products that have more value added to them. As such, upgrading can occur either by increasing the number and type of functions in a value chain, or the level and type (Bolwig et al. 2010). Conversely, if risk and vulnerability is reduced, a chain actor may also choose to 'downgrade' or 'outgrade' in a value chain. Simply put, downgrading is the opposite of upgrading; corresponding to a reduction in functions and contractualisation. Outgrading refers to the exit, either strategic or forced, from a value chain or a 'strand' within a value chain.

Humphrey and Schmitz (2002) developed a typology of upgrading to explain the specific ways in which products, functions and contractualisation may change (see Figure 4). *Process* upgrading refers to transforming inputs and outputs more efficiently by reorganizing the production system or introducing superior technology. *Product* upgrading refers to moving into more sophisticated product lines with a higher unit value. *Functional* upgrading refers to acquiring or abandoning (new) functions to increase overall skill content of activities. Finally, *inter-sectoral* (or *inter-chain*) upgrading refers to using knowledge and skills acquired in one part of the chain to another part of the chain, or a new chain altogether. Bolwig et al (2010) add a fifth category of '*other forms*' of upgrading to incorporate less conspicuous improvements that may in fact be the most common forms of upgrading among small producers. In many cases this fifth category may be related to a combination of the first four categories.

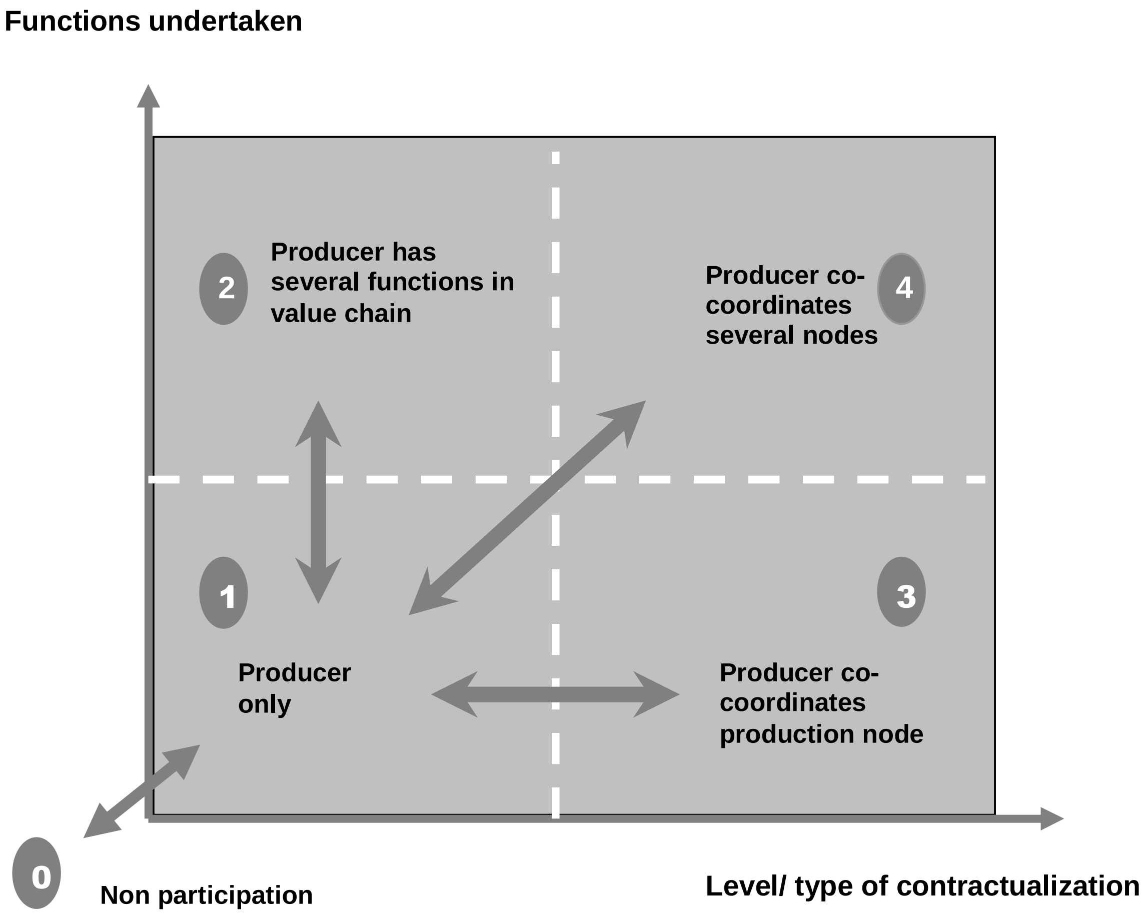


Figure 4. Upgrading strategies – how small producers can increase rewards or reduce risks from participation in value chains

In identifying these categories of upgrading strategies, Humphrey and Schmitz make a distinction between value chain and cluster approaches. The clusters model of upgrading emphasizes incremental upgrading through locally derived innovation and dissemination by actors through local informational networks. Alternatively, the value chain approach focuses on incremental upgrading through the allocation of tasks by the chain's lead firm allowing for succession into more complex chains. In the context of small holder producers in developing countries a strict division seems implausible. Small holders often exist within complex and incomplete informational settings, where a degree of local innovation is continually influenced with lead firm innovation. When change is instituted through new governance mechanisms, such as quality standards, the complexity of this interaction increases. Compliance of small holders is then only made possible through the interface between local innovation and externally defined requirements.

This study focuses on the notion of upgrading both practically and analytically. First, given the action orientated approach of the project (explained below), upgrading was applied normatively to identify practical methods of reducing the vulnerability of marginal smallholders in the pangasius chain. Second, the concept of upgrading was used analytically to identify the trade-offs between innovation and obedience in complying with the terms and conditions of incorporation in GVCs. This includes analysing the function and form of technical and contractual changes, as well as what Gibbon (2008) refers to as the 'structures of rewards' available to suppliers within a chain and the 'concrete roles' of upstream actors releasing these rewards to downstream actors.

1.4 Action research and adaptive cycles

An action research framework was adopted for the study aiming to investigate the complex and diffuse social, cultural and economic influences surrounding pangasius production in Vietnam. Action research is defined as a combination of critical inquiry, with a focus on social practice, and a deliberate process of reflective learning (German and Stroud 2007). The aim of an action oriented approach is to explicitly bridge research, policy and practice, and facilitate a learning process for the subjects of the research (Nutley et al. 2003). As German and Stroud (2007) argue, through such a framework "deeper lessons can be gained through more interactive forms of research grounded in actual experiential learning and change processes" (p.794).

Action research therefore transcends participatory action learning models, which are more focused on local processes of social change, by taking into consideration wider processes and conditions of social change. Such research is therefore well placed to evaluate the outcomes of upgrading in GVCs, which focuses on both technical aspects of production as well as the terms and conditions of incorporation (or voluntary non incorporation) and reward structures. As Bolwig et al (2010) outlines, action research should facilitate dialogue and mutual accountability between those participating within the value chain, with researchers facilitating the negotiation of common interests, to identify interventions of common benefit. They also note that chain actors can be empowered through such ongoing accountability of action oriented outcomes and research findings.

While action oriented research is practiced in Vietnam in rural extension, there is less experience in more reflexive modes of research with a high degree of coordination. This meant that the research team also went through a process of learning. In addition to positioning themselves as objective researchers, the team was also responsible for coordinating the implementation of support activities, to develop the necessary skills for improving market access and responding to the challenges of complying with emerging quality standards. In doing so the research team invested considerable time into building strategic partnerships between different actors within the value chain, including fishing and farming communities in Vietnam, the An Giang Fishery Association, processing companies, auditors and relevant provincial and national government departments.

Based on the guidelines for action orientated research outlined by Riisgaard et al. (2007), the research adopted a seven step 'adaptive cycle': 1. Diagnosis of the value chain; 2. Livelihood analysis; 3. Participatory identification of chain actors; 4. Identify and enroll target groups; 5. Implementation of strategies; 6. Monitoring and evaluation; and 7. Reporting and dissemination (see Figure 5). The first half of the analysis identifies which actors could be supported to upgrade their strategies, where they exist, how they are related to pangasius production and which steps are required to meet their goals. The second half of the research then focuses on the facilitation and monitoring of upgrading activities as well as negotiations over both vertical and horizontal contractualisation.

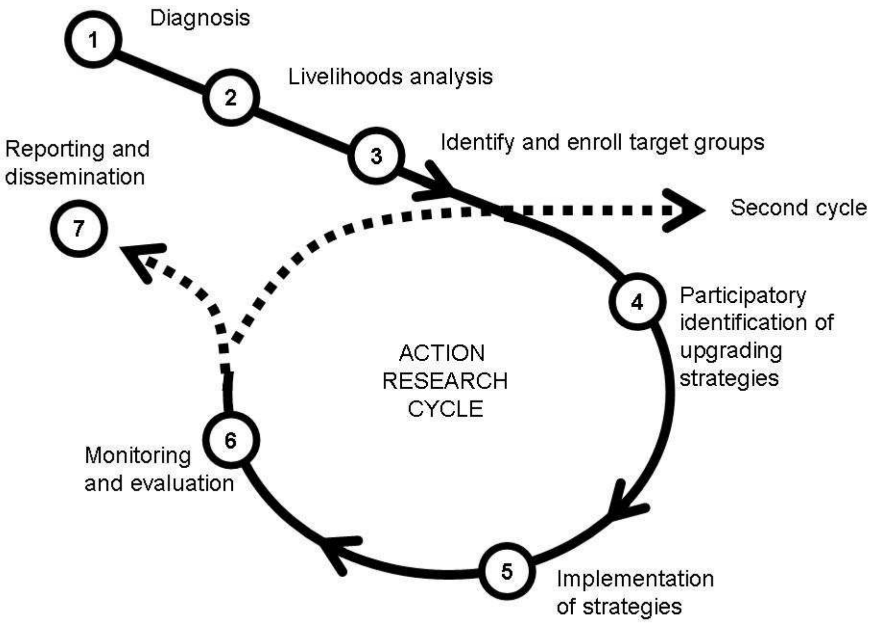


Figure 5. Action research cycle.
Adapted from Riisgaard et al. (2007)

1.5 Outline of report

This report is organized into eight sections. Chapter two provides an outline of the background to the pangasius industry, focusing on the key vulnerabilities faced by the industry. Particular attention is given to the influence of international markets and actors in the pangasius GVC on local production in Vietnam.

Chapter 3 then presents the results of the value chain analysis conducted as part of the diagnosis phase of the research. The analysis focuses on the net share of different size classes of producers along the domestic and export strands of the value chain. Attention is given to determining the key functions of chain actors in different market channels and what proportion of total market value they receive.

Chapter four presents a series of quantitative and qualitative indicators used by the research team to assess the success of horizontal and vertical contractualisation, process upgrading and what impacts these have to farmer livelihoods.

Chapter five, six and seven present the findings of the three upgrading strategies supported in the project. Chapter five focuses on the results of the process upgrading by family scale grow-out farmers. Chapter six presents the findings of the nursing farmers and chapter 7 the results of the outgraded household farmers.

Finally Chapter eight then provides a discussion of the results and draws conclusions.

2 Vulnerabilities within the Pangasius industry

The rapid growth of the pangasius industry has raised a series of concerns over the long term sustainability of production, as well as the position of small holder producers in global value chains. The vulnerabilities that have emerged from this growth are widely debated in international media and through the development of quality standards. However, there is relatively little strong empirical evidence to support many of the claims made. This section reviews current and potential social, economic and environmental risks from global markets and local production practices and how these risks are likely to be translated into vulnerabilities for smaller producers.

2.1 Global market vulnerabilities

2.1.1 Market diversification

Political economic decisions made in distant international markets have highlighted the vulnerability of pangasius farmers in Vietnam. The 2003 U.S. anti-dumping case was based on a stance taken by the Southern catfish farmers against the cheap import of Pangasius after the normalisation of trade relations with Vietnam in the same year. As a result tariffs were placed on the import of Vietnamese Pangasius equivalent to the dumping rates. Shortly after imports of pangasius to the US fell by around 50% - an estimated loss of US$24 million (Tung et al. 2004). The impact on farmers from the loss of market share was an estimated between 17-63% (depending on the size of investment), representing a 3-10% income (Brambilla et al. 2007).

In response the government and industry collaborated to offset these losses through an active programme for promoting domestic consumption of pangasius (Tung et al. 2004). A series of subsidies were also offered by large processing companies in the Mekong Delta to secure future supply by stopping farmers from existing production. The shock of the case, exposing the vulnerabilities of the industry as a whole, led to considerable restructuring of contracts and investment. Under current practice, processors and exporters have reduced their exposure to price fluctuation by transferring these onto fish farmers.

2.1.2 Developments in export markets

The pangasius industry in the Vietnam Mekong Delta continues to rapidly evolve, increasing the vulnerability of farmers to market fluctuation, highly variable costs, low prices through poor coordination of supply, and events of protectionism in international markets. Production has been increased ten folds in the last six years, from a level of 100 thousand tons in 2002 to more than 1 million tonnes by 2007 (Dung 2008). In 2008, despite the global economic downturn, Vietnam exported around 641 thousand tons of processed fillets with a total value of US$ 1.45 billion, 65% higher than that of 2007 and more than double the volume of 2006. However, according to government estimates the export volume was expected to be 20-25% lower in 2009. In 2009, despite a 20 to 25% decline in production in 2009 production was estimated to have grown to between 1.3 million tonnes and 1.5 million tonnes with an export value of US$ 1.5 billion (GLOBEFISH 2009a).

The growth of the industry since the 2003 US anti dumping case can be largely attributed to the successful diversification of export markets, especially in the European Union, which in 2008 collectively made up approximately 38% of total market share (Figure 6) (Dung 2008).

However, other markets in Africa, the Middle East South America have increased their share having grown significantly from 2% in 2007 to 28% of total exports in 2008 (GLOBEFISH 2009b). The growth of Russia and Ukraine have also fueled growth, but also proven high risk. In 2008 and 2009 Russia banned the import of pangasius owing to safety concerns despite no evidence being publically released. Similar scares have also been witnessed in Egypt and the EU.

The diversification of international markets has changed regulation within the pangasius industry in two ways. First, quality grades have been established within the industry to define high and low value fish. These grades are defined by the colour and consistency of the meat of the fish: Grade 1 fish have white meat and is sold to the EU and US, Grade 2 off-white meat and sold to the emerging markets like Russia, and Grade 3 yellow meat sold domestically or regionally in Asia (Khoi et al. 2008). This grading not only affects farm gate negotiations over the price of the fish sold by producers, but also influences the procurement strategies of export companies as a whole. The fact that the EU remains the major market for pangasius and, despite the various claims made about pangasius, will continue to provide the necessary leverage over those farms aiming to produce high quality 'grade 1' fish. However, the ongoing diversification of the pangasius industry to markets requiring lower quality 'grade 2' or '3' fish means that the access of smaller farmers to export markets, who are most associated with poorer quality fish, may well be maintained.

The second impact of diversification is the increased role of international quality standards. Gaining access to the EU has brought with it added regulation in what has emerged as one of the most risk adverse markets in the world. A gradual move towards certification is indicative of this shift, with both EU and private certification schemes now expanding to third countries such as Vietnam. This has brought with it new standards of safety and quality with which processors and, increasingly, producers must comply in order to maintain market access. The EU continues to be a stable market for Vietnam pangasius, however at the end of 2008 and the start of 2009 domestic politics in Italy, Spain and France led to claims about the perceived poor safety and quality of the fish (Bush and Duijf 2009). In the most extreme cases the fish was withdrawn from the shelves of supermarkets and school canteens despite little evidence to support claims. Given Spain is the largest single importer of pangasius in the EU the Vietnamese government took diplomatic action to reassure EU governments of their safety and quality concerns over the fish.

As Bush and Belton (Forthcoming) point out, much of the success of pangasius has been its ability to compete on price in most if not all international markets it has entered. In the more lucrative European markets it has continually been able to outcompete many of the traditional white fish species such as Sole, Haddock and Cod. However, objections have increasingly been raised over the fairness of competition given that the import price of the fish to the EU has continued to decline while domestic species such as Sole have remained steady (see Figure 7). The Vietnamese government has recognized that the decline in price has come about not because of falling production costs, but rather because of high competition between exporting processing companies in Vietnam vying for greater market share. To try and reduce the impact of this competition the central government called a meeting of processing companies and provincial officials in 2008 to establish a minimum export price. Although not successful, the event illustrates rising government concern over maintaining the export led economy.

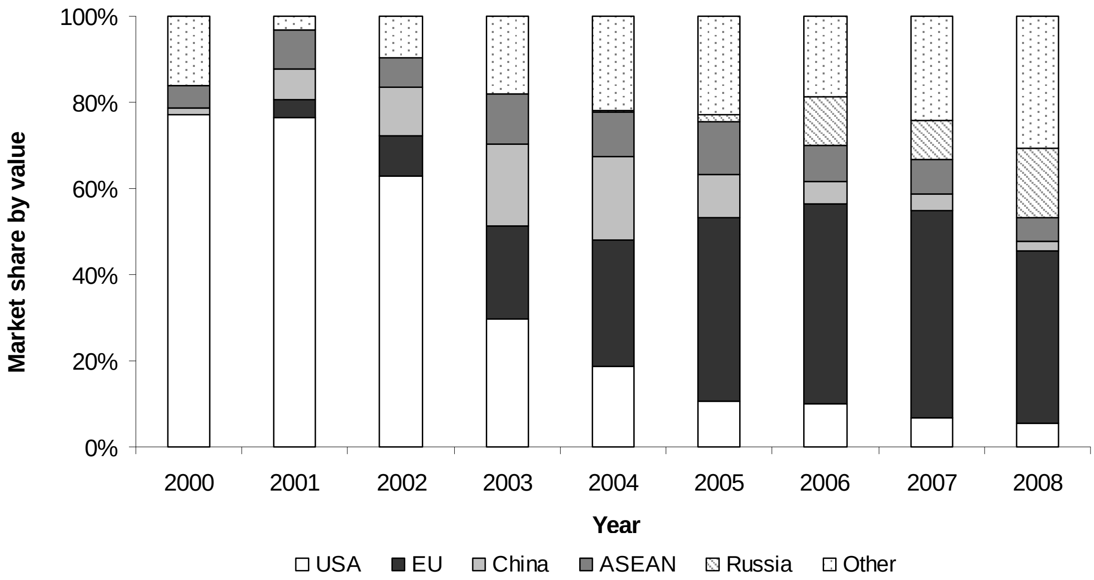


Figure 6. International market share for Pangasius

Source: Hau (2008), Dung (2008) and GLOBEFISH (2009a)

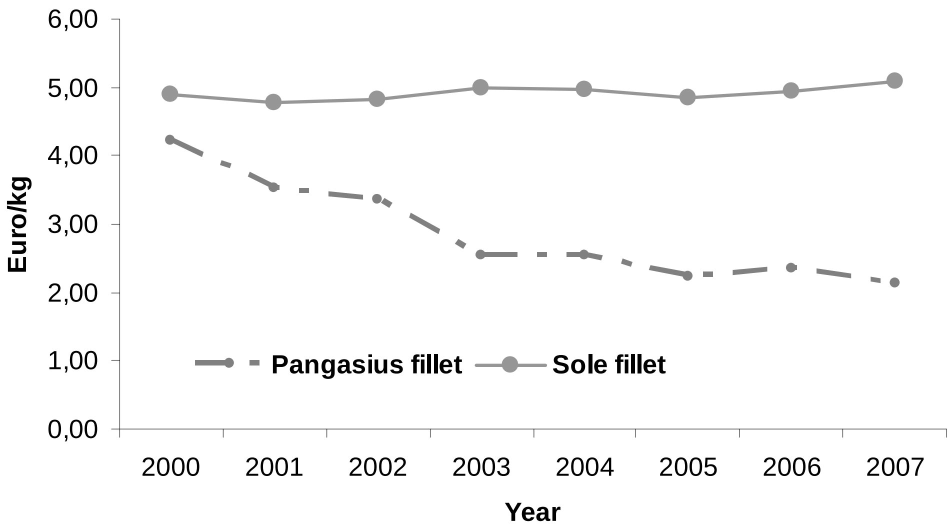


Figure 7. Pangasius and Sole frozen fillet prices 2000-2007.
Source: EuroStat

2.1.3 Peak oil and the global financial crisis

In 2008 a lending crisis has seen processing companies purchasing fish from farmers from 13.800 to14.500 VND/kg (0.86US$ to 0.91US$); 1500 to 2000 VND/kg (0.09US$ to 0.13US$) lower than the cost price. Farmers have been unable to reduce the cost of inputs, particularly feed which makes up 70-80% of the cost price. In fact, the cost of feed has increased between 1000 and 1400 VND/kg (0.06US$ and 0.09US$) to a current average price of between 7500 – 8500 VND/kg (0.47US$ - 0.53US$). In addition it appears the price of antibiotics and vitamins have increased between 30-40% compared to 2007. Based on these increases the provincial government believes that the purchase price for pangasius needs to rise to 15.500 VND/kg (0.97US$/kg) at minimum to ensure profitability.

The low value market niche that pangasius has filled in international markets has led to significant challenges for the industry in Vietnam. The capacity of the producers to deliver a stable supply to processing companies is determined by the price of globally sourced inputs and domestically set farm gate prices. Given that farmers receive a marginal profit of between US$0.06 for industrial systems and US$0.14 per kg for family scale systems (Phuong et al. 2007; Loc et al. 2010), even fairly small variations in costs or market price can turn farmers away from production, which subsequently leads to higher demand and higher prices and a return to production the next cycle. Cyclical patterns can also be seen over a longer period. In 2006 the industry underwent a massive expansion in terms of the number of farmers and processing capacity in response to the increase in global demand in 2006 leading to a 104% increase in exports and 120% increase in production (as illustrated in Figure 1 for An Giang). However, in 2007 speculators within the industry were left with a 69% relative decline in growth leaving the industry leading to a large surplus of fish. By 2008 many farmers had either not been able to sell their fish or had chosen not to in the hope of getting a high enough price to break even.

By mid-2008 a number of factors coalesced to significantly drive prices up, as illustrated in Figure 8. First, after a long period of oversupply processing companies once again required product. Given that a large number of farmers had pulled out of the industry, or sold their fish at a significant loss to the domestic market, demand rose. Second, despite the farm gate price of pangasius rising in the first half of 2008, with a six month average of US$ 0.88 per kg, the price of feed, feed ingredients and other inputs were also much higher due to peak oil prices in July. The rise in costs were significant for many farmers as the price of oil in Vietnam peaked at US$1.19 per litre; a 43% increase from six months prior (Figure 8). Initially processing companies passed their own costs on to farmers, with prices of falling to a six month low of US$0.85 per kg for high quality 'white' meat (sold predominantly to Europe and the USA), and US$0.77 for 'yellow' meat (sold predominantly to Eastern Europe and the Middle East). However, soon after prices peaked at US$1.07 for white meat and US$0.93 for yellow meat, before falling to six month average of US$0.83 for the first half of 2009.

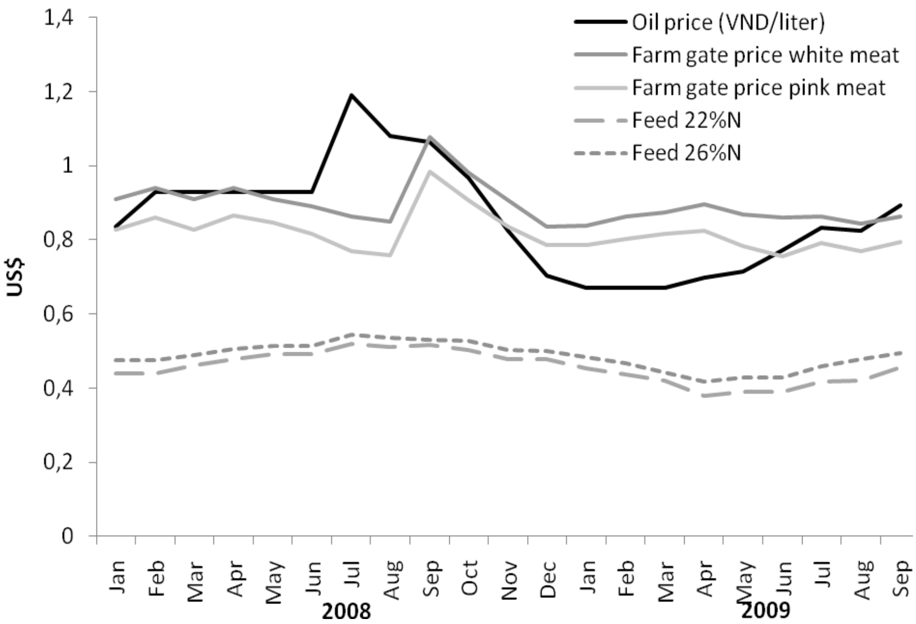


Figure 8. Input costs and farm gate prices for Pangasius in 2008 and 2009
Based on data from DARD and DoS (2008)

The impact of peak oil prices in 2008 had a profound effect on the production strategies of farmers in the Mekong Delta. Seeking higher efficiency and lower production costs large scale pangasius producers, with sufficient financial resoures, have expanded their operations downstream of An Giang province to Can Tho, Tra Vinh and Vinh Long provinces. This shift has occurred in response to the need for lower pumping costs, helped by the tidal movement in downstream areas. These larger producers have been able to shift or expand their production to these areas because of new zoning of land to pangasius production in these downstream provinces. Smaller producers, such as those targeted by the project, have not been able to reduce production costs through relocation, and have therefore been unable to offset the cost of increased fuel prices.

Also driving the financial crisis in the pangasius industry was the low capacity of processing companies to cope with the growing production levels. News reports at the time indicated that An Giang province alone had an estimated 30000 tones of oversized fish which have not been purchased by companies, representing 16% of the provinces total production target for the year. Most processing companies have a capacity of 100-300 tonnes/day (VietNamNet Bridge 2008). In order to meet the supply they need to upgrade this capacity, but are currently constrained by interest rates of up to 20% per annum. It now appears the State Bank of Vietnam has agreed to subsidize between 50 and 100% of the interest rates, at a cost of US$61.54 million, to allow companies to cover all pending purchases of oversized fish until August 2008. However, there is also concern that to ensure processing companies can meet future growth of the industry they will require a further US$257million.

As outlined above the Russian market also played a central role in the instability of export markets for Vietnamese pangasius and has had a profound impact on small holders in An Giang province. In 2008, the Russian market accounted for more than 70% of Agifish and

Navico, the two largest processors of An Giang. By the end of 2008, Russia stopped importing Vietnamese pangasius citing the reasons of the product not meeting quality and food safety standards. Difficulties in payment of Russian importers to Vietnamese processing companies during the financial crisis and infighting among Russian importers and distributers has added to the increased variability in demand for pangasius. However, in early 2009 with intervention of the government, exports to Russia started to pick up again.

In response to the competition of exporters vying for market share in the EU and emerging markets like Russia the Vietnamese government established two governance institutions were established in early 2009. The Council of Pangasius Export to Russia under the Ministry of Industry and Commerce has been set up in early 2009 to assist Vietnam pangasius exporters in negotiation with Russian counterparts and to regulate the export business of the Vietnamese exporters. A more recent development is the establishment of the Steering Committee of Pangasius Production and Consumption in the Mekong Delta. The Committee is chaired by the Minister of MARD and composes of 20 members from the provinces of the region, VASEP and AFA. The Committee functions as an advisory body to the government to coordinate production with international demand.

2.2 Challenges of Pangasius production

The intensity of pangasius aquaculture production in An Giang province provides a strong case study into the growing concerns over the environmental performance and social equity of pangasius farmers in the GVC. The following reviews these concerns and identifies challenges for supporting improved state and non-state governance measures, and practices of farmers, fishers and aquaculture producers to meet increasingly stringent social and environmental production standards.

2.2.1 Feed

Pangasius farmers have historically been dependent on the use of homemade feeds, but have more recently shifted to manufactured feeds. It is currently estimated that between 50-75% of ponds producers are using manufactured pellets (Tran 2005 in World Bank 2006). The type of feed used by farmers has considerable impact in terms of feed conversion ratio (FCR) – the ratio of dry feed required to produce one unit of wet fish. Manufactured feeds containing 2-3% fish oil, have a FCR of around 1.71-1.78, while homemade feeds made up of organic material such as rice bran mixed with around 33-40% protein from 'low value' or 'trash' fish have an FCR of between 2.45-2.51 (Ish and Doctor 2005). However, extreme FCR estimates are as high as 5.9 (Edwards and Allan 2004).

Up to 2002, 99% of the total number of pangasius farmers still used home-made feed, 20-30% of which was made up of low-value fish (Sinh 2005a). In 2004 it was also estimated that 100,000-120,000 tonnes of low-value marine fish were being used for pangasius culture (APFIC 2005). In a 2008 survey the government found that 56 % of pangasius farmers with pond area of 0.2 ha exclusively use homemade feed while a further 23% predominantly use homemade feed in conjunction with a small amount of industrial feed during early stage of growing cycle (Figure 9) (DARD and DoS 2008). A further 21% of farms – mainly large scale farms – use industrial feed either exclusively or predominantly.

The survey conducted during the diagnosis phase of this project indicates that farmers use an equal proportion of home made and commercial feeds from a number of different sources.

Nearly three quarters of surveyed farmers reported using home made feed, made up of rice bran, soy meal and marine trash fish. Commercial feeds are also used by roughly the same proportion of farmers – just over half of these obtained their feed from agents, while 20% sourced directly from feed companies. Only 35% of farmers sourced their feed from other farmers (3%). The majority of farmers use a combination of industrial and home made feed in order to maintain fish's quality and reduce costs. As such, home-made feeds remain an important input to reduce feeding costs.

However, there are a range of perceived environmental and social impacts of using these fish for feed. The use of 'low value' fish for feed is direct competition for these fish as an imperative source of nutrients for rural communities in the Delta and, given their migratory life-cycles, the Lower Mekong Basin as a whole (Hortle and Bush 2003; Poulsen 2003). Much of the artisanal fishery along the coastline of Kien Giang and Ca Mau, are low in value and accessible to coastal poor populations (Sinh 2005b). As the commercial pangasius farming is more often conducted by wealthier farmers and companies, the use of low-value fish disproportionately affects the income, food and employment of the rural poor in the Delta (Sinh 2005a). Promoting better use of fish stocks for human nutrition and pangasius production requires a more detailed understanding of the type and source of feeds and the practice of feeding. This will lead to effective interventions to improve the capacity of fishers and farmers to improve the socially equitable and ecologically sustainable use of small and low value fish.

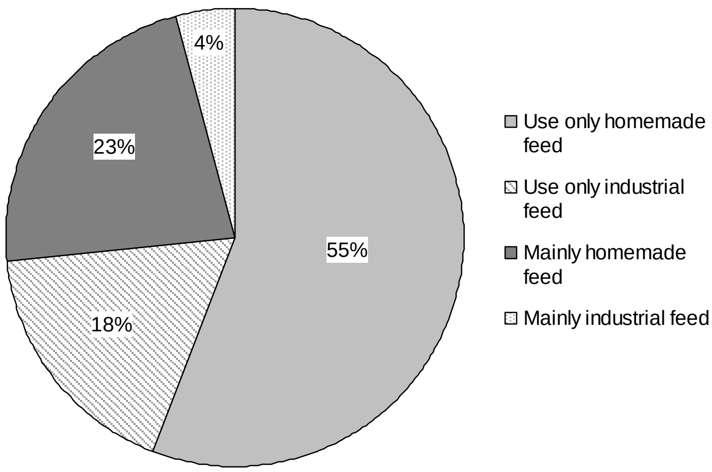


Figure 9. Use of feed types by grow-out farmers in An Giang, 2008.
Source: DARD and DoS (2008)

Farm-made feed is gradually being replaced by manufactured pelleted feed, or a combination of both, because of the further decline of low value fish and the consequent increase in price (World Bank 2006). This transition is limited by the domestic production of manufactured feed, 45% of which is imported from Thailand, Hong Kong and Taiwan. Until the production of manufactured pellets can meet current demand, at a competitive price, low-value freshwater and marine fish will continue to be exploited. Recent studies have shown that feed represents between 84-94% of variable costs and that home-made feed in particular gives better net returns than manufactured feeds (Phuong et al. 2007). There are also ongoing concerns that the use of these fish degrades coastal fishery resources. Government policy and many of the quality standards require the use of industrial feed. To comply with these standards small scale farmers will have to make a larger investment in feed putting further pressure on their already small margins.

2.2.2 Water quality

The high water temperatures and fast growth of primary producers the release of organic matter and nutrient loading will likely lead to a degradation of water quality and have a direct impact on the health of the industry, as well as having implications for the health of surrounding waters (GTZ cited in World Bank 2006). Cages have been the main concern with the leakage of nutrients into water ways. The higher levels of nutrient waste accumulated in ponds is released after each harvest, leading to an estimated 24g of nitrogen and 9g of phosphorus per kilogram of pangasius into surrounding waters (Le 2004). More recently Anh et al. (Forthcoming) estimated that overall emissions associated with the production of one ton of pangasius frozen fillet product amount to 740 kg BOD, 1020 kg COD, 2050 kg TSS, 106 kg N and 27 kg P. In real terms this means that pangasius production contributes less than 0.01% to the nitrogen and phosphorous content of the river and even less for the total suspended solids (TSS) (Bosma et al. 2009). Based on 2004 production this would mean a release of approximately 5 million MT of nitrogen and 2 million MT of phosphorus released annually into the Mekong-Bassac River system. The impacts of releasing this waste is not known, but as pond culture increases pangasius aquaculture may become a sink for pesticides and agricultural chemicals and source of pollution in the Mekong.

Table 1. Selected characteristics of the wastewater in Pangasius farming (wastewater), compared with Vietnamese standards for surface water quality (TCVN 5942 - 1995).

Source: Anh et al. (Forthcoming)

Parameters	Unit	Average (Min – Max)	TCVN 5942 -1995 (*)
Temperature	^{0}C	30.7 (27.5 – 34)	
pH		7.8 (6.7 – 9.2)	5.5 – 9.0
BOD	mg/l	22 (10 – 78)	< 25
COD	mg/l	27 (23 – 196)	<35
TSS	mg/l	61.0 (3.5 – 274.2)	< 80
Total Nitrogen	mg/l	4.0 (3.2 – 6.0)	
Total Phosphorus	mg/l	1 (0.4 – 2.21)	
$N-NH_3$	mg/l	1.4 (0.05 – 4.4)	< 1
$N- NO_2^-$	mg/l	0.158 (0.01 – 1.36)	< 0.05
H_2S	mg/l	0.035 (0.001 – 0.64)	
DO	mg/l	5.73 (0.44 – 15.90)	≥ 2
Coli-forms	MNP/100ml	$317.32x10^4$ ($63.2 x10^4$ – $640x10^4$)	10^4

Notes: Compilation of results collated by Anh et al (Forthcoming) from empirical sources and citing the work of Giang et al. (2008), Tuan (2007) and Dan et al. (2008). (*): TCVN 5942 – 1995: Vietnamese standard for surface water quality

State regulations to minimize the build-up of nutrients exist, but there has been little enforcement of these regulations and effluent levels have not been mitigated. The unplanned development of ponds has also meant that water exchange is either made difficult due to the distance from waterways, or farmers release water into communal waterways close to other aquaculture ponds and farming systems. Although there is little information about the direct impact of these discharges it is believed that the mortality of both culture and native fish has increased with the number of cages and ponds (Pers. Comm. DARD 2008). The impact to the livelihoods of fishers and farmers is also not clearly understood, but based on the importance of fish protein to the population of the Delta, it is expected to be significant. Investigating the trade-offs between aquaculture and fishery production based on water quality management therefore provides necessary information to determine the capabilities and vulnerabilities of farmer and fisher livelihoods. This information can be used to guide effective interventions which create governance mechanisms that promote, support and reward cleaner production measures and improve farmers capacity to implement such measures while meeting their livelihood needs.

2.2.3 Drug and chemical use

The use of antibiotics and chemicals in the production process is becoming of major concern to government regulators and processing companies who must conform to the international food safety standards. Product residues are of particular concern to processing companies who have come under increased scrutiny by regulators in the US and the EU (Oosterveer 2007). Both state regulators and private companies have gained considerable experience about the impact that food safety standards on anti-biotic and chemical residues in shrimp industry and are wary of similar impacts to pangasius. Indeed there is evidence that concerns over the affect of these antibiotics on water quality and resistance in wild fish populations are well founded with a recent study by Sarter *et al.* (2007) finding 20-80% resistance within populations of common bacteria.

The expansion of aquaculture has meant that there are higher risks associated with disease at all stages of the production process, from spawning, nursing to grow-out (World Bank 2006). Small-scale farmers, vulnerable to risks associated with disease, are particular likely to use banned antibiotics such as Fluoroquinolones because of poor knowledge about diseases and products, misuse vitamin C, probiotics, antioxidant, enzymes (lysine, methionine) and mineral premix, as well as legal antibiotics (oxytetracycline, chloramphenicol, trimethoprim-sulphamethoxazole, nitrofurantoin, nalidixic acid, ampicillin) (Sarter et al. 2007). As the intensity of pangasius farming increases producers may be likely to use these drugs as they expect more security around their high investment in cages and ponds: especially those not selling to highly regulated markets in the EU and US. Despite little evidence to show many legal additives have a measurable benefit to fish growth and health they currently make up to 5% of the variable costs of farmers using home-made feed 2-4% of those using processed feed (Sarter et al. 2007).

The baseline survey results showed that farmers trust laboratory tests for disease the most followed by their own experience and then advice from aquaculture experts. Due to the low level of technical knowledge most farmers diagnose and treat their stock by observing the behavior of fish, their general characteristics. Free diagnostic support provided by processing, feed and drug companies is also widely used. Farmers keep detailed records of mortality, quality of fingerlings and stocking densities which are used in both formal and informal diagnosis methods. Most of the farmers combine their own experience with advice from other local farmers, as well as veterinary or drug stores. Aquaculture extension plays a less important role in the process, mainly because the network is under staffed and lack of capacity to perform the assigned task. Overall farmers rank the abilities to diagnose disease in the following order: aquaculture extension officers, veterinary drug sellers, and other farmers.

The application of chemicals and veterinary products is based largely on farmer experience than formal guidance from either extension services or suppliers. Observations from 30 grow-out farmers showed that 60% of farmers base their judgment on experience in combination with instructions when making decision on chemical use, a further 30% used only their own experience and 10% follow formal instruction. The lack of consistency in the correct application of these chemicals poses several problems related to food's hygiene and safety regulations which are increasingly important for gaining access to international markets.

As food quality and safety measures become more stringent in export markets pangasius farmers will be forced to adapt their practices in order to maintain market access. How farmers can adapt to these changes is dependent on the provision of timely information and also improved capability of farmers to use this information to change their farming practices. Understanding how poor small-scale farmers can improve or 'upgrade' their position within global value chains therefore requires an improved understanding of their capacity to both respond and contribute to governance and control mechanisms such as food standards.

2.2.4 Seed

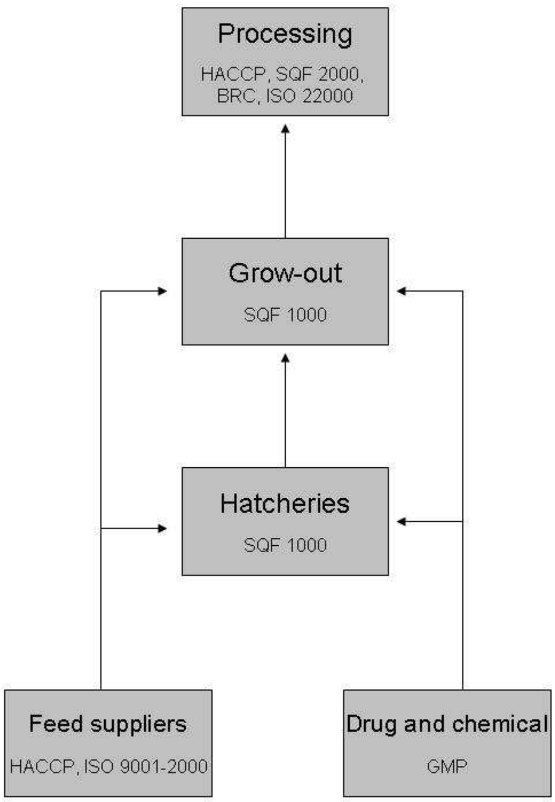
The results of the baseline survey reveal that grow-out farmers are aware that the quality of fingerlings is an important factor affecting their production efficiency. Fish farmers bought fingerlings from different sources, mostly from other farmers in the region, public nurseries and breeding centers, breeding and nursery farms, and smaller amount from traders and own production. Up to 73% of the buyers reported that they did not have any means to check for the quality of fingerlings and 27% of respondents did some form of check for quality. In many cases the quality assessment is done by nursery farmers who bare the risk for the quality of the fingerlings (also found by Belton et al. 2008; Sinh and Hien 2009). As their business is based on high survival rates to ensure return business they are responsible for the quality.

Factors affecting the outcome of pangasius production are cited by farmers as: the source and quality of fingerlings, stocking density, the size of fingerlings and regulations on fingerlings. The most often cited factor, noted by 57% of the respondents, was the variable price of fish at harvest. Generally, farmers trust their own-produced fingerlings and those produced by public breeding/nursery centers more than fingerlings from private farms. As farmers do not have capacity or facilities to check for the quality of fingerlings they base decision over which fingerlings they buy on their own observation and experience (cf. Belton et al. 2008; Sinh and Hien 2009). The most important quality standard of fingerlings, according to the farmers, was healthy looking, agility and the presence of a bright, shiny blue skin.

2.3 Governing quality standards

2.3.1 Quality standards

A key development direction in markets is towards progressively higher food safety, quality, social and environmental standards, and even niche products such as high quality organic pangasius (see Figure 10). There is a growing differentiation in quality standards for international markets. The EU and US have stringent requirements for food safety and select only high quality white meat fish. Other markets, such as Ukraine, Russia, while having high safety standards are willing to accept pink meat at a lower price. However, overall international markets are increasing monitoring over pangasius because of both real and perceived safety and quality problems (Bush and Duijf 2009; Bush et al. 2009). While some of the medium scale producers are currently able to sell their fish to processing firms they, along with the smaller producers in the target group of this study, will need to improve their product quality and commit to certification processes if they are to participate in the global value chain in the longer term.



- HACCP – Hazard Analysis and Critical Control Points Risk is a management system for the prevention of contamination by physical, chemical and biological hazards
- SQF 2000 – a food safety assessment programme covering processors, distributers and warehousing
- SQF 1000 - a food safety assessment programme for primary producers
- BRC – Food safety and quality criteria required for supplying to UK retailers and designed to standardizing food criteria and monitoring procedures.
- ISO 22000 – international food safety management system involving interactive communication between chain actors, and a system management approach based on the HACCP principles.
- ISO 9001-2000 – Quality management system for providing consistent products and services to meet customer expectations focusing on quantitative measurement of performance.
- GMP – Developed by the US Food and Drug Administration for verifying the safety and purity of drug and food products.

Figure 10. Certified system of provision with explanation of standards

In 2006 the state authority NAVIQAVED situated in the Ministry of Agriculture and Rural Development (MARD) started to develop a 'Vietnamese Catfish' brand to increase global market confidence in the quality and safety of pangasius. The brand was developed in partnership with Swiss food safety and quality auditor Société Générale de Surveillance (SGS) and was to be based on the HACCP-based Safe Quality Food (SQF) standards. The two standards developed for pangasius was the SQF 2000 standards for assuring food safety in processing companies and the SQF 1000 standards for nurseries and farms. Together the SQF 1000 and 2000 standards are designed to ensure greater traceability through each stage of production, from hatcheries to grow-out, and finally processing.

In addition to the government SQF initiative a series of first, second and third party private sector standards have also been under development for pangasius. First party standards such as the "Blue Planet" from Seafood Connections and Trace Panga from Anova Seafoods are being implemented in order to establish a closed chain of custody from farm to retailers. Second and third party standards have also established food safety and quality standards for a wider group of retailers, importers processing companies. These include the US based Global Aquaculture Alliance (GAA) and the European retailer organization GlobalGAP (ACC 2005). A particular feature of these standards is their attempt to branch out from product safety and quality to include a range of credence, process based standards including environmental impacts and social issues. As they have done so they have come under increased scrutiny from NGOs to open their standard definition process to include a wider group of stakeholders – including disaffected producers and communities.

There have been a series of critiques of the above standards. First, while many have been developed over a number of years, few farms have yet been certified. The first party standards have been relatively successful in certifying farms by working directly with large industrial farms. For example, the Trace Panga of the Dutch importer ANOVA Seafoods has been extended to farms owned by or closely related to their closest suppliers in Vietnam. Naturland has been successful in certifying a closely controlled specialized niche chain of custody for two farms with a total production of 900 MT/yr representing around 0.001% of total production (Bush et al. 2009). In comparison, second and third party standards have largely failed to certify any farms largely due to the complexity of feed, seed and water management. The only exception to this has been SQF who has certified large farmers who are members of processing company sponsored production groups. They have also come under criticisms over their inability to comply with national legislation, the high costs of auditing, their attention to output and not process based standards, their inability to considering all stakeholders, and their *ad hoc* enforcement.

To improve the prospects of using certification WWF instigated a series of Aquaculture Dialogues to facilitate the development of a widely accepted set of environmental standards for 12 key species (WWF 2007). The standards developed within these dialogues will be certified through the Aquaculture Stewardship Council (ASC), which will be launched in 2010. The Pangasius Aquaculture Dialogue (PAD) aims to facilitate the development of a more sustainable set of standards that are lower cost, through a lower dependency on auditing resources, and use metric-based indicators of improvement rather than prescriptive output targets to make them more attractive for producers and processors alike (WWF 2007). Another key target of the PAD standards is that they should be generally applicable, rather than only suitable for a niche group of farmers. As such the PAD has set an initial target of 20% of all pangasius farmers.

2.3.2 Challenges of compliance

Given the movement of smaller farms out of pangasius production due to market instability, it seems likely those that will be able to comply with first, second and third party certification in the future will be larger industrial farms. Recent data from An Giang shows that 26% of farms, equivalent to 55% of total pond area, perform some kind of quality and safety management (DARD and DoS 2008) (see Table 2). The proportion of farmers not aware of information of quality and safety standards remains relatively high at 36%. Non compliance with one of the key farming practices that farmers are required to follow is the treatment of waste water discharged from ponds in sedimentation ponds. Despite this being a requisite of the government Best Management Practices (BMP) only an estimated 6% of farms have invested in their construction (DARD and DoS 2008). Most of the farms capable of investing in these water treatment pond are larger farms with the necessary land and capital.

The baseline survey showed that larger farmers have more capacity to implement hygiene production process that small farms. Results from pangasius farms in An Giang show that 26% of number of farms, equivalent to 55% of total pond area, practicequality and safety standards. However, 36% of farmers are not aware of information about quality and safety standards. More than half of *pangasius* farms follow recommendation of treatment of waste water discharged from ponds but only small proportion of farms invested in construction of sedimentation pond (5.8% of farms).

Of the farmers surveyed for the project all had received some form of training, 64% of which had attended SQF training between 2004 and 2008 mainly from commune fisheries extension workers. However, none of the farmers have been certified. First, many of the farmers interviewed confuse SQF training with actual certification. Many reported not being interested in certification because the of reporting requirements; with approximately half having no more than six years of education any form of reporting becomes difficult. However, the main constraint to certification is cost. The total cost of certifying a certification procedure is close to US$2000, regardless of whether it is a single farm or a group of farmers.

Table 2. Application of quality and safety production by farmers
Source: DARD and DoS (2008)

Standard requirements	**No. of farms**	**Area (ha)**	**% of Farms**	**% of Area**	**% of prod.**
Practice of food safety requirements	793	541	26	55	
Aware of food safety requirements but not practicing	1,181	269	38	27	
Unaware of food safety requirements	1,113	178	36	18	
Total number of farms practicing water treatment	1,875	687	54		
Treatment of water by sedimentation pond	205	347	6		
Treatment water by discharging to rice fields	1670	48	40		

2.3.3 Government policy

Despite the difficulties the government in An Giang is committed to either assisting smaller farmers to be certified or helping them to upgrade out of pangasius to alternative species. As part of the wider shift to an export led economy the government created a number of programmes to promote improved linkages between farmers and export-processing companies through Decision 80 *Liên kết "4 nhà"* (Linkages Between the Four 'Houses') in 2002.[1] Part of this wider policy shift is the promotion of certification as means of improving products for export markets, as well as the 2007 revision of the Cooperative Law (Decree No. 151-2007/ND-CP 2007), and the implementation of subsidies and spatial zoning.

The provincial government in An Giang has worked most closely with the SQF standards because of their existing having been involved in the SGS/NAVIQAVED project. These standards are also promoted within the government because of their close association with the national BMP standards. The provincial government has been active in training farmers and developing the capacity for auditing in partnership with SGS. Nevertheless, the An Giang Department of Fisheries believes that GlobalGAP is most likely to gain market dominance in the coming years; largely because it is being developed into a specific VietGAP aquaculture standard. However, at the start of the project, the DoF's main focus was the successful extension of SQF – which, it was agreed by all respondents, are more accessible for family scale pangasius producers.

It is widely assumed that the US$2200 cost of SQF certification is prohibitive for most farmers. To promote the adoption of the SQF standards the An Giang Provincial government has develop a subsidies programme to cover up to 50% of these costs for any farmers wishing to apply. Until now there has been very few cases of farmers applying for this subsidy. The provincial department of Fisheries reports that only one group of three farmers have received the subsidy so far, all of whom were directors of ASIAFEED, a large feed company in the Delta. As argued in Vietnam and elsewhere in Southeast Asia (e.g. Lebel et al. 2008; Anh et al. 2010; Umesh et al. 2010)}, attention has now turned to the possibility of cooperative groups or clusters to facilitate technical and financial compliance with standards.

An important development to promote cooperative forms of production in aquaculture was the 2007 Decree on the organization and operation of cooperative groups. This Decree was an important step in addressing the resistance to 'old style' cooperative production (see for example Kerkvliet 1995; Fford and Huan 2001) by relaxing the state control and giving legal space for these smaller cooperative groups, operated "by three individuals or more who jointly contribute assets and labour to carrying out certain works for mutual benefit and responsibility" (Decree No. 151-2007/ND-CP 2007). Under the Decree members in both forms of cooperatives are considered legal entities, allowing them to associate, advertise and access formal credit. The primary objective of these cooperatives in state policy is economic development and poverty alleviation (MARD 2008). However, in the aquaculture sector these cooperatives are also expected to be instrumental in improving compliance with both national BMP and international safety and quality standards.

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[1] The 'Four Houses' is political terminology referring to the state, enterprises, farmers and science.

Under the guise of spatial planning the An Giang provincial government has also developed a zoning plan for pangasius production. The government has developed these zones both north and south of the capital Long Xuyen. The government uses these zones as a means of limiting the spread of pangasius farms, which during 2003-2007 proceeded in a largely uncoordinated fashion, to predefined areas. The policy has been relatively successful, despite the continued growth of pangasius outside these zones. One of the main incentives for producers, nurseries and hatcheries to locate themselves in these areas are subsidies for certification, as well as a new subsidy designed to provide a 60% subsidy on the interest rate payments. The policy was essentially developed as a stimulus to the industry during the 2008 crisis. The subsidy on interest rates appears to be more attractive, but has been limited by the central criteria of a production contract with a processing company. What role government subsidy can play in promoting what has been until now an essentially market led development of the sector.

This section has reviewed the current and potential social, economic and environmental risks from global markets and local production practices and how these risks are likely to be translated into vulnerabilities for smaller producers. The growth of the industry and its expansion in international markets has led to a range of new economic risks. Most notable has been the increase in regulation of pangasius quality in response to food safety scares, but now extending to standards governing both environmental and social dimensions of production. While it is generally accepted that the unplanned expansion of the pangasius industry in the Mekong Delta has increased pollutant loads, increased drug and chemical use, led to the appropriation of marginal and sometimes sensitive wetlands, and placed pressure on coastal forage fisheries that used in homemade and processed fish meal, there remains a surprisingly small amount of empirical evidence to substantiate claims.

What is clear from the analysis is that wider political and economic context of pangasius in global markets and concerns over the sustainability of production has led to considerable restructuring of the industry. The large number of small producers that have exited production from 2008 onwards appears to indicate that this group is the most vulnerable to this restructuring through their inability to comply with standards and national regulation. The rest of the this report goes on to analyse how, given the increasingly small profit margins for pangasius production, small holders can remain competitive in the industry by questioning what structural and relational dimensions determine the distribution of value, position and the degree to which they negotiate the terms and conditions of incorporation in the global pangasius value chain.

3 Value chain analysis

This chapter addresses the structure and function of the pangasius value chain by identifying the distribution of value along both export and domestic strands. In particular attention is given to the net share of different size classes of producers. Two main questions guided the value chain analysis. First, what are the key functions of chain actors in different market channels, where are they located, and what proportion of total market value they receive? Second, what contribution does each value chain make to the livelihoods of fishers and farmers? By answering these questions a clearer picture of the governance modes employed in the chain are identified as well as the structure of rewards for producers.

The value chain analysis was conducted in 2008 in collaboration with Can Tho University and the SUMERNET project published in Loc et al. (2010). The sampling methodology is presented in Box 2.

Box 2. Methodology for value chain survey

> The methodology for the value chain analysis was based on the ValueLinks approach developed by GTZ (2007), designed to map out the material and financial flows from input suppliers to market. In doing so we were able to calculate the main expenses and net profit margins of production for the actors and consolidate the expenses and margins from the rest of the chain. The analysis emphasizes the value added to the fish at each transaction in the chain, calculated as the selling price minuses buying price, not taking into account fixed or variable costs of each actor. The data was then mapped, illustrating the main export and domestic channels, proportional outputs and a description of key functions.
>
> In total 240 discrete chain actors were surveyed in September and October 2008, collecting information for their production for January to December 2007. Informants included: 90 fish farmers, 91 fishing households, 10 Pangasius hatcheries, 7 processing companies, 22 traders, and 20 chain facilitators (NGOs and government departments), across An Giang, Dong Thap and Hau Giang provinces.

3.1 Domestic structure of a global value chain

The survey recorded 1.2 million tonnes of pangasius traded in 2007 representing an estimated 28.9% of total aquaculture production in Vietnam and 50.6% in the Mekong Delta. Of this 91.4% of the trade was exported, emphasising the international focus of the industry (see Figure 11). There are five distinct functions within the chains including a general group of input suppliers, grow-out and hatchery farmers, traders, processors, and retailers. The composition of chains actors differed depending on whether the channel extended to domestic or export markets, but the function of these actors across the channels remained relatively similar.

The pangasius chain is predominantly export oriented and, as a result, dominated by processing companies. The first channel in Vietnam is a vertically integrated international chain extending from producers to processors and export markets. The export trade extends to well established markets such as Japan, US and EU, as well as emerging markets such as Egypt, Russia and Ukraine. The results indicate that nearly all producers selling fish to export markets have a direct contract with processing companies, thereby avoiding the extra costs incurred by collectors. This is not consistent with other studies that show that collectors play an important role in trading pangasius and providing credit to farmers (Bush 2006; Loc 2006). Nevertheless, the results indicate that there is a tendency towards vertical integration by processing companies in order to maintain greater control over farming practices.

The second channel is a domestic flow of fish from producers, to traders, wholesalers and finally consumers in major urban centres such as Ho Chi Minh City. This channel accounts for 8.9% of total production, passing from producers to collectors, who then sell to wholesalers, retailers or processing companies. Approximately one third of the fish sold in domestic markets is processed, made up of both filleted fish as well as waste material from processing companies. The domestic chain is also a secondary market for those farmers who do not meet the quality or safety requirements of export markets. Quality failures mainly consist of meat discolouration or fish that cannot be delivered live to processing companies, while safety failures mainly include problems with antibiotic or pro-biotic contamination. The survey results indicate that most disqualification from export markets occurs at the farm gate as only 1.9% of fish is traded from processing companies to domestic markets.

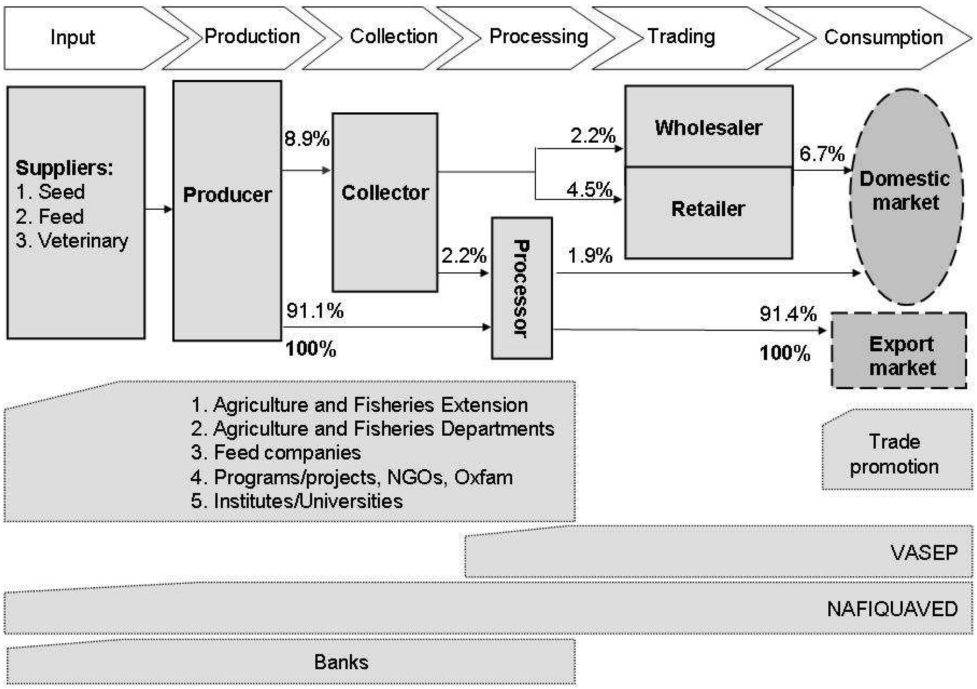

Figure 11. Pangasius value chain in Vietnam

3.2 Pangasius chain facilitators

A large number of state, private and civil society organisations facilitate both domestic and international trade of pangasius (Figure 11). Market support is provided by the Vietnam Association of Seafood Exporters and Processors (VASEP) who supply processors and exporters information and training on quality and safety requirements. In addition, the Provincial Trade Promotion Center and the National Trade Promotion Center explore new export markets, as well as publically broadcasting market prices and new developments in farming techniques and quality standards.

VASEP also sponsors the An Giang Fisheries Association (AFA), a member based organisation set up after the U.S Anti dumping case in 2003 to advocate farmer's interests in policy and negotiate individual contracts with processing companies. However, the project baseline survey found that only half of the respondents believed AFA operated effectively, providing information on inputs and market prices, production techniques and effective disease control. The remaining respondents thought AFA was ineffective because the association had no decisive role in negotiating contracts between members and processing companies, banks or feed companies. One in ten respondents said the relationship of AFA with processing companies was ambiguous and, as a result, members doubt its willingness to advocate their interests.

The main source of technical support for farmers is the Fishery Extension officers within the District Agriculture Departments. They offer training to hatchery and grow-out farmers in new aquaculture technologies as well as instruct farmers on governmental policies to increase pangasius hygiene and safety. In addition, there are a range of technical programmes for farms including irrigation projects for raising aqua-products, and projects to upgrade breeding centres. More specialised support on veterinary issues is provided by the National Fisheries Quality Assurance and Veterinary Directorate (NAFIQUAVED), which is also responsible for checking, controlling as well as certifying feed, fingerlings and fish processing.

3.3 Added value

The average total net added value in the pangasius chain is estimated at US$0.29 per kg. The results also show that the percentage net added value between actors in the export and domestic channels are relatively similar (Table 3). Traders contribute the lowest net added value at 17.5%. Producers and retailers/processors in both import and export channels have a similar contribution of net added value; 41.3% and 40.1% in the export channel and 46.9% - 53.1% in the domestic channel. Overall, farmer's profit is similar in both of the channels at US$0.12 per kilogram. However, the share of profit and income differs greatly by size of farm. Table 4 shows that farms with a pond area of less than 0.5ha make up 89% of all farms, but receive 11% of the income and only 4.8% of the profit from the export value chains.

The contribution of labour relative to benefits received differs between the chain actors. The results show that farmers contribute 1.2% of labour to the value chain and contributing 38.7% of the net added value, and receiving 48.2% of gross profit and 44.5% of gross income from the chain. By comparison, traders contribute 3.4% of labour to the value chain, while contributing 17.5% of net added value, and receiving 1.9% of gross profit and 4.6% of the gross added value in the chain. The rest of the labour is contributed by processing companies. In return, processing companies receive 49.9% of the gross profit which is similar to the overall share of farmers but 26 times higher than the share of traders. By comparison, we estimate the average gross profit of a single processing company at US$1,861,642 per year and the average gross profit for individual farmers at US$11,621 per year.

These findings are supported by a GLOBEFISH report that calculates that of the final average sale price of €7.00/kg in European markets 10% goes to fish farmer, 10% to the fish collector, 20% to the processor, 20% to the trader and the remaining 40% to the retailer (GLOBEFISH 2009a). This distribution between actors in the value chain highlights the vulnerability of (smaller) producers in the value chain. Consequently, there is an endemic cycle of over and under supply within the chain that affects the confidence of farmers and processing companies alike to invest in improving infrastructure and supply contracts.

Further data collected in August 2008 illustrate this cycle, with farmers costs having risen sharply, largely due to peak fuel prices in 2008. The cost of feed in particular rose between US$0.06 and US$0.09 per kg to a current average price of between US$0.48 to US$0.54 per kg. At the same time declining demand in international markets led to decrease in market price to US$0.88 toUS$0.92, approximately US$0.10 to US$0.13 per kg lower than the total cost per kg. In addition it appears the price of antibiotics and vitamins have increased between 30-40% compared to 2007. Based on these figures it is estimated the market price for pangasius needs to rise to US$0.98 per kg to ensure profitability.

Table 3. Integrated analysis of value in the *Pangasius hypopthalmus* chain in Vietnam

Actor / Analysis	Grow-out farmers	Traders	Processors	Total
1. Total working time (months)	107	81	20680	20868
2. Total labour cost (US$)	10048,68	6526,07	2873124,80	2889699,60
3. Volume traded (tonnes)	1,200,000	106,800	1,096,800	
4. Selling price (US$/kg)	0.92	1.06	1.15	
5. Profit (US$/kg)	0.12	0.05	0.14	
6. Gross profit (US$)	144.00	5.34	153.55	302.89
7. Gross income (US$)	1104.00	113.21	1261.32	2478.53
8. Labour costs (US$/kg)	0.0002	0.0007	0.0196	
9. % share of labour costs per kg	1.2	3.4	95.4	100.0
10. % share of profit per kg	38.7	17.5	43.8	100.0
11. % share of total profit	48.2	1.9	49.9	100.0
12. % share of total income	44.5	4.6	50.9	100.0

Table 4. Income and profit of grow-out farms selling to the export value chain by size of farm

Size of farm	Proportion of farms		Direct sale to processing companies		Share of farmer profit (%)	Share of farmer income (%)
	Survey	All*	% of farms	% of volume		
<0.5ha	49	89	84	10.3	4.8	11.0
0.5-1ha	24	6	100	19.4	27.4	19.3
>1ha	27	5	100	61.4	67.8	64.1
Total	100	100		91.1	100	100

* Based on DARD and DoS (2008) census of ponds – see Table 6

3.4 Return on investment

Pangasius farmers have an investment ratio of 1.04. This is comparable to the findings of Ngo (2008) and Sinh and Hien (2008) showing rates of return for grow-out farmers of 1.13 and 1.12 respectively, with a standard deviation of 1.17. Although returns are positive, they are associated with a high degree of variation and, therefore, risk. The risk inherent in the industry is also indicated by the increasing failure rates of farmers in the Delta (Figure 2). It is likely the estimated 30% of farmers that have remained profitable in 2009 are the larger industrial farmers who account for between 91.4% of the total export production.

The results show that the average production costs of pangasius grow-out farmers are US$462,729 per hectare per year or US$240,649 per hectare per crop (Table 5 and Table 6). However, the later figure differs considerably by size of farm, with larger farms being considerably more efficient than smaller farms in their production costs. Overall, pangasius grow-out farmers make a return on investment of 4.2% higher than many other industries, with medium and larger farmers receiving returns of up to 16.2%. However, these returns are offset by the large number of smaller farmers that have made a loss in recent years. As argued in chapter 1, the wider trend in the industry of farmers leaving aquaculture production in recent years also demonstrates the high risk nature of grow-out production.

Nursery farmers and hatcheries also have considerable costs, but only 39% and 54% of the costs incurred by grow-out farmers. Nursery farmers are also the most profitable with a return on investment of approximately 11%, reflecting the higher risk of mortality in this phase of production. Despite this risk nurseries succeed with 77.9% of their crops; 3% more than grow-out farmers. The failure rate is only 3% higher than that of grow-out farmers; however the impact of a crop failure is considerably more catastrophic for a grow-out operation because of the much higher cost of production. For example, if processing companies refuse to buy the fish or disease kills the fish in the last month of production it can take up to three years before they return to consistent profit margins.

Pangasius aquaculture is a relatively new activity with 55% of the households investing in production after 2003. The large investment farmers make in pangasius means they are less willing to diversify away from pangasius (Figure 12). This is either because of the high returns they receive when production succeeds, or because they need to persist with production to pay off debts. The survey found that grow-out farmers are two times less likely to be involved in trading activities than hatchery and nursing households. However, as maintaining a profit has become more difficult, many farmers have diversified away from production. Information from DARD and DoS (2008) indicates that the number of small and medium farmers producing pangasius fluctuated greatly between 2006 and 2008. In particular, farmers with a pond area less than 0.1 ha have decreased 52%, shifting their production to alternative species such as *Channa* spp. (snakehead), *Trichogaster pectoralis* (Snakeskin Gourami) and *Tilapia* spp..

The survey results show that the annual income of pangasius farmers is five times higher than the regional average of US$538 and 14 times higher than the annual income of fishers (CSO, 2007). Although these farmers cannot be considered poor their relatively high degree of specialization and investment make them highly vulnerable to market fluctuation. As demonstrated by the international economic crisis of 2008 and 2009 it is increasingly difficult for farmers to continue to secure these income levels. The capacity of farmers to specialise or diversify appears to be important determinants of livelihood security.

Table 5. Contribution of the activities to total annual costs and total annual net income

Description	Pangasius hatcheries	Pangasius nurseries	Pangasius grow-out farmers
Total Costs/year (US$)	**28**	**53**	**62**
Mean	250649,02	178717,94	462768,55
Std Deviation	597108,36	477648,42	593893,85
Total Net Income/year (US$)			
Mean	27380,75	21072,91	10208,05
Std Deviation	28956,12	30384,79	42337,16
Net income per capita/year (US$)			
Mean	6416,27	4783,50	2676,70
Std Deviation	7462,26	7034,93	10561,97

Table 6. Return of Investment of grow-out farmers by size of farm

Size of farm	Production cost (US$/ha)	Turnover (US$/ha)	Profit (US$/ha)	Investment Ratio	ROI (%)
<0.5 ha	263516,18	246791,74	-16724,45	0,94	-6,3
0.5 – 1 ha	274838,95	319462,56	44623,61	1,16	16,2
>1 ha	167382,46	195419,63	28037,17	1,17	16,8
Total	240648,59	250856,64	10208,05	1,04	4,2

* Based on DARD and DoS (2008) census of ponds

Smaller pangasius farmers appear to have less potential for growth given their limited land holdings, but they are more able to diversity to other fish species, or alternatively to downgrade from grow-out farming to nursing. If farmers diversify they do so vertically within the industry, shifting their operations to nursing or hatching during periods when inputs for grow-out farming are too high. Overall, farmers have been able to move between these three activities relatively successfully, mainly because the return on investment is also very high, if not higher than grow-out farming.

Our results support previous findings in noting that grow-out farmers are highly dependent on the cost of feed. The value chain analysis estimate that feed makes up nearly 90% of total operating costs. One of the key mechanisms farmers use to cope with poor production or poor market prices is access to informal credit. However, farmers are more able to access credit through informal lenders meaning that any bridging finance comes with high interest rates and, if from their suppliers or traders, often implicit conditions of indebtedness. Given the variability of input prices and market demand is likely to increase in response to the global economic downturn farmers will be faced with periods of greater economic vulnerability.

3.5 Upgrading, downgrading or outgrading

The results of the value-chain and livelihoods analyses indicate value chain governance arrangements hold very real implications for the structure and function of trade in the Mekong Delta. As more than 90% of the volume traded goes to export markets famers are dependent on high market prices to remain profitable. Low compliance with standards regulating these lucrative export markets might mean more fish will be directed into unregulated domestic markets. Consequently, a shift to domestic markets with similar prices to export markets means that grow-out farmers may be able to cope with shifting between channels. However, the higher demand for a variety of alternative fish species in domestic markets may also be a driving factor for smaller farmers to diversify away from pangasius. It remains a question whether it is more likely that these farmers will be the 89% majority of 'smaller' farmers that contribute between 20 and 30% of the production and receive only 4.8% of the net profit (Table 4). The other 11% of 'large' farmers are more likely to consolidate their position in export markets with their stronger connections to the processing companies. For small-scale farmers to remain competitive they may require cooperative forms of production to improve their economy of scale in both production and the costs of compliance.

Small holders are the most vulnerable to changes in the wider changes in political economy of the Pangasius GVC, and this is likely to increase with a shift away from relational modes of governance and implementation of more hierarchical and captive modes, such as vertical integration and international quality standards.

The results of the value chain analysis also show the wider concerns around the position of small-holders in the global pangasius value chain will remain tenuous at best. Such concerns have been presented in international fora such as the WWF Aquaculture Dialogue and now the nascent Aquaculture Stewardship Council. The low value captured by small-holders and their poor bargaining power, and low financial capacity to comply are all notable barriers to negotiating improved terms and conditions for incorporation in the global value chain. Nevertheless, Loc et al. (2010) report that roughly half of farmers consider they have the capacity to diversify away from pangasius production but do not have the willingness to do so (see Figure 12). Their opinion however sits in direct contrast with the realities of their position within the value chain. As we go on to investigate, it appears their continued inclusion will require specific upgrading strategies such as compliance with quality standards and/or improved horizontal and vertical contractualisation. Alternatively they may wish to downgrade to lower risk and lower capital intensive production such as nursing farming. For the smallest, most marginal producers outgrading into the production of alternative species may be their best livelihood option.

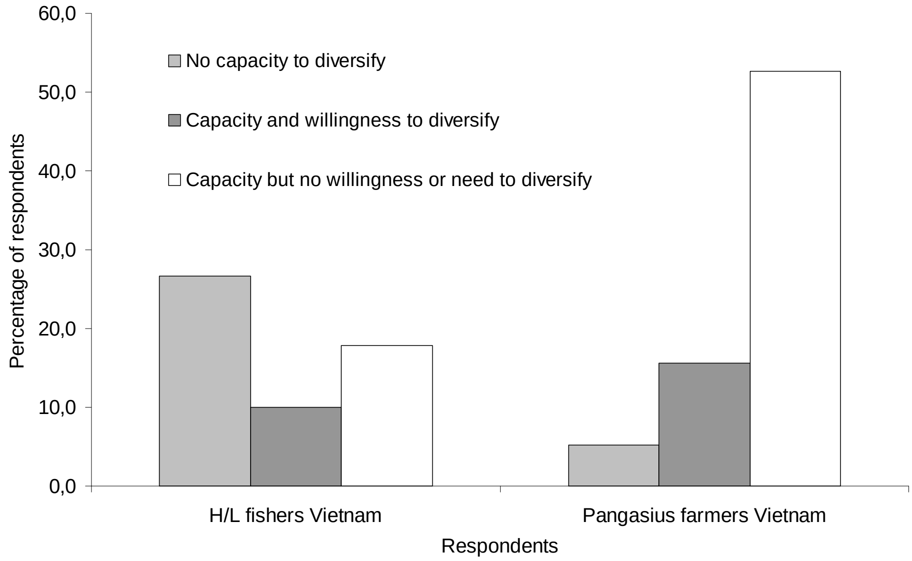

Figure 12. Capacity and willingness of farmers to diversify their primary livelihood activity away from fishing or Pangasius farming.

Source: Loc (2008)

4 Action research indicators

To ensure the objective evaluation of the success or failure of these strategies a series of quantitative and qualitative indicators were developed by the research team. The following explains the relevance of these indicators to the respective upgrading, downgrading and outgrading activities.

4.1 Key indicators of upgrading grow-out and nursing farmers

To determine the degree to which nursing farmers have reduced their vulnerability in the value chain over time and the challenges they face in doing so the following indictors were developed. The indicators are divided up by the three upgrading strategies: horizontal contractualisation through the formation of a cooperative group, vertical contractualisation through improved sale contracts and coordination with processing companies, and upgrading process of production through successful SQF1000 certification.

4.1.1 Horizontal contractualisation

- *Compliance with cooperative law* – compliance is indicated by the establishment of cooperative by-laws, a logo, the election of leaders, and the development of a management structure for provisioning, supply, and product safety and quality. Changes in compliance with the cooperative law are taken as a measure of the durability of the cooperative group over time.
- *Collective production management* – key indicators include the extent to which the management structure of the group organizes changes in environmental (e.g. water quality) practices, the coordination of feed, seed provisioning, the coordination of output and harvesting, and changes in collective management of credit. These qualitative indicators are supplementary to quantitative indicators of environmental quality described below.
- *Group membership* – key indicators include whether membership increases or decreases over time. This is accompanied by a qualitative indication of the main external and internal dynamics play in the choice to entry or exit. Such analysis provides an insight into the trade offs between individual vs. group production strategies.
- *Membership of AFA* – successful membership indicates a change in the bargaining power of the group as well as improved access to information and support services. The 'quality' of membership is qualitatively assessed by how this information and services change over upgrading cycles.

4.1.2 Vertical contractualisation

- *Contract conditions* – improved contractualisation is indicated by the timing and conditions for payment and harvesting are considered key indicators of improved coordination and bargaining between processors and producers.
- *Building trust* – Trust should be established and strengthened through quality. However, we also used qualitative indicators of building trust focusing on whether and how the reputation of farmers improves in response to the quality of their fish.

- *Provisioning strategies* – does the source of seed and feed change as a result of contractual relations, similar to the producer associations? Any favorable credit relations for feed? Any changes in purchasing certified seed?

4.1.3 Certification

- *Product quality and safety* – successful SQF1000 certification implies an improvement in the product quality over time. We consider key indicators of this improvement as a gradually higher proportion of Grade 1 quality meat over time. If the percentage amount of Grade 1 meat changes in each crop then there should be an improvement of the process of production.

- *Environmental quality* – successful SQF1000 certification implies an improvement in the environmental performance of production over time. A key aspect of this improvement is the water quality in certified ponds compared to non-certified ponds in each upgrading cycle.

- *Improvement trajectory* – compliance with certification can be qualitatively assessed through the auditor's reports at the end of each grow-out cycle. The audit reports indicate a degree to which a producer has moved along an agreed 'improvement trajectory' by providing key action or control points for farmers in order to upgrade or maintain their production to the SQF 1000 standards.

4.1.4 Economic and livelihood assessment

- *Return on investment* – a higher return is indicative of the economic incentives farmers have for upgrading the production and position in the value chain. A breakdown of costs also indicates inefficiencies in the production and can be related to how contractualisation does or does no enhance their bargaining power ability.

4.2 Key indicators of upgrading micro farmers

Micro farmers are those farmers with pond area less than 0.23 ha and who have largely now exited the pangasius industry. As such the following are key indicators for upgrading micro farmers:

- *Improved management practices* - as many of the farmers targeted in this activity had already begun farming alternative species to pangasius the project focused on the improved management of selected species. The adoption of these practices is recorded to determine how successful new management practices were.

- *Return on investment* – see above.

- *Value chain diversification* – the successful access to domestic and export value chains for alternative species indicates successful outgrading. Monitoring the terms and conditions of incorporation into these value chains enables a comparison with their former incorporation in the pangasius value chain.

- *Improved income and food security* – as the poorest group of farmers absolute increases in income and food security are measured as a measure of poverty alleviation.

5 Process upgrading by grow-out farmers

5.1 Introduction

This chapter presents the results of support given to family scale grow-out farmers to upgrade their production practices. The objective of this activity is to therefore to determine the extent to which process and product upgrading can improve supply and quality of production, as well as bargaining power with processing companies. The first target group have been assisted with the development of cooperative production groups (horizontal contractualisation) designed to improve their capacity to negotiate sale contracts with processing companies (vertical contractualisation) and reduce costs associated with complying with international standards. Attention focused on individuals within this broadly defined target group with limited access to capital and capacity to invest in improved management practices and poor contractualisation. The three aims of this action research activity were to:

4. Increase collective productive area and output to a more commercially viable scale through horizontal contractualisation by establishing a production group.
5. Coordinate supply and demand in a predictable manner along the chain through vertical contractualisation by negotiation of contracts between farmers and three target processing companies.
6. Improved the production process of producers for compliance with environmental standards & food quality and safety standards.

As outlined in chapter two, SQF1000 certification was chosen because it provided an entry level set of production-based standards which could act as a potential stepping stone to the more difficult environmentally oriented standards now starting to be applied. Indeed, SQF has come under criticism within Vietnam from private sector and NGOs alike because they feel compliance is 'too easy' and there is no market incentive for compliance; either explicit premium or market access. Our justification for selecting SQF was that if family scale producers are unable to meet the requirements of SQF then it is likely they will be excluded from future certification standards such as GlobalGAP, ASC and GAA. SQF therefore provides a test case for understanding the potential as well as the challenges that certification holds as an upgrading strategy.

The following section outlines how the target groups of family scale farmers were identified and enrolled into the project, as well as explaining the main characteristics of these farmer's production before their involvement in the project. In section 1.3 we outline the activities associated with horizontal contractualisation, analysing the rational and challenges of establishing a cooperative group of farmers. We then focus on the challenges of vertical contractualisation before turning to the extent to which farmers were able to upgrade their production practices to comply with SQF 1000 certification. The chapter then reflects on the impact on upgrading to the livelihoods of the target group of farmers.

5.2 Identification and enrollment of key actors

Upgrading family scale grow-out farmers through horizontal and vertical contractualisation requires bringing together a range of related and unrelated state and private sector actors. In the first phase of the project a series of workshops were held with these actors to identify their needs, interests and expectations were in improving the provisioning of pangasius in global value chains. As outlined in Chapters 2 and 3, family scale farmers were identified as the target group because of the impact of market volatility and the increased pressure on them to comply with quality and environmental standards to maintain access to the Pangasius GVC. This section describes the role and interests of key actors involved in the pangasius industry in promoting process and product upgrading by family scale producers through horizontal and vertical contractualisation (as summarized in Figure 13).

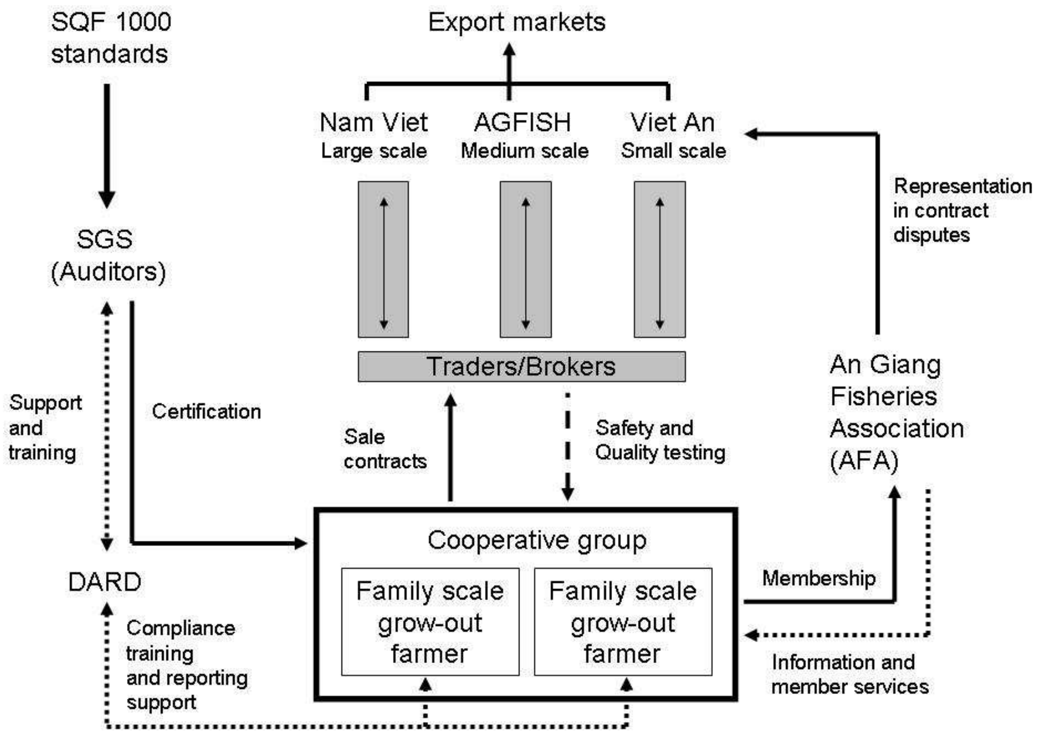

Figure 13. New linkages between key actors as a result of process and product upgrading of family scale farmers

5.2.1 Grow-out farmers

A group of 17 family scale grow-out farmers were selected in both Vinh Thanh Trung in Chau Phu district and Hoa Lac commune in Phu Tan district in An Giang province. Both communes were selected on the basis of the results of the value chain survey, through negotiations with the Provincial Department of Agriculture and Rural Development (DARD), having been identified as a typical commune in terms of having a large number of family scale farmers. Both communes are also within a new pangasius zoning area established by the DARD and the Provincial People's Committee. Vinh Thanh Trung was also selected on the basis of an existing relationship with An Giang University through previous research projects on rice farming. In the context of an action research project this relationship was seen as providing certain advantages given existing rice-based livelihood data existed for the community and there was a high degree of trust needed for farmers to enroll themselves into upgrading activities.

Vinh Thanh Trung and Hoa Lac are located approximately 40 km north of Long Xuyen, the capital of An Giang. Both communes were sites of early pangasius pond aquaculture in the mid to late 1990s. The target group of farmers in both communes were among these early adopters having farmed pangasius for between 10 and 12 years. As Schut (2009) notes these two communes are also characterized by a high percentage of family scale farms located away from the main channels of the Hau (Mekong) River on secondary and tertiary canals. The size of these canals has significant impact on water quality and land holdings along them is usually limited to small, well established plots converted from rice farming.

The scale of pangasius farms in Vinh Thanh Trung is larger than in Hoa Lac. Taken together the size, number, location and experience of producers in the area of these two communes provides relatively representative examples of family scale pangasius farming in the Mekong Delta (see Table 7). An important difference is that farmers in Vinh Thanh Trung have no income from rice, having converted all of their fields to pangasius production, while the Hoa Lac target group had an average income from rice of approximately 15 million VND (US$938) in 2008.

Table 7. Comparison of livelihoods in Vinh Thanh Trung and Hoa Lac.

Statistic	Hoa Lac	Vinh Thanh Trung	Mekong Delta
Farming system			
Average land holding (ha)	2.95	3.02	1.20
Average rice area (ha)	2.3	0.87	1.02
Average total pond area (ha)	0.62	2.1	-
Average number ponds	1.9	2.5	-
Crops per year	1.5	1.7	-
Human capital			
Education	7	11	7
Previous SQF Training (%)	72	85	-
Household size	4,5	4.5	4.3
Male family members	2	1	1
Female family members	1	1	1
Income (US$)			
Pangasius	5213	20140	11621
Aquaculture (general)			663
Rice	938	-	1231
Other	99	-	2841
Total	6250	20140	4735
Per capita	1388	4475	1101

Note: Hoa Lac and Vinh Thanh Trung data from project survey of Pangasius farmers, Mekong Data survey VLSS (2008) and Loc (2010).

Family scale farmers in Vinh Thanh Trung and Hoa Lac are well above the rural poverty line of 2.4 million VND (US$150) per year. However, as also indicated by the value chain analysis in Chapter 3, family scale farmers are highly vulnerable. Given the large number of these family scale pangasius farmers in the Mekong Delta it is possible their exit from production will have some impact on the overall wellbeing of rural communities – depending on what alternative livelihood activities they adopt. Phuong et al. (2007) found that the daily preparation of home-made feed made what they term 'traditional' farms (feeding with combination of farm-made and manufactured pelleted feeds) and 'semi-intensive' farms (feeding only with farm-made feed) the most labour intensive production. Their results show that these farms require higher levels of full time, part time and casual labour than larger 'intensive' farms using only manufactured pelleted feeds. Although this increases costs it demonstrates the importance of these farms in providing part-time labour in rural communities, especially for landless households.

During the diagnosis and implementation phases of the project two cost breakdowns of the enrolled farmers, calculated through farmer recall of their last production cycle, indicate the very marginal nature of family scale pangasius farming. The results from the baseline survey of target farmers presented in Table 8 show the cost structure for the second half of 2008 (Loan 2009). On average during this period both 'control' farmers and those eventually enrolled in the project made a substantial loss of 10% on investment – approximately 180.3 million VND (US$11266). These loses were driven by the combined effect of oversupply in the industry leading on from the large extension in pangasius farming during 2007 (see Belton and Little Forthcoming) and higher production costs following peak oil in July 2008 (see Chapter 2).

Table 8. Cost breakdown of production for the period July to December 2008.
Based on two project surveys conducted by Loan (2009) and Duijf, 2009 #2985}

Inputs	Project farmers (n=19) VND/kg			Control farmers (n=52) VND/kg		
	Minimum	**Maximum**	**Average**	**Minimum**	**Maximum**	**Average**
Fingerlings	0,02	0,14	0,08	0,02	0,16	0,08
Chemicals and drugs	0,00	0,11	0,03	0,00	0,07	0,03
Feed	0,61	0,93	0,74	0,59	0,91	0,77
Interest	0,00	0,11	0,05	0,00	0,07	0,03
Sludge removal	0,01	0,03	0,01	0,00	0,02	0,01
Pumping	0,00	0,03	0,02	0,01	0,04	0,02
Labour	0,00	0,04	0,01	0,00	0,03	0,01
Total input costs	0,64	1,38	0,94	0,76	1,30	0,95
Selling price	0,78	0,94	0,84	0,73	1,13	0,85
Production (t)	72	175	129	37	300	118
Profit/Loss	0,15	-0,44	-0,10	-0,03	-0,17	-0,09
ROI	0,23	-0,32	-11	-0,04	-0,13	-0,10

As a result of lower prices farmers held on to their fish for up to 14 months – more than double the average grow-out period - while waiting for demand to pick up again (*ibid.*; Loan 2009). This led to a double bind for producers. The linear rise in feeding prices and parallel drop in the value of 'oversized' fish meant farmers increased costs while running down their value of their stock. Compounding this problem was the added interest repayment on existing loans from the AgriBank and Joint Stock Bank at 1.9% per month, and the cost of extra loans from informal sources to cover feeding costs at interest rates of 3.4% per month (see Table 9). These conditions led to an average variable costs for crops during this time of approximately 2.6 billion VND (US$168148) and 4.4 billion (US$280246) per ha – approximately 180% higher than costs from 12 to 18 months prior (Phuong et al. 2007).

As seen in other production systems in Vietnam, most notably intensive shrimp production (EJF 2003), the balance between debt and high returns means farmers are reluctant to leave production all together. With losses of around 10% and returns of 17% farmers remain confident that one failure can be made up within one or two future grow-out cycles. Their optimism is also driven by a degree of path dependency that is illustrated in this and the following chapters. Once farmers have converted their rice fields to ponds they are unable, unlike inland and coastal shrimp production to reconvert their land. Many farmers would also be unlikely to do so given they earn between 5 and 10 times more income from one pangasius crop than they do from one rice crop.

Table 9. Credit arrangements for target family scale producers for July to December 2008

Source	Bank	Private	Total credit	Total variable costs
Total credit per crop (US$)	61447,37	20230,26	81677,63	168148,91*
Credit per unit fish (US$/kg)	0,33	0,17	0,50	0,96
Interest rate per month (%)	1,71	3,35		
Average term (months)	11	2		
Total interest	12519	1378	13897	
% feed cost	49,01	16,83	65,15	
% of total variable costs	36,54	12,54	48,57	
% Loan to income	-179,56	-545,40	-724,96	

Note: Costs for an average pond size of 0.6ha.

The results from the second monitoring survey in the first half of 2009 (Table 10), represents a slight improvement in cost structure (based on an MSc survey conducted as part of the project, seeDuijf 2009). The figures show that those farmers harvesting after the main period of oversupply in 2008 had lower costs for most inputs, most notably feed which makes up approximately 80% of total cost. Feed remained one of the most volatile production costs given that local supply of marine fish for homemade feed is subject to seasonal fluctuation (Sinh 2007) and industrial fish meal is subject to international fuel prices given most is imported from South America (Bosma et al. 2009). The farm gate price of fish remained relatively similar to those at the end of 2008 leaving project farmers with a slightly smaller loss of 5% and control farmers with an 11% profit. The main difference between these crops therefore appears to be the timing of harvesting, which demonstrates the importance of coordinated production either through improved vertical contractualisation with processing companies or through improved horizontal coordination between producers.

A more structural source of vulnerability for pangasius farmers is in contract negotiations with processing companies. Indeed, one of the reasons the farmers were interested in joining the project was the opportunity to renegotiate these contracts in more favorable terms. Based on the results of the survey of farmers, we identified four ‘types’ of contract being used by processing companies. These contracts range from those with favorable terms, labeled Type 1 in Figure 14, often agreed in advance and with full payment on delivery to the contracts with less favorable terms, labeled as Type 2-4. The Type 1 contract is usually negotiated by farmers who have a good track record with the company, or at times when the company is experiencing a short-fall in supply. The other three types of contracts are together more common (see Figure 14) and far less favorable to farmers, giving processing companies delayed dates to harvest the fish and a further delay in providing payments.

Table 10. Cost breakdown of production for the period January to June 2009
Based on two surveys conducted as part of the project reported by Duijf (2009)

Inputs	Project farmers VND/kg			Control farmers VND/kg		
	Minimum	**Maximum**	**Average**	**Minimum**	**Maximum**	**Average**
Fingerlings	0,04	0,08	0,07	0,02	0,13	0,05
Chemicals and drugs	0,00	0,05	0,01	0,00	0,04	0,02
Feed	0,57	0,99	0,71	0,06	0,97	0,63
Interest	0,01	0,11	0,05	0,00	0,05	0,03
Sludge removal	0,00	0,03	0,01	0,00	0,02	0,01
Pumping	0,00	0,08	0,02	0,00	0,03	0,02
Labour	0,00	0,02	0,01	0,00	0,02	0,01
Total input costs	0,62	1,37	0,88	0,09	1,25	0,77
Selling price	0,69	0,98	0,84	0,74	0,97	0,85
Production (t)	40	330	123	40	450	160
Profit/Loss	0,07	-0,39	-0,04	0,65	-0,28	0,08
ROI	0,11	-0,28	-0,05	7,04	-0,23	0,11

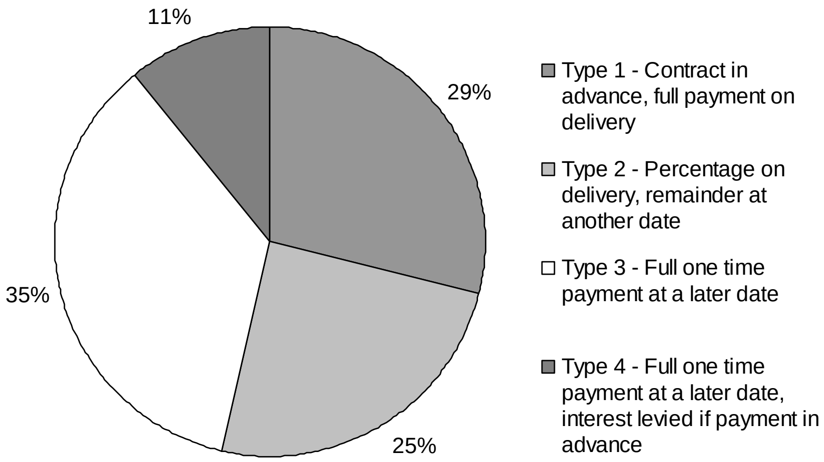

Figure 14. Percentage frequency of different types of sale contracts for family scale Pangasius producers

The final price of the fish is not agreed upon until the day of the harvest. Instead a floor price is negotiated providing the farmer a starting point in the negotiations. Delaying the harvest allows processing companies to put pressure on farmers who, during this time continue to feed the fish at rates proportional to the their increasing size (Phuong et al. 2007). This gives the processing company opportunity to both regulate their supply in the event of large orders, as well as maintain pricing pressure on farmers. In many cases the contracts payments are made in both specified and unspecified installments, between 20 to 45 days after harvest. These delays benefit processing companies by allowing them to avert cash flow problems – especially those seen during 2007 and 2008 when processing companies were adversely affected by events in Russia, the EU and Egypt (Bush and Duijf 2009). However, these payments often lead to increased transaction costs for farmers who, in some cases, continue to accrue high levels of interest on credit for inputs such as feed.

The quality of the fish is the main component of the contract that determines the price of pangasius. Farmers argue that the process of testing these fish is another point of vulnerability, which they argue is not transparent for two reasons. First, they argue that quality testing, which is done by sampling fish during the harvest for the colour of the meat, is too subjective. In principle there are three categories of meat each with different values: grade 1 has white and light pink meat with highest demand in Europe and USA; grade 2 has light cream yellow with high demand in Eastern Europe; grade 3 has yellow meat with high demand in Asia (Khoi 2007). Pricing of these three categories follows a stepwise decline; for example, grade 2 is worth 15% less than grade 1 and grade 3 a further 15% less. Second, they argued they have too little insight into the market demand for these meats, which excludes them from planning for high or low value meat. It should be noted that it is very difficult for farmers to 'plan' for any of the categories of meat, though farmers are aware the effects of water and feed on colour, giving them at least the perception of control. Finally, they argued that safety testing is not transparent because they often have to rely on the company to provide the results. Farmers do not disagree with the methods of testing, which is highly technical in nature, but instead the independence of the companies.

In the preparation phase the government, processing companies and An Giang Fisheries Association all noted that these farmers cannot consistently deliver high quality products. The consequence is that many risk losing their position in international value chains. In the first phase of the project the farmers identified that the formation of a cooperative would enable them to improve both the quality and quantity of their pangasius. They also noted, as supported by the value chain analysis, that improved cooperation and coordination between farmers and processing companies would provide them the necessary security and incentives to further invest in upgrading their farms. The high cost of compliance was regarded by all actors as a major constraint to the ongoing participation of family scale farmers in meeting current and emerging market standards – a point which our results challenge. Furthermore, due to their small size they have been unable or unwilling to gain membership to processor sponsored association such as the An Giang Pure Pangasius Union (APPU) and Viet An Club (Belton and Little Forthcoming).

The farmers also noted that in order for them to upgrade their production processes support was needed from other actors. They argued that AFA, which the farmers thought had underrepresented family scale farming interests, should take a stronger lead in providing access to credit and take more responsibility for facilitating the transfer of new technologies and techniques. Farmers argue that DARD should also take a lead in providing further training to increase the capacity of farmers for independent monitoring of quality and safety, thereby reducing their dependence on what they perceive as biased testing by processing companies. Interestingly they noted that processors also need more training to better communicate the quality control issues to farmers and provide improved and more timely information to help farmers plan production cycles and 'help improve the company's reputation in the pangasius community'.

The fact that processing companies do not provide technical support to family scale producers appears to indicate they have no problems with supply. As the next section illustrates, processing companies currently source between 70 and 80% from preferred, often larger scale industrial suppliers (with ponds >2 ha). Family scale producers remain important for 20-30% of production, which is especially important for periods of peak demand.

5.2.2 Processing companies

Processing companies have experienced enormous growth in the industry since the anti-dumping case in 2003 largely as a result of the diversification into new international markets. As shown by the value chain analysis processors capture approximately half of the total income and profit before the fish are exported. This growth is now being tempered by challenges to the quality and safety of pangasius products. To consolidate and expand their position in these international markets processing companies must facilitate better management systems to meet international standards. This is particularly important as retailers and consumers in the EU and US are expanding their focus to include environmental and social standards. While the companies have begun developing strategies to overcome these challenges they have been unable to increase the number of farms able to upgrade their process of production.

During the diagnosis phase of the project processing companies noted a series of needs for improving their own provision of fish and, in their view, the position of family scale farmers in the global value chain. Like the farmers they argued that improved 'connections' were required between processors and farmers through improved horizontal and vertical contractualisation. They believed these connections would improve coordination and ensure 'fairer access to fish', in terms of reducing their own competition for a highly cyclical supply of pangasius and the resulting price fluctuation for farmers. However, the processors were clear that these connections should be established by them, drawing on their growing experience with company sponsored satellite farms and producer associations.

Most of the pangasius processing companies have established their own supply chains or have contracts for buying directly from members of their own producer associations. While the companies are able to maintain control over the majority of the provisioning through their size and bargaining power, and enjoy relatively stable international markets and well established consumers, they face the growing challenge of meeting quality standard requirements set by the import markets. However, as Belton et al. (Forthcoming) argues access to these producer associations are limited by a range of social and political factors, with many of the members having close ties to the processing companies, and therefore excluding family scale producers. This processor-led vertical contractualisation is indicative of the shift toward improved supply chain management, both in terms of supply and quality. How such models can be applied for 'unassociated' family scale producers, who provide between 30 and 20% of total supply is addressed in the second half of this chapter.

The two largest producer associations are the AGIFISH Pure Pangasius Union (APPU) and the Viet An Club. APPU was set up in 2004 and currently has more than 80 farmers who supply 70% of the production material for the company. Membership to the Viet An club is based on 2 years experience and a minimum capacity of 50 MT/crop. At present there are more than 20 members contributing around 80% of the companies' total supply. The proportion of supply to the processors by these association members roughly matches the overall distribution of value within the pangasius value chain presented in Chapter 3.

Processor-led vertical integration is a central strategy to gain control over supply and meet increasingly stringent international food safety and quality standards. The formation of these associations has made a clear divide between those farmers that have been granted membership and sell predominantly higher value grade 1 meat, and non-associated family scale farms, who according to processing companies contribute a higher proportion of grade 2 and 3 meat. Bush and Belton (Forthcoming) point out there is no obvious reason why family scale farmers should only be able to produce lower quality fish given the production systems, regardless of size are increasingly standardized – a trend seen in other Southeast Asian species such as tilapia for example (Belton and Little 2008). Furthermore, 'lower value' markets such as the Middle East and Eastern Europe, with lower quality requirements, have also increased their scrutiny of cheap pangasius imports (Bush and Duijf 2009).

Member producers are required to meet basic requirements including buying seed from certified sources, using commercial feed and keeping records of drug and chemical use. In the case of APPU, these standards have led to a new organizational structure for what the AGIFISH regards as 'good management practices'. These include a system of screening farmers before membership is granted, the creation of a 'clean production unit' to provide information and supervise tests batches sent to processing factories, a system of internal auditing of farmers to ensure they meet standards, and coordinating the timing of products to the processing companies. The Viet An club has also set up an organizational framework designed to facilitate better quality control and provisioning of pangasius using SQF1000.

The processing companies also noted their reluctance to develop such groups for smaller farmers. One company interviewed argued they had tried and failed with such groups in the past because of their 'low education' and 'unwillingness to cooperate'. In business terms they also argued that poor supply coordination of these smaller farmers, too much variation among production systems and therefore variable quality of the product led to prohibitively high transaction costs. This in turn made it difficult for the company to either invest in the group, or provide production contracts. He also noted that if these constraints could be overcome family scale production groups may hold some interest for processing companies given the growth of new, 'lower quality' global and regional markets.

The success and increasing popularity of these producer associations indicates the potential of both vertical and horizontal contractualisation to simultaneously upgrade farmers' process of production and reduce their vulnerability in global value chains. After lengthy negotiations three companies, AGIFISH, Viet An (ANVISH) and Thuan An (TAFISH) (see Table 11 for details of these companies), were willing to assist the development of associations for family scale farms to determine whether such arrangements can also help these smaller, more vulnerable producers. These companies, like many of the others approached, were unwilling to provide support because, despite recognising the problems small-scale producers face, they see no incentive to invest time into what they perceive as 'high risk', 'uncoordinated' producers.

However, they did agree in principle to enter into contract negotiations with these farmers should they be able to establish and coordinate their own cooperative groups.

Table 11. Important operation characteristics of three processing companies involved enrolled in the project

Processor	Procurement (%)			Members in producer association	Production capacity (MT/day)	Main export markets
	Own farm	Association/ satellite farms	Other			
AGIFISH	-	60-70	30-40	32	350	Europe, US and Russia
ANVIFISH	-	50	50	10	100	Australia, EU, Japan and Russia
TAFISH	(100 ha farm planned)	-	100	-	200	Europe

5.2.3 An Giang Fisheries Association

The An Giang Fisheries Association is an organisation established after the 2003 US anti dumping case to advocate the interests of producers in economic and political affairs. Their specific objectives are to promote compliance with national fishery regulations, facilitate sale contracts, promote environmental protection and fishery conservation, and represent members in policy formulation. AFA accepts producers, processing and feed companies as official members and Vietnamese expatriate's living abroad, and providing international market information, as associate members. The operation costs of AFA are contributed by membership fees, international project donors and budget from An Giang province. All members have to pay membership fees of 60000 VND per year (US$3.75), but the main operation costs and donation to AFA is contributed by processors and exporters.

There is widespread opinion amongst producers that AFA has not fulfilled its mandate in representing the interests of producers. Smaller producers are especially critical of the role that AFA plays given it's membership is made up solely of 'large' producers, and structural funding comes from processing companies. Overall farmers are very skeptical of the specific role that AFA plays, or think they would be better served if it played a more active role in financial issues. In response, target group farmers made very specific suggestions for how AFA might increase their role in supporting upgrading activities. They argued the association should take a stronger lead in providing access to credit and take more responsibility for facilitating the transfer of new technologies and techniques. They also suggested that AFA should provide loan guarantees – showing a clear misunderstanding of the association's capacity and role.

Bringing AFA in to better support family scale farmers therefore raised a series of questions. Could the organisation fulfill their mandate to assist farmers to better negotiate contracts or arbitrate when contracts were not honoured? What role might they play in providing more technical support in independent testing? And, what information could they provide to farmers and what impact would this have on their decision making?

5.2.4 DARD, SGS and SQF

The close relationship between DARD, Société Générale de Surveillance (SGS) and SQF was implemented through NAVIQAVED/SGS project to develop VietGAP standards from 2003 to 2007. As outlined in chapter 2 the provincial government has an interest in increasing the number of farmers that are certified for food safety and quality. SQF is seen as the lowest bar in terms of quality standard compliance, previously linked to the BMP programme of the government as they sought to develop a VietGAP standard. The level of the standard has now been surpassed by the range of standards outlined in Chapter 2. They were adopted by the project because they were the only available set of standards at the time and provide a test case for compliance with the more involved standards such as the forthcoming GlobalGAP and ASC standards.

The SQF standards cover three areas of the production process: 1. Preparation of pond and stocking of fingerlings, 2. Feeding and health management, and 3. Harvesting (see Table 12). Pond preparation and stocking include issues related to the construction, management of pollution streams through water and sediment and sourcing of high quality fingerlings. Feed and health management include limits for drug and chemical use as well as guidelines for optimal feeding. Harvesting guidelines focus predominantly on sanitation, including the detection of banned drugs and chemicals and guidelines for increasing quality of meat by altering feeding in the last days of production. All three categories of standards refer to both international best practice in terms of optimizing production as well as national and international legislation for environmental and food safety limits and thresholds.

Table 12. Upgrading actions on grow-out farmers to attain SQF 1000 standards certification

Upgrading activity	Standard	Control reference
A. Preparation of pond and stocking of fingerlings		
1. Site of pond	• Aquaculture zoning	Reference to Decision 3354 Dec 2007 of An Giang People Committee on Aquaculture Zoning.
2. Pond construction	• Pond construction according technical specifications	Standards and technical specifications provided by Document 28 TCN 55:2009 of STAMEQ (Vietnam Standards System)
3. Preparation of pond	• Pond preparation following specified process • No use of forbidden chemicals	Forbidden chemicals for treatment of pond listed in MARD specification document.
4. Water management	• Control of pond water environment following standards of GMP • Checking water source before taking in water to pond	Water quality control following standard of GMP. Pond water quality specified in NAFIQAVET document.
5. Stocking of fingerlings	• Control of fingerling according to GMP and quarantine of fingerling before stocking • Procure from certified sources, sellers having government permission	Fingerling meeting standards & technical specification provided by Document 28 TCN 170:2001 of STAMEQ
B. Feeding and health management (feed, water quality, feeding method, health management)		
1. Feed	• Purchase of materials from certified suppliers, having certification of governance body • Checking of material before processing • No use of forbidden antibiotics • Control by GMP	Following standards of Vietnam and demand of importers. Forbidden antibiotics listed in MARD guidance.
2. Feeding and health management	• Provide sufficient feed • Daily monitoring of feed ration • No use of forbidden antibiotics specified in guidance of MARD	Following current standards of MARD and demand of importers and meeting hygene and safety food.
C. Harvesting		
1. Sanitation guidelines	• Controlled by SSOP (sanitation standard operating procedure) and GMP. HACCP Based Program for Quality and Safety Assurance • No use of forbidden antibiotics specified in guidance of MARD • No feeding of fish 2-3 days before harvesting	Following demand of importers.

The implementation of SQF standards is part of a wider government mandate for assisting small farmers to maintain their position in the pangasius industry. The government mandated the involvement of small holders in the export oriented economy of Vietnam through Decision 80 *Liên kết "4 nhà"*, designed to link farmers with processing companies. To promote the compliance of small farmers with quality standards the provincial government of An Giang has provided financial and technical support to farmers. The high cost of certification up to 35.2 million VND (US$2200) has led to a subsidy designed for farmers who want to apply for certification. The government will pay 30% of the total costs. To comply for the subsidy the farmers have to be in the production zones and be certified through MARD. To date only four farms have received this subsidy and all were members of large processor associations.

DARD and SGS have also developed a close relationship in terms of compliance training and auditing. SGS has outsourced much of the day-to-day training and auditing to DARD. Although raising some issues related to the independence of audit and extension organisations, as outlined under ISO 65 (see Mutersbaugh 2005), the programme has continued to be promoted. Nevertheless, the low number of farmers applying for certification, indicating it's rather limited success to date, has made it difficult to evaluate its potential in generating improved production practices and higher quality fish.

5.3 Horizontal contractualisation - The Tan Phu Clean Pangasius Club

The first activity of the project after identifying the target group of farmers in Vinh Thanh Trung and Hoa Lac communes was to facilitate investment in horizontal contractualisation through the formation of cooperative groups. The collective form of a 'cooperative group' was chosen because it provides the farmers with a legal status under the 2007 Cooperative Law. The aim of this horizontal contractualisation was to implement a formal production unit that would be able to increase their bargaining power within the value chain and provide a platform for group certification. In terms of research, the experience of group formation provided an opportunity to assess whether horizontal contractualisation can reduce the vulnerability of producers to market variability while also providing a 'community based' institutional basis for upgrading the environmental performance of production.

5.3.1 Group formation

The main assumption for this activity was that horizontal contractualisation through the formation of a cooperative group would improve information transfer between farmers, improving their bargaining power with both input suppliers and processing companies, reduce the cost of SQF compliance and provide a platform through which innovative farming techniques would emerge. The first indicator of the extent to which horizontal contractualisation was successful was whether membership increases or decreases over time, as well as qualitative indicators of what the main reasons for entry or exit were. It is expected that such analysis provides insights into the trade offs between individual vs. group production strategies.

The project established two cooperative groups, one in Hoa Lac and the other in Vinh Thanh Trung. Membership was initially attractive to the farmers because they are granted a legal status under the cooperative law meaning they could advertise and, it was hoped by all farmers, improve the legal authority of the government to enforce contract law. This issue was particularly important to the farmers given their belief that the conditions of contracts were firmly not in their favour and because the government had so far exercised little enforcement in breeches of contracts. In negotiation with DARD and SGS the two production groups were then joined together under a single entity – the Tan Phu Clean Pangasius Producers Club. The legal status remained at the level of the two village cooperative groups, but by joining the two in the 'club' the cost of certification was reduced and the scale of production was increased to 32 farmers. To ensure the agreement was legally binding both groups signing the certification documents.

The broader changes in the industry from 2007 to 2009 meant that a total of 18 farmers did not complete the first upgrading cycle (Figure 15). Even though this meant they were not actively participating in upgrading they retain their membership under the by-laws of the group. Some stopped production altogether, while others pulled out of the certification process because they saw there was no economic incentive being offered by the processing companies. Many of the farmers remained skeptical of the benefits that the group could bring to them, but did not want to disassociate themselves from what, in their mind, held potential to improve their livelihoods. Because the by-laws made a provision for farmers who want to join the certification in a later production cycle by allowing them to maintain their membership, with an additional fee, others were more strategic, waiting to see how the other farmers faired before joining themselves.

In the second phase there was a further reduction in the number of farmers participating in process upgrading activities. Only nine finished the second phase, of which only three were farmers continuing from the first cycle. The additional six farmers were existing members of the cooperative group who decided to join in the activity. Those farmers that pulled out did so because of uncertainty in the market, difficulties in gaining credit, or because the processing companies did not honour the farmers contracts (see Box 3). In most cases the farmers who continued to produce pangasius raise concerns about free riding as they are included in the group certification and benefit from the growing reputation of the Tan Phu Clean Pangasius Club.

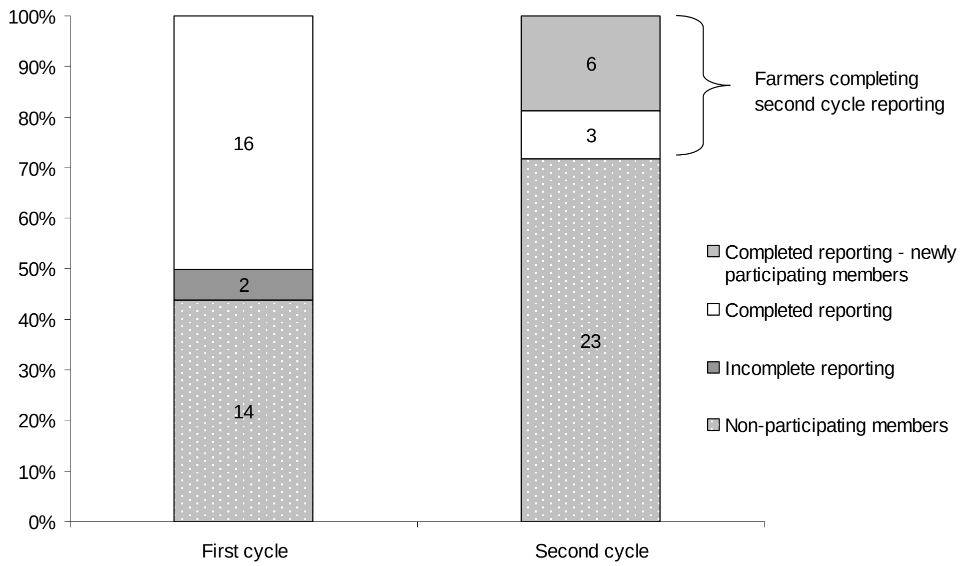

Figure 15. Participation of Tan Phu Clean Pangasius Club members in SQF1000 recording activities in the first and second production cycles

Box 3. Reasons farmers temporarily stop recording SQF audit documents

1. **Mr. Đỗ Chí Trung (anh Hà):**

- The economic risk is too high because the market price of fish is currently too low (12.600 đồng/kg) and unstable
- The bank has stop releasing credit which means operating capital is too uncertain

⇒ *Continue growing cycle but significantly reduce feeding because lack of capital*

⇒ *Will resume participation in recording when the situation improves.*

2. **Mr. Võ Thanh Nhàn:**

- Banks (AgriBank) stop releasing credit => producers do not have enough operation capital to start another cycle

⇒ *Sold fish 2 months earlier (14.100 đ/kg) breaking even because of reduced interest payments*

3. **Mr. Hồ Ngọc Lợi:**

- Record keeping started in April 2009 but not regularly, done by farmer's wife. Farmer is busy at village administration office.
- Farmer considers that SQF upgrading is highly beneficial: able to improve management of feed (type, quantity, sources, quality) resulting in saving costs, lower incidence of disease, lower death loss, meat quality improved: more white.
- Traders and buyers have not paid attention to SQF certification and pay no premium price for quality fish.

⇒ *Will resume participation in recording when prices increases*

4. **Mr. Nguyễn Văn Sơn (chú 9 Xê):**

- Farmer considers that SQF upgrading is highly beneficial: able to improve management of feed (type, quantity, sources, quality) resulting in saving costs. The reason why not continue recording is do not see any incentive from price premium.
- Temporarily stopped growing because market price of fish too low, processors do not honor contracts, delay in payment.

⇒ *Will resume participation in recording when companies honour contracts*

A number of farmers noted that those that chose not to be members were doing so strategically. Reports circulated that those that have pulled out of the certification process, but maintain their membership, and even other non associated farmers that lived within the two villages, would still try to sell their fish under the Tan Phu Clean Pangasius Production club name. Because of the small nature of the group and their close ties, both spatially and familial, it seems unlikely this strategy would succeed. The cooperative group by-law states that members are responsible for monitoring and enforcing any breach of contract internally. However, the group has not yet stipulated what penalties these breaches would entail. It is also unclear what jurisdiction those acting outside the group fall under.

The strategic nature of membership is also illustrated by the group certification process. The group by-laws state that if one of the farmers loses their certification then all the farmers lose their certification. All of the farmers were aware of the risk of joint certification and the responsibility to follow requirements for the complying with the standards. To minimize the risk associated with this requirement, some of the members of the group were elected as 'controllers' who are responsible for monitoring the internal compliance to the cooperative group's by-laws and ensuring all active members are on track to certification. These controllers and the cooperative by-laws, are supported through the commune level people's committee and also assisted by commune level fisheries extension officers who provided support to farmers with documentation.

Over the course of the project membership to the collective group also brought an unexpected benefit. Farmers commonly reported their joint ownership of the group as a common asset of the community, giving them a new common identity in an increasingly high risk and uncertain industry. As the first cooperative group of its kind in the pangasius industry the Tan Phu Clean Production Club has also gained the attention of government and private sector alike.

5.3.2 Structure and function of cooperative group

A major accomplishment of the Tan Phu Clean Production Club was compliance with the 2007 cooperative by-laws and in doing so establishing a legally recognized management structure for managing provisioning, supply, and product safety and quality. This was an achievement not least because of the disbelief by both government and processing companies that it was possible with small scale farmers. The accomplishment is also notable given the continued skepticism of farmers of collective organizations having experienced the failures of government collectivization programmes of the late 1970s and early 1980s (see for example Beresford 1990; Kerkvliet 1995). How the management structure changed over the duration of the project in response in compliance with the cooperative law is taken as a measure of the durability of the cooperative group.

The project has been able to capitalize on the new cooperative law by developing consensus on the form and structure of the Club. This has been achieved though ongoing negotiations with the farmers with the support of the commune fisheries extension officers – both of whom have undergone training and received technical and financial support from the project. The main output of the formation of the group has been the formulation of the production group by-laws with assistance from a legal expert - presented in Appendix Box A. The by-laws define the principles of organization and operation and the responsibilities of the group members, including the full commitment to meeting the quality standards set out by SQF 1000. The central organizational principles of the group sets out the financial responsibility of individuals to the success of the group, the freedom of association of members and decision making procedures. The by-laws also set out in clear terms the obligations of members to comply with the SQF standards and adhere to financial and data requirements of certification.

Quality control and compliance support was established on the group and commune government level. The two controller positions were established in discussion with SGS. Their role is to provide a first level of monitoring to ensure that all farmers comply with the standards – including both production techniques and reporting. They are also responsible for taking water quality measurements throughout the cycle (using equipment supplied by the project) to monitor drug and chemical usage. The controllers are supported by the DARD staff in the commune who assist with documentation and interpretation of technical indicators. This two tiered construction of monitoring has the important function of reducing the cost of compliance and increases technical support and ensures a greater chance of compliance.

The legal status of the group has also meant they receive full recognition by the commune officials. Disputes within the group will first go to a vote within the group. If no resolution is reached the commune level office provides further adjudication – including any further necessary reference to other laws and decrees. To ensure the financial security of the cooperative group the members are asked to pay an individual fee of 60000 VND per year (US$3.75) – the annual costs of membership to AFA. Although a token amount this fee has been instrumental in creating a sense of trust amongst the farmers. With further success the group plans to levee a harvesting fee on members to ensure a long term income stream.

5.3.3 Provisioning strategies and credit arrangements

There was a clear shift from homemade to industrial feed between the first and second upgrading cycles – outlined in detail below. The main driver for this change was a combination of price and compliance with the SQF 1000 rather than any internal group pressure of process. Nevertheless, it was observed that the farmers did tend to change practices collectively, through a combination of information sharing and replication of neighboring practices. Such shared experience may well be linked to the group as a platform for innovation.

The group was unable to provide a functional provisioning function, increasing bargaining power for either home made or industrial feed. In the first phase the famers were particularly reluctant to change the source of rice bran, soybeans (or cassava), and either marine fish or fish meal given their reliance on small traders for fresh ingredients. This is especially necessary for marine fish traded through diffuse trade networks from Ca Mau and Kieng Giang provinces. As all the farmers shifted to commercial feed in the second cycle it was expected the group would assist in negotiating a bulk price. However, once again the farmers opted to buy their feed individually. It is not clear why they did so other than individual provisioning remained the norm or convention for the farmers.

The group also aimed to increase their bargaining for credit. As part of an overall government policy to subsidize interest rates from around 12% to only 4% per year. This means that, on average, farmers were able to save approximately 13.2 billion VND (US$8260) per year on their loans. To receive the loans the farmers must show they have technical support, farm in the designated pangasius farming zone. There is little difference between these farmers than other individual farmers. Most of the farmers have outstanding loans with the bank. The farmers fit all the requirements for the interest rate subsidy – they grow fish in a growing zone, sale contract from a processing company. The credit needs to come from the Bank of Agriculture and Rural Development (Circulate No. 02/2009/TT-NHNN 2009). Prior to the establishment of the group most of the farmers did not know how to access the subsidy. The cooperative group enabled the farmers to access the subsidy because the project staff were able to assist them with documentation.

Table 13. Credit arrangements for target family scale producers for first and second upgrading cycle

Source	First upgrading cycle		Second upgading cycle	
	Bank	Private	Bank	Private
Total credit per crop (US$)	55600		51300	
Credit per unit fish (US$/kg)	0.52		0.45	
Interest rate per month (%)	1.1	3.4	1.1	3.4
Average term (months)	8		8	
Total interest	4900		4500	
% feed cost	78		63	
% of total variable costs	58		47	
% Loan to income	460		250	

The farmers did comply with sourcing certified fingerlings from the AGSC. In both Vinh Thanh Trung and Hoa Lac the farmers did not buy directly from the centre but from one of the certified nursing farmers attached to the centre's nursing network. As outlined in Chapter 6, fingerlings are on average 300 VND (0.02US$) more expensive than non certified fingerlings, indicating farmers are willing to pay a higher prices for quality seed. Despite this the farmers did not use the cooperative group as a platform to negotiate better prices or changing provisioning of fingerlings. As seen with feed, the reason appears to be a combination of convention and the fact the starting dates for farmers were not completely aligned in the two grow-out cycles.

One of the key findings of the group formation was that the information about drug use improved between farmers. According to farmers this was because of improved and up to date information from AFA the interaction between members was higher, and also because through the certification *process* of reporting they became more aware of what was legal and illegal, as well as the amount of drug and chemical use and timing of its use.

5.3.4 Changes in production management

An indicator of the impact of group formation is also the extent to which the management structure can organize changes in environmental (e.g. water quality) practices, the coordination of feed, seed provisioning, the coordination of output and harvesting, and changes in collective management of credit.

As expected by the farmers, information sharing has been facilitated by the formation of the cooperative group. This function has proven more important, at the current early stage of the group development, than collective purchasing or bargaining. Farmers in the group meet every two weeks to share information on a range of issues related to feed, seed and drug use. These meetings also play an important role in ensuring that compliance with the SQF standards are also monitored, again through sharing information and dealing with any problems the farmers face. The commune fisheries technicians are also present at these meetings to provide any advice or information and help with any accounting or auditing issues.

One of the innovations from group formation was collective water management in Hoa Lac and Vinh Thanh Trung villages. Sedimentation ponds are a key part of all government and private standards for pangasius as a means of reducing the total nutrient load in discharged water (see Anh et al. Forthcoming). Government legislation states that water should not be directly discharged to the canal or rivers, but for many farmers their ability to comply by constructing a sediment pond is limited by the size of the land. In both Hoa Lac and Vinh Thanh Trung the cooperative groups have overcome this individual constraint by building a canal for inlet water and outflow water. In both cases the irrigation system has been modified to pump wastewater to the rice fields. In Vinh Thanh Trung the water is pumped collectively into one channel. In Hoa Lac the farmers pump water individually, but because they are located nearby to each other they are able to make use of a communal sedimentation pond before draining the water into the adjacent rice fields. The sludge from the sedimentation pond, which contains the highest levels of nitrogen and phosphorous, is removed and brought to a common field to dry and then used as organic fertilizer.

Although communal sedimentation ponds have increasingly been proposed by the government and technical aquaculture circles, there are few working examples. The Hoa Lac system is therefore a test case. How replicable this system is remains to be seen. One of the reasons the system was so quickly adopted was because the field was donated to the group by one of the farmers. He has received no compensation for the use of the field, which was not in use and low in value. The average land price in Hoa Lac is increasing, but is currently worth around 20000VND (US$1.25) per square meter (Pers. Comm. Hoa Lac People's Committee 2009). If the farmers ha to buy the 0.1 ha it would have cost them 1248000 VND (US$78) between each of the 16 farmers in the first cycle and 2208000 VND (US$138) between the nine farmers in the second cycle. Given this equates to between 11 VND (US$0.0007) and 20 VND (US$0.001) per kg of fish the cost for compliance would have in any case been negligible. The individually cost of a sedimentation added 160 VND per kg (US$0.01) to the cost of production, or between 8 and 15% of total profit for family scale farmers.

Despite the technical success pumping water into the fields has led to conflict the rice farmers within the two villages. The rice farmers plant 2-3 crops per year in the adjacent fields protected from flooding from the Mekong dyke. In the dry season the farmers have to pump water from the canal to fields for irrigation. On the other hand, the dyke construction also means that in the wet season they have to pump water out. The costs for pumping are covered by the rice cooperative group which owns the pumping station. Pumping costs are covered by an annual water fee payable by members – including some of the pangasius farmers. The conflict arose between the rice and pangasius cooperative groups over increases in pumping costs from pangasius wastewater irrigation. The rice farmers argued that the cost of pumping out of the rice fields in the wet season has increased. In response the pangasius cooperative group argued that the water they pump into the area in the dry season reduces the pumping costs in the dry season and there is a balance between these costs. Moreover, the pangasius farmers argue that the water they pump is also nutrient rich, and therefore reduces the cost of fertilization to the rice farmers.

Anh and Mai (2009) reported on the water quality benefits of sedimentation pond in Hoa Lac province. They found that the approach reduces the pollution from discharged water and improve the rice production through reducing up to 40 to 50% of fertilizer cost. In a controlled experimental site in Can Tho province Phong (2009) argues that costs can be reduced by 30%. It appears both figures are likely to be optimistic given fertilizer costs make up around 60% of total production costs for rice. The average total cost of rice production is VND 8 million (US$500) per ha of which VND 4.8 million (US$300) is fertilizer (DARD 2010). This means that that with an average rice area of 2.3 ha in Hoa Lac, farmers are saving approximately VND 3.2 million (US$200) per farm. Conversely, Phong found that the rice yield in wastewater rice fields is poorer and farmers still had to balance the nutrients with chemical fertilizer, adding approximately 1.2 million VND (US$75) to the total costs.

The disagreement between the rice and pangasius cooperative groups was brought before the commune office for adjudication. As argued above, the only reason that the office was willing to hear the complaints of the pangasius farmers was because they had legal representation as a cooperative group. After considering the case the commune office found that all of the pangasius farmers active in the Club had to collectively pay 25% of the electricity bill, worth approximately 7.8 million VND (US$475) per farmer, or approximately 76VND per kg of (US$0.005) for the three months of the wet season, to pump the water out of the rice fields.

5.4 Vertical contractualisation - selling contracts

The establishment of a collective group of pangasius farmers was a major success of the project representing a clear example of upgrading. The farmers involved have made a series of changes in the production practices, but from a GVC perspective innovative within the production system have to placed within the wider social and economic context of international market trends and actors. This section outlines the results of attempts made by the project to (re)negotiate vertical contractualisation between the collective group and processing companies. The following describes the negotiation process between the group and companies and changes made in the contract conditions before briefly discussing how this process has impacted the terms and conditions of small holder incorporation in the Pangasius GVC.

5.4.1 Contract negotiations

The most difficult activity within this project proved to be facilitating negotiations between processing companies and members of the Tan Phu Clean Pangasius Club. As outlined in Chapters 3 and 4, processing companies maintain considerable power over producers and there is a clear tendency towards complete or partial vertical integration of supply. The contribution of small holders in providing only 20% of the total production (and 11% of the total value) considerably reduces their bargaining power. Nevertheless, this group of farmers remains important for the wider rural economy of An Giang province. After lengthy negotiations the project was able to negotiate three trial contracts; the first two between producers in Hoa Lac with Agifish and Tafish, the third between producers in Vinh Thanh Trung and Anvifish. The following describes the specific position of companies *vis-à-vis* small holders in contract negotiations and outlines the specific details of this new contract.

Before enrolling in the project none of the processing companies had production contracts with small holder farmers, but instead sale contracts with farmers arranged two to four weeks prior to the end of the grow-out phase. This provides considerable flexibility to the companies and reduces their liability. Famers also maintain a degree of flexibility with these contracts, providing them a clear pricing strategy in times of high demand, but leaving them vulnerable during periods of oversupply. Producers with ties to the processor sponsored associations, such as the An Giang Pure Pangasius Union, also do not have a written contracts. Given their social and political ties with the companies, as well as their large scale of operation, it is more likely they receive favorable contract conditions (see Belton and Little Forthcoming). This is not exceptional given, perhaps with the exception of organic value chains, selling contracts are common across the aquaculture sector in Southeast Asia.

The processing companies require delivery of a large quantity of fish at one harvest. The companies wishing to reduce their transaction costs have tended to minimize their procurement from small producers. They use large producers for the bulk of their regular product and use small producers when demand exceeds forecasts. The companies also see large farms as 'lower risk' given they have the capacity to invest in quality upgrading and have better management of the production. There was a clear reluctance of all the processing companies to buy with smaller farmers because they believed they were not able to gain certification or provide high quality fish. The low capacity of small holders has limited their ability to negotiate selling contracts. The project has facilitated a change in attitude towards these small producers arguing that by horizontal contractualization small farmers in the target group can coordinate the production cycles, can reduce transaction costs and produce 'lower risk' fish.

One of the central negotiation points was SQF certification. The companies made it clear from the start of the project that they would not pay a premium for the fish, with the requirement that small holders be SQF certified to demonstrate a reduced safety and quality risk. The lack of a premium remained a central issue for many of the farmers, with many leaving active participation with the cooperative group in response. Those who stayed in the group did so on the expectation of maintaining market access and the expectation that certification will increasingly become the norm for the industry. However, the contract negotiations over SQF certification demonstrate a clear dilemma for farmers: they need certification in order to get a contract, but cannot get a contract unless they invest in certification. Because processing companies were only willing to provide sale rather than production contracts the farmers receive no guarantee of market access after upgrading and certification.

Another reason for the delay and disinterest in negotiating contracts with small holders was the wider economic uncertainty in export markets in 2008 and 2009. The oversupply of fish in 2008 clearly illustrates the poor bargaining power of small producers and the cyclic supply and demand nature of the industry, largely caused by the latent capacity in small holder sector. The fall in demand meant there was little to no incentive for processing companies to invest in small holder contracts. During the negotiations they postponed any decisions relating to smaller farmers because of this oversupply. This again demonstrates how difficult it is for smaller farmers to negotiate incentives for upgrading in certification or vertical/horizontal contractualisation.

5.4.2 Contract conditions

The project has been active in facilitating discussion on the content of sale contracts, including improved timing of harvest and payment conditions. A specific target was reducing the high transaction costs associated with interest rates on credit as a result of slow payments and poor contract conditions. Contract conditions were able to be changed, but there remains contradictions between contract conditions and SQF certification, and it also remains difficult to determine the extent to which transaction costs have been reduced. The contract outlines basic requirements such as the size of fish and a list of banned substances. Despite the companies also requiring the farmers to meet the SQF 1000 standards they made no reference to this in the contract. This is largely because each of the companies have developed their own internal sets of quality standards which they include into their contracts. In practice the terms of the contracts are not very different – for example, all make reference to nationally banned substances and national sanitary requirements. Most of the contracts also stipulate that the cost of testing shall be born by the farmers, which again is not new, but from the perspective of the farmers has been improved through the formation of the collective group.

There are some contradictions between conditions in the contract and the process that the project was trying to negotiate. Most notably the processing companies would not agree to make explicit reference to the SQF1000 standards. Other contracts used by the processing companies also do not make mention of production standards. The reluctance is understandable given that processors are only interested in sale contracts rather than production contracts. They are able to reduce their own costs of monitoring and assessment by simply focusing on their own core set of quality and safety standards. Nevertheless, the processors do require HACCP based monitoring of their own producer associations, such as the An Giang Pure Pangasius Union, and are beholden to such standards within their own vertically integrated production systems; especially when an international party is involved.

The most important change in the contract conditions was in relation to payment and delivery. The contract makes explicit the date of delivery within a three day window. This was considered an important change by farmers given the variability of previous delivery dates and the implications this had on increasing feeding costs. The new contract also states that payments are made in cash on delivery, which reduces costs associated with interest repayments, but by the end of the second cycle farmers felt there was little improvement. As presented by many farmers during project workshops, the processing companies may have agreed to the new contract, but in reality purchasing practices did not change. Farmers too were reluctant to tie themselves to the conditions of the contract negotiated by the project on the basis that they believed they would limit their own potential income.

Table 14. Average payment terms of contract payments in the first and second cycle

Company	Number of contracts (n=22)	Average farm gate price (US$/kg)	Payment length (days)	Number of installments
Afiex	2	0,88	45	3
Agifish*	3	0,92	40	3
Namviet	3	0,90	57	4
Ntaco	1	0,88	30	2
Saomai	1	0,93	40	3
Thuan An*	6	0,92	30	2
Viet An*	5	0,90	47	4
Vietfish	1	0,89	45	4
Average		0,91	41	3

* Companies involved in the project

Table 14 shows that in fact four processing companies did offer higher potential prices than those offered by the companies involved in the initial contract negotiations. It also shows the number and conditions of contracts after the two upgrading cycles. While Viet An, Thuan An and AGIFISH had the largest share of sales to the group five other companies also purchased fish from the cooperative group. The conditions were relatively similar between the companies yet all marginally lower than the 2009 average farm gate price of 14967 VND/kg (US$0.94 per kg; Personal Communication DARD An Giang, December 2009). The conditions of all of the contracts were overall better than the Type 4 contract that many of the farmers selling to Nam Viet had received prior to the project. Even so, many were still unable to get payment in full and within a shorter period than experienced previously. In fact whereas many farmers had received payment within 20 days in 2007 and 2008, they were receiving payment between 30 and 57 days in 2009 and 2010. With interest rates of 1.1% per month and 3.4% per month from private sources in these years, such delays are adding between 31 and 64 million VND (US$1981 to US$4008) in repayments, representing between 2 and 4% of total operating costs of family scale farmers, and between 12 and 53% of profit (as explained below).

5.4.3 Changes in provisioning strategies

Farmers could be more strategic when it comes to the use of feed to determine which value chain they feed into. Instead they are selected to some degree by the processing companies. The three companies involved in the project all have different quality requirements – highlighting again the variability in factors that determine production. TAFISH require high quality meat for it's main markets of Spain – farmers tend to use trashfish at the start of the production cycle and industrial feed at the end of the cycle. Anvifish is the only processor in An Giang able to continue to export to Russia in 2009. Anvifish has not established its own supply areas like Agifish. The farmers selling to AGFISH mainly use trash fish – this is not a problem because they sell to Russian and Ukraine markets which have a lower quality requirement, accepting yellow meat.

One of the benefits sought by farmers of horizontal contractualisation was to increase their bargaining power for inputs such as feed. After both upgrading cycles they were unable to coordinate the purchase of feed. The reasons for this failure relate to the type of feed used. Industrial feed is provisioned predominantly through processing companies, who extend credit to the farmers as a means of locking farmers to sell their produce. Alternatively, the processors facilitate feed companies to provide feed on credit. As all credit arrangements in the production group are made on an individual basis, there is little scope for increasing their collective bargaining power. Trash fish is used in much smaller quantities and is highly perishable making it difficult for collective bargaining.

5.4.4 Building trust

One of the underlying objectives in the contract negotiations was to improve the trust between processing companies and producers. In project workshops and throughout the contract negotiations both parties expressed considerable mistrust and skepticism over each other's ability to meet any contractual agreements. Trust was first addressed by improving quality. As outlined in the following section, the SQF 1000 certification was an important mechanism in this respect.

It is too soon to judge whether the overall reputation of farmers has been improved through the project. The Tan Phu Clean Pangasius Club has provided the first brand for small scale pangasius and the successful SQF certification of 12 farmers has certainly been seen as an accomplishment by private and state actors alike. A longer time period is needed to determine whether these institutional changes will translate into improved market trust as has been seen with the processor sponsored associations such as APPU. In a surprising turn at the end of the project three farmers from the collective group were approached by Thuan An to enter into discussions around a new form of production contract. They are now in the process of getting GLOBALGAP certification indicating that SQF 1000 was a sort of stepping stone, providing them with the necessary awareness and skills to continue upgrading their production and position in the GVC. Whether this discussion will turn into a contract, or what impact this will have on the collective group is yet to be seen. Nevertheless, it does provide an indication of the willingness to continue with new innovative relations with small holders.

One interesting finding was that all of the processing companies involved in the project have made an implicit regionalization of pangasius quality based on geo-physical conditions. They argue that in certain regions within An Giang, especially in the northern part of the province, the soil acidity reduces consistency and colour quality of the meat. Hoa Lac and Vinh Thanh Trung fall within one of these regions. By comparison Tuot Noc district in Can Tho province is regarded as producing higher quality fish because of the water quality. Notably, this district has also been long associated with high quality rice production. There is no scientific evidence that fish from Chau Phu district is in fact of lower quality, but this regional characterization appears to have also undermined trust building through vertical contractualisation. It may also be used as a narrative in negotiations over grading and pricing. Further research would be needed to determine if this regionalization has been transferred into prices.

5.5 SQF1000 certification

The impact of certification is evident from both a quantitative and qualitative evaluation of practices along what might be considered an 'upgrading trajectory'. Improvements to production was assessed at the group and individual farmer level for feed, health care management and efficiencies in water pumping. In addition, the audit reports indicate whether and how a producer has upgraded their practices or infrastructure in relation to the SQF 1000 standards. The following addresses the extent of the changes made by the 12 farmers that finished the two upgrading cycles.

5.5.1 Training and support

The preparation phase of the project lasted from March to June 2009 and focused on preparing collecting data on the farmers that were interested in the upgrading process see Table 15). It was also during this time that the capacity of DARD and AFA was developed to support farmers in their upgrading activities. Both groups had considerable training on SQF 1000 prior to the start of the project, but very little experience had been accumulated on implementation because either farmers did not see any benefit of certification. As a result, extension services were not asked to assist. This situation made it relatively easy for the project to enter as the main challenge was not introducing what SQF was, but instead supporting the relationships and initial support necessary for both farmers and government staff to start the upgrading process.

To ensure farmers have been working progressively towards meeting their individual upgrading plans the project team has been monitoring their progress on a weekly basis through the commune fisheries officers. Supporting DARD staff enabled them to go to farmers and provide the necessary support for documentation and technical upgrading. Such activities are within the remit of DARD staff, with the project providing necessary motivation for this work. The specific benefits this brought to the farmers are outlined in turn.

Upgrading plans for individual farms outlined the specific steps that farmers need to take in order to be certified by the end of the first upgrading cycle in August 2009. The monitoring and evaluation indicators and training plan were discussed with farmers. Internal follow-up audits with individual farmers were conducted at regular intervals by DARD technicians.

Table 15. Timing and action points of upgrading training

Time	Actions	Method & Objective
Fourth week of March 2009	Farmer commitment to produce Pangasius to meet safe product SQF. Forming farmers group, group decision on organization structure, preparation of operation rules, and election of leader and planning of activities for 2009. Training of farmers on SQF process	Establishment of collective group
First week, April 2009	Evaluate pond site and farm infrastructure of each farmer. Identify the site location and the pond identification in the site plan, site in relation to its surrounds and location of buildings, pens and storage and feed preparation facilities	Meeting, evaluation condition of each farm
Second week April 2009	Starting upgrading process following SQF 1000	Training, on-farm workshop
Second week April 2009	Guiding farmers keeping record, documentation of practices, use of inputs, water treatment, and fish health management.	Distribution of document and recording forms. On-farm guiding at each farm
Weekly, from Second week April 2009	Monitoring farmers recording and documentation activities of each farmer. Support farmers in corrective actions	Weekly visit to each farmer
Last week of April 200	Three farmer group become AFA group members. The first group members of small *Pangasius* farmers of AFA	Full AFA group membership of the three farmer group
Fourth week, May 2009	Club of Clean *Pangasius* Production established. Name and logo of the club: Tan Phu Hygiene *Pangasius* Production Club. Elected chairman (Mr. Lý Công Tâm) and vice chairman (Mr. Phạm Văn Bi) and secretary (Mr. Võ Thanh Nhàn). Office located at the house of Mr. Tam (Hoa An hamlet, Hoa Lac village)	AFA decision to rectify the establishment of the club
Middle of June 2009	Inauguration meeting of Tan Phu Hygiene *Pangasius* Production Club	Attendance of AFA executive vice chairman (Mr. Binh), DARD, District offciers of Chau Phu and Phu Tan, AGU
End of June 2009	Completing legal procedures, logo of the union.	Coordination with AFA

5.5.2 Seed quality and growth rate

A 'major must' of SQF certification is buying seed from certified sources – either the An Giang Seed Centre or one of their satellite nursing farms. In the first cycle 10 of the 14 enrolled farmers sourced seed from the AG Seed Center. In the second phase all SQF farmers had certified seed from the AG seed centre. The delay between the first and second phase demonstrates the difficulties in breaking existing relations with trusted but non-certified hatcheries. The shift away from decentralized to certified sources again illustrates a central trade-off between wider rural economy versus more centralized provisioning of services such as seed and feed.

The project attempted to measure improvements in the growth rate of production between grow-out phases. The results from the first grow-out period show fall within a normal range for pangasius (Figure 16), giving a grow-out period of 130 days. Unfortunately no comparison could be made between the first and second cycles because of errors in data collection. The basis for any comparison is that the grow-out period was also 130 days. Normally the shift to industrial feed would be expected to shorten the grow-out period by 20 to 30 days (Phan et al. Forthcoming). But because farmers stock smaller fingerlings they extend the grow-out period back to the full 130 days.

In first cycle farmers stocked an average of 3.5 cm fingerlings at 22 per m^2 and in the second they stocked an average of 106111, 2.5 cm fingerlings at a stocking rate of 17 per m^2. There was no recorded difference in mortality rates between the first and second period. The smaller fingerlings were worth 1186 VND (US$0.05) worth 800 VND (US$0.07) each respectively. Farmers chose this strategy in the second phase to reduce startup costs. Choosing for smaller fish equated to a saving of 24 million VND (US$1494) or 160 VND (US$0.01) per kg.

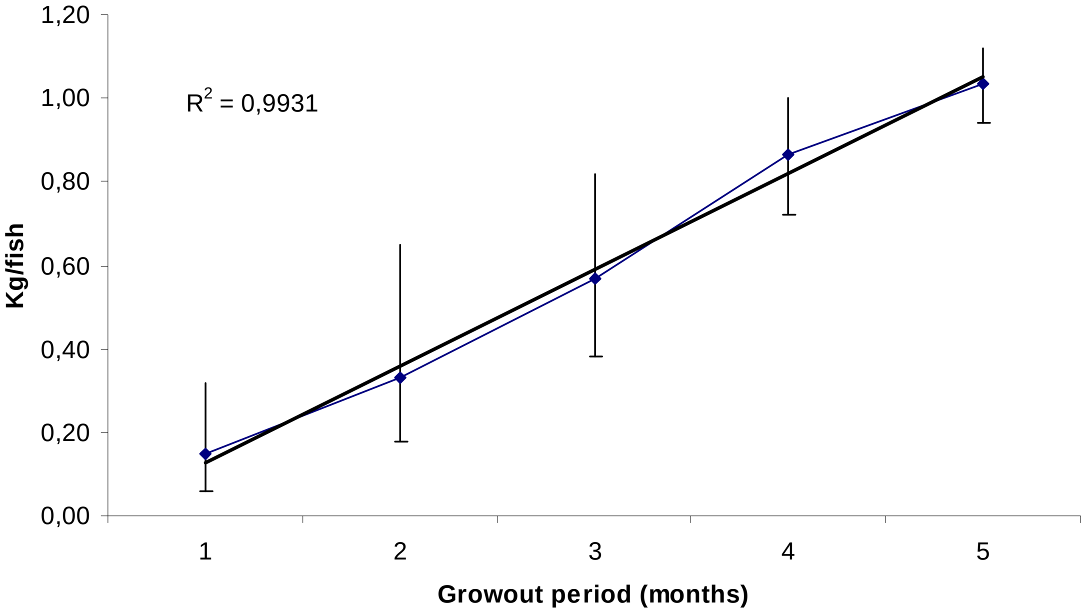

Figure 16. Growth rate for selected grow-out farmers in the first upgrading cycle (n=11)

5.5.3 Feed

A central part of the SQF 1000 standard is recording and monitoring the use of feed. The farmers enrolled in the project clearly understood the nutrient requirements of their fish and how to control the protein percentage according to growth stage of fish. In addition, all of the farmers recognise the disadvantages of using homemade feed given the variation in nutrient content, the difficulties in storage and the link to poorer water quality. The farmers were advised to use industrial feed by processing companies and the government for a number of years in order to improve the quality of meat and reduce pressure on coastal marine forage fish (Chapter 2). It was not until a series of factors combined that the farmers decided to shift from homemade to industrial feed.

The most influential factor was that feed became a more stringent requirement as part of vertical contractualisation negotiations with the processing companies. The final incentive came when the price of marine fish increased from 5000 to 5500 VND/kg (US$0.31 to US$0.34), making it only 1500 VND/kg (US$0.09) less expensive than industrial feed. The results show that the total cost for marine fish used in homemade feed was on average 529.2 million VND (US$33077) for an average pond area of 0,6 ha, or 1.3 million VND (US$79879) per ha, while industrial feed cost 518.2 million (US$32384) for an average 0,48 ha pond on the entire grow-out cycle, equivalent to 1.3 million VND (US$82370) per ha (Figure 17). These figures are on average lower than those of Phuong et al. (2007) who found per hectare feed costs of between 785.4 million VND (US$49086) for home made feed using 'traditional' farmers and 1.4 million VND (US$89343) or semi intensive farmers.

The extra cost of using industrial feed is therefore 39.9 million VND (US$2491) per hectare. However, because the higher average harvest in second phase the unit cost of industrial feed was the same as marine fish mix in the first phase at 11680 VND (US$0.73) per kg.

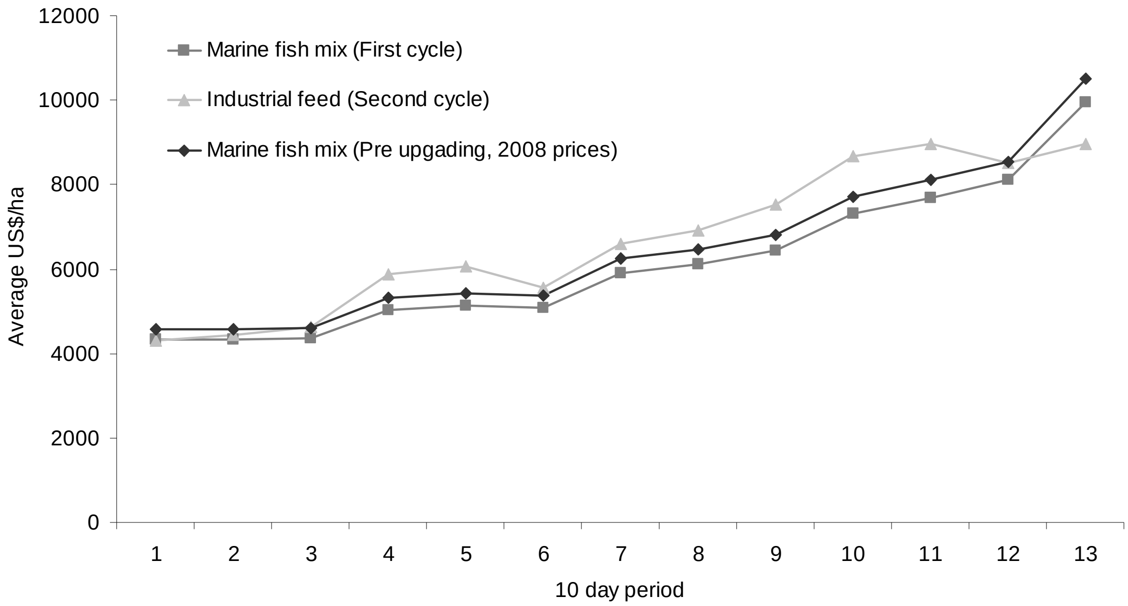

Figure 17. Average per hectare expenditure for homemade and industrial feed per 10 day period in pre, first and second cycles.

Note: the average pond size of the target farmers in the first cycle was 0.48 ha and 0.6 ha in the second cycle.

5.5.4 Drug and chemical use

There is high variation in the practice of drugs and chemicals with more than 60 generic brands used for the treatment of pond water before stocking of fish and for health management – including vitamins, mineral supplements and antibiotics prevention. Many of the farmers reported having little formal knowledge about the use of these drugs and chemicals. Most of traditional farmers based on their own experience and the advice of drug agents to determine the amounts and timing of application. Only one of the farmers, with a university degree, knew the specific use of the drugs and chemicals.

Overall, 15 types of probiotics and vitamins were used for treating ponds. Lime is the most popular, with an average of 59 kg used by all of the farmers. Just over half of the farmers also reported using salt both to treat their ponds before stocking and during growing cycle. Other chemicals are used for treating water such as BKC 90, Zeolite and Chlorine. A further 29 chemicals are used in feed including nutrient supplements, minerals, vitamin supplement, premix and yeast. Vitamin C is the most commonly used feed supplement, used by 65% of farmers.

There was a marked difference between the first and second cycles in terms of probiotic and vitamin use. Very few of the farmers use the same brand name of drug with the exception of Vitamin C Mix, Nova-Antishock and Novazyme F. The average application quantity varies according between 0.2 and 3.5 kg, with an average of 2 kg per application. In the second phase the average dose was considerably less, ranging between 1 and 1.4kg (see Figure 19), and the period of application was considerably shorter, both reducing costs and improving water quality.

It is difficult to determine a correct application given the variation in production conditions. The results indicate a higher frequency of drug and chemical application at the start of the grow-out cycle but higher dosages at the end of the cycle (see Figure 18 and Figure 19). The farmers explain this pattern as a strategy to protect fish from disease and promote the highest level of growth when they are relatively small, vulnerable. They also reported that by virtue of recording they became more judicious in the application of probiotics in the second phase. It is also apparent that the farmers stopped using any pro-biotics in the last 20 days of the cycle to improve, according to them, the quality of the meat. Because only three farmers continued into the second phase it appears there is a degree of shared learning in application of drugs and chemicals.

The lower volume of supplements and vitamins used by the farmers in the second cycle led to considerable cost reductions. In the first cycle the farmers spent a total of 62.1 million VND (US$3882). This was reduced significantly to 11.1 million VND (US$696) in the second cycle. In terms of unit costs this equates to a reduction from 480 VND (US$0.03) in the first phase and to 160 VND (US$0.01) in the second cycle.

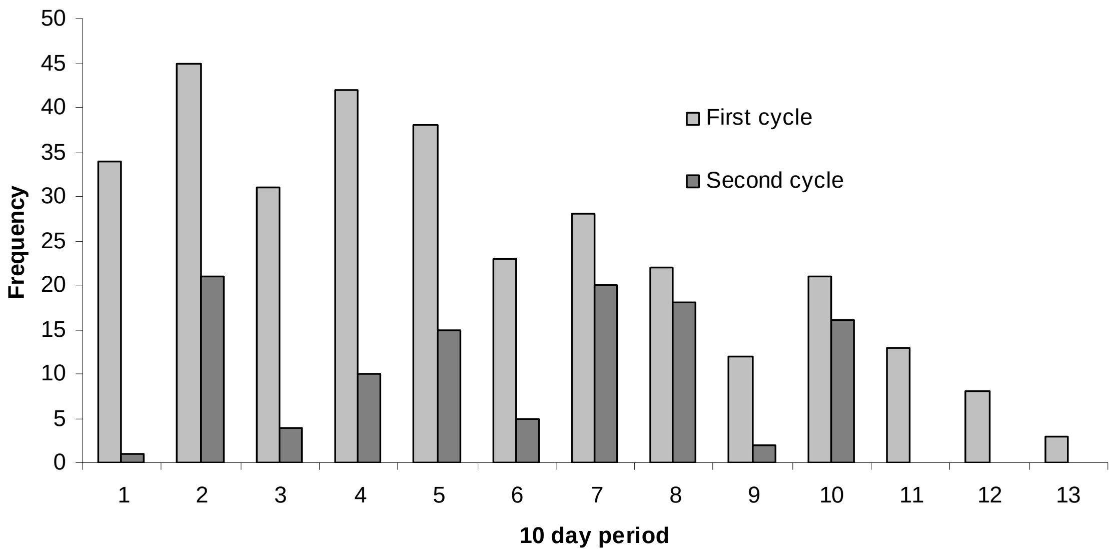

Figure 18. Frequency of drug and chemical application to feed mixes per 10 day grow-out period

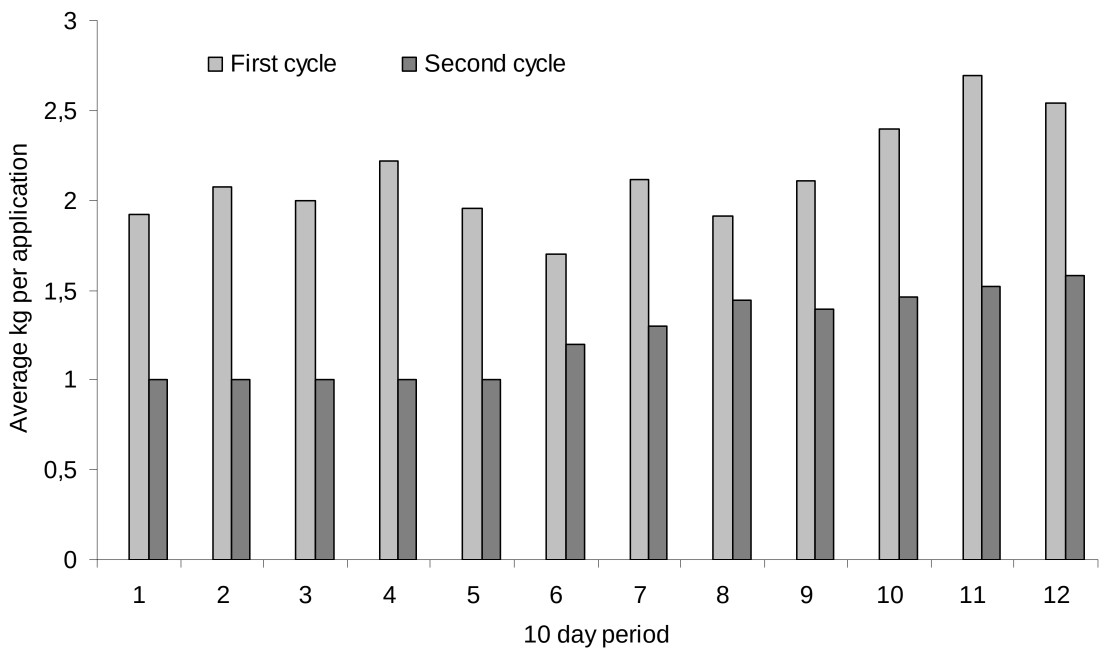

Figure 19. Comparison of the average application of probiotics per 10 day grow-out period in the first and second cycles

5.5.5 Improvements in water quality

Successful SQF1000 certification also implies an improvement in the environmental performance of production. An important aspect of this improvement is the water quality which was measured in certified ponds and then compared to non-certified ponds in each upgrading cycle. The results from the last month of each grow-out cycle, indicate a clear difference in the overall water quality of the pond (Table 16). Most of environment indicators of waste water taken from traditional farmer ponds are higher than waste water criteria specified by the national Vietnamese standards for water quality (TCVN 5945:2005), particularly NO_2 and TSS. Discharge water from SQF ponds satisfy the requirements of the national criteria. However, with the exception of total nitrogen the measurements are less than the average for pangasius farming reported in Chapter 3.

Despite showing a clear environmental improvement in water discharge the farmers expressed a clear concern that the measures they were taking were of little benefit to the long term quality of their production. Their main concern was that despite their efforts to improve water quality exiting their ponds the water they pump in from public canal exceeds the national standards. This central concern indicates that farmers may be unwilling in the long term to adopt voluntary standards if there is little material individual incentive to upgrade production. However, regulating farmers to replicate the collective water treatment systems established in Hoa Lac and Vinh Thanh Trung may overcome immediate farmer concerns of acting in isolation.

Farmers reported pumping less in the second phase because of the lower stocking densities and overall better water quality. Many of the farmers did not record their electricity and diesel costs making it difficult to assess the real cost of pumping. However, farmers reporting that the lower stocking rates and the use of industrial feed meant they had to pump less. We estimate the pumping costs to have declined by 200 VND/kg of fish (US$0.01 per kg) from the first to the second grow-out period.

Table 16. Water quality parameters for Hoa Lac village. Source: Anh and Mai (2009)

Pollutant	Unit	Average concentration	Pangasius pond water and sediment	Discharged from sedimentation pond	Public canal	Rice field	Vietnamese National standard 5942-1995 Category B
TSS	mg/L	61.0 (3.5 – 274.2)	6497	47	860	211	80
BOD5	mg/L	22 (10 – 78)	-	15	300	33	25
Total N	mg/L	4.0 (3.2 – 6.0)	45,6	6,1	28	12,2	-
Total P	mg/L	1 (0.4 – 2.21)	22,67	0,58	10	0,35	-
Coliform	MNP/ 100ml	317.32×10^4 (63.2×10^4 – 640×10^4)	-	93100	-	46100	10000

5.5.6 Changes in quality and safety

In terms of safety none of the fish from the group had any banned substances detected. As such all of the farmers were successful in selling their fish to the processing companies. Improvement in quality was measured by the proportion of grade 1, 2 and 3 fish. Before the project all of the farmers sold their fish as grade 2. Their expectation was that upgrading the production practices through SQF1000 would improve the quality of the fish and as such the grade of their fish. After the first upgrading cycle 12 of the 17 upgrading farmers believed there was a quality improvement in terms of speed of growth or health of their fish. However, when it came time to sell the fish there was no change in the proportion sold as grade 2 meat.

It is nonetheless difficult to distinguish the real difference in the quality of the fish as it is largely determined through a negotiation at the point of harvest. As Figure 20 illustrates, agents that come to purchase the fish are solely responsible for determining the grade of the fish. The grading of the entire harvest from a pond is determined through a sample of five fish. The proportion of grades 1 to 3 meat within this sample are then used to calculate the value of the total contract value. Given the timing of this negotiation, providing the farmer with little to no bargaining power at all, it is difficult to assess whether the grading is a true reflection of the real quality of the fish produced.

Figure 20. Agent checking the quality of meat before final negotiation over farm gate price

In following each of the farmers through their contract negotiations it emerged that the all of the fish from Hoa Lac and Vinh Thanh Trung were classified grade 2 by the agents. Some of the sale contracts made a distinction between two subcategories "grade 2 *đẹp*" (or 'beautiful') and "grade 2 *bình thường*" (or 'ordinary'). The price difference between these two categories is between 200 to 400 VND/kg (US$0.01 to US$0.02). In general farmers in Chau Phu district sell only grade 2 fish - in contrast with downstream Thuot Not district that is rumoured to sell mainly grade 1 fish. The grade 2 meat in Chau Phu is thought to be caused by the widespread use of homemade feed in Chau Phu, as well as what many processing companies regard as poor soil conditions. This contradicts the notion that water quality determines meat quality given that Thuot Not is downstream. It is also likely that the farmers in Chau Phu have less bargaining power, but it is not immediately apparent why this might be the case.

5.5.7 The benefits and challenges of reporting

One of the problem areas farmers faced in complying with SQF 1000 certification was to keep up to date and accurate records. There is no culture of keeping organized records on their production activities, despite these farmers investing billions of VND in a production cycle, much of which is on credit. As such, it proved difficult to motivate farmers to write down their activities in the SQF pond diary and input logs. Over the course of the first grow-out cycle it became apparent that about half of the farmers found it difficult to keep correct or complete records. As a result the project team and fisheries officers devoted considerable time to ensuring that farmers not only kept good records, but understood the link between record keeping, farm management and certification. Of the 17 farmers that completed the first grow-out cycle three pulled out of the certification process because they failed to keep records. The main reason they gave for pulling out was a lack of economic incentive, thereby, perhaps, indicating highlights the scepticism of some farmers as to the benefits of certification.

The half of the farmers that did make it make through the certification exercise, and as such kept records, reported benefiting from record keeping. In fact, the exercise of keeping records revealed what might be labeled a 'learning dividend'. Such a learning dividend refers to the improved efficiencies in production that many of the farmers experienced. The exercise of keeping improved records enabled farmers to reflect on their farming practices. In some cases this led to radical changes in production inputs from the previous grow-out cycle to upgrading.

The benefits of reporting in both achieving certification and the implicit learning dividend associated with efficiencies means farmers that failed to keep up their reporting jeopardize the group certification process. In principle, the failure of one member to either upgrade their production or report on there production, means that the group is ineligible for certification. Ensuring that all farmers do comply therefore not only places pressure on individual farmers but also on the cooperative group to provide management support and enforcement of the cooperative group's by-laws, governed under the Cooperative Law. According to the Law each of the members of the cooperative are obliged to follow the by-laws set out by the group. In the case of the Tan Phu Clean Production group this means complying with the SQF 1000 certification. If farmers do not meet their obligations they are required to compensate those other members for any damages lost. Although this is a serious measure to take there is provision for compensation under Article 9 of the cooperative law.

Overall, though, the future of the group remains in question. The movement in and out of production by the farmers demonstrates different approaches to risk and benefit. The composition of the group changed in both upgrading cycles. Even though SGS granted the certificate in the first cycle some farmers subsequently defected while others joined in production and recording. The group will be recertified in 12 months time during which time SGS will take a random sample of farmers to test compliance. The likelihood of having complete records for the previous 12 months is unlikely given that only three of the original 32 farmers have records for the two grow-out cycles. Despite this the reputation of the group has continued to grow with processors and the government leading to a dilemma regarding free riding. Those that have not discontinued recording still fall under and benefit from association with the certified Tan Phu Pangasius Production name. How the cooperative group deals with a loss of good will and defection is yet to be seen.

Compensation is a common means of dealing with externalities in Vietnam. However, the experimental nature of the production group means there is little incentive to enforce the by-laws internally. It also appears that the commune, the legal arbiter of the cooperative contract, is also not inclined to intervene in the early stages of the cooperative. The commune has taken a central role in managing conflict within rice cooperatives in both Hoa Lac and Vinh Thanh Trung in the past. They also took a lead in the negotiations between the pangasius and rice farmers over the dispute over payments for water pumping in Hoa Lac. Based on these interventions it is expected the commune, in collaboration with will take a future role in the pangasius cooperative group.

A more likely mechanism for ensuring that farmers comply with the reporting requirements of certification is social pressure within the community. Again, the experimental nature of the certification means that half of the farmers initially enrolled in the cooperative group are playing a 'wait and see' strategy before deciding on whether they will enter into an upgrading cycle. The experience of rice farmers is that once benefits in the cooperative gained a degree of legitimacy, either through reductions in input costs (such as pumping), or reduced conflict in access to water, they invest directly in complying with the by-laws of the group. Certification brings a new dimension to the cooperative structure, and with it external auditors. It is expected the influence of these external actors, and the response to their assessments by farmers, will only become apparent over a longer time period.

5.6 Livelihood impact

Improvements to the livelihoods of small-holder grow-out farmers are framed in terms of reducing their vulnerability within the Pangasius GVC. All three upgrading strategies were designed to determine the extent to which this group of farmers, at the edge of being excluded from the industry, could (re)negotiate the terms and conditions of incorporation. This section assesses the impact horizontal and vertical contractualisation on this incorporation and associated impacts on farmer livelihoods.

5.6.1 Costs and benefits of upgrading

A key question of the project was to determine what incentive farmers have to upgrade their production and position in the value chain through certification. One of the main reasons that SQF1000, as well as many of the voluntary standards available to pangasius farmers have not been successful to this point is that farmers see no benefit in compliance. Either the farmers believe that the cost of compliance is too high or the added effort required to report outweighs the marginal benefits. The results of the project challenge this view. The farm gate price for farmers did not increase as a result of certification – i.e. no price premium was paid by processors for SQF1000 certified fish. Although negotiations within the project focused on providing an premium, it was not a surprise processors were not willing to pay more for a HACCP based standard, governing what they consider a non-competitive issue of safety and quality. What the results do show is improvements in production efficiency that provide what might be termed an 'implicit premium' or 'learning dividend' from the *process* of certification.

If the change in return on investment (ROI) over the four monitoring periods of the project are taken at face value it appears production efficiencies through vertical and horizontal certification had a considerable impact. As illustrated in Figure 21, the project farmers were able to turn around a -11% ROI in 2008 to a 13% ROI by 2010. While the figures do indicate a considerable turn around for family scale pangasius farmers the return to profitability is not only a consequence of upgrading. What the figure does clearly indicate is the position of the project within an upward swing in demand after the 2007-2008 period of oversupply which led to the exit of 35% of family scale producers in An Giang alone (see Chapter 1). The result was an increase in farm gate prices from 13440 VND (US$0.84) in 2008 to 16000 VND (US$1.00) in 2010 – with no significant difference in the prices obtained by control farmers for the same cycles. Given the small margins that these farmers work with this increase has had considerable impact on overall profitability.

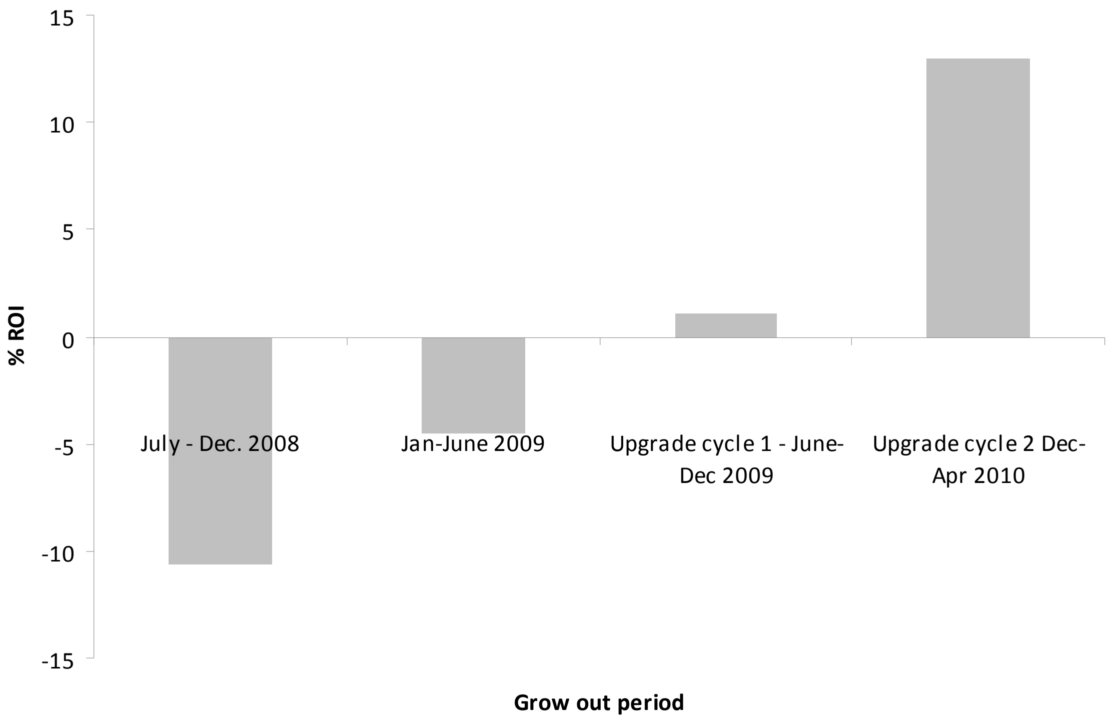

Figure 21. Comparison of return on investment from 2008 to 2010

The renegotiation of contracts did provide some of the farmers with a token increase in the farm gate price of their fish. Three of the farmers in the first grow-out cycle received a token 200 VND/kg (US$0.01) increase in the price of their fish, but this increase was an explicit gesture to the efforts made by the project rather than a structural change in pricing. Indeed after the two upgrading cycles there is no evidence that companies are willing to pay more for SQF certified fish. On the one hand this is not a surprising result; food safety is regarded throughout the industry as non-competitive issues. On the other hand, the quality of a product is competitive and meeting quality standards implies for farmers that they will improve their capacity to negotiate a better price for the fish. The benefits from higher efficiency expected from adhering to quality standards may be regarded as a form of 'implicit premium'.

Compliance with SQF standards, group formation and the new contract negotiations are all dimensions of such an implicit upgrading premium. For example, higher incomes based on higher proportions of fish sold in higher grades, improved timing of payments reducing transaction costs associated with interest repayments, improved purchasing power and negotiation of credit arrangements, and increased efficiency in feeding and water pumping are all potential sources of efficiencies created through upgrading. Total unit costs dropped 5% from the start to the end of the project from (Figure 22 and Table 17). The bulk of this decrease is due to a real drop in input prices after peak oil in July 2008. Nonetheless, efficiencies in production were seen between the upgrading cycles.

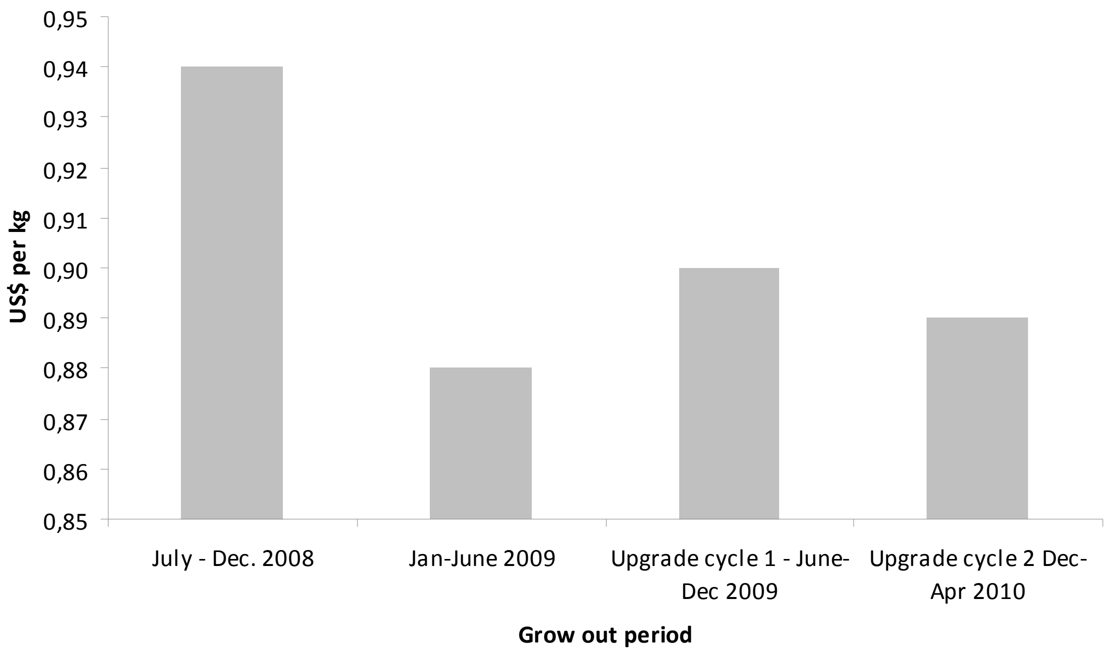

Figure 22. Comparison of total costs for target farmers from 2008 to 2010

The shift to industrial feed from homemade feed in the second cycle had no real increase in cost. This is because of the rising price of marine fish as well as the improved on-farm management of feed. This result challenges the assumption by many of the farmers that shifting to industrial feed increases their overall costs. The results also challenged the finding of Phuong et al. that the labour costs associated with homemade are discernibly higher. Although this remains a cost of production the reliance on family employment in the grow-out phase of these farmers means actual costs were negligible.

Table 17. Comparison of cost structure over four grow-out cycles, 2008 to 2010.

Input (US$ per kg)	July - Dec. 2008	Jan-June 2009	Upgrade cycle 1 - June-Dec 2009	Upgrade cycle 2 Dec-Apr 2010
Fingerlings	0,08	0,07	0,08	0,07
Chemicals and drugs	0,03	0,01	0,03	0,01
Feed	0,74	0,71	0,73	0,73
Interest	0,05	0,05	0,02	0,04
Sludge removal	0,01	0,01	0,01	0,01
Pumping	0,02	0,02	0,02	0,02
Labour	0,01	0,01	0,01	0,01
Total input costs	0,94	0,88	0,90	0,89
Selling price	0,84	0,84	0,91	1,00
Average production (t)	129	123	109	96
Profit/Loss	-0,10	-0,04	0,01	0,11
ROI	-11	-5	1	13

Two further cost savings attributable to the upgrading process include seed and drug use. The strategy of farmers in stocking smaller fingerlings was to reduce initial startup costs which equated to 160 VND (US$0.01) per kg. Farmers were more willing to purchase smaller fingerlings because they were from certified sources, making them more confident of their quality. The results show that the mortality rates were minimal and no different between the two cycles. Pro-biotic and vitamin use was the single largest cost saving having been reduced 320 VND (US$0.02) per kg between the two cycles (Figure 23). This was largely attributable to improved information sharing within the group and reflection on the usage during the first cycle.

The target farmers were fortunate that the sedimentation pond and canal infrastructure was already in place. This reduced capital investment. The only cost the farmers incurred was for the compensation to the rice farmers, totaling 80 VND (US$0.005). In addition, the use of pond water in rice fields may also bring a further benefit of reduced fertilizer use, equivalent to a 2 million VND (US$125) net saving for a 2.3 ha farm. The results also emphasize the cost benefits of investing in collective sedimentation ponds. In Hoa Lac the cost of replicating the collective sedimentation system now in place is estimated to cost around 11 VND (US$0.0007) and 20 VND (US$ 0.001) per kg of fish for each farmer. Even if farmers were to invest in these ponds themselves the cost would still only be around 160 VND per kg (US$0.01).

Interest payments were also an important saving. However, as outlined above, the savings made in the first cycle with reduced payment periods were not replicated in the second cycle. This was in large part due to a combination of farmers moving away from the companies enrolled in the project and the recovery of international markets. The second point is perhaps more telling. If competition amongst processing companies for market share resumed in 2010, as it appears it has, then the farmers are once again in a situation where they are subject to unfavorable payment conditions driving up their interest repayments.

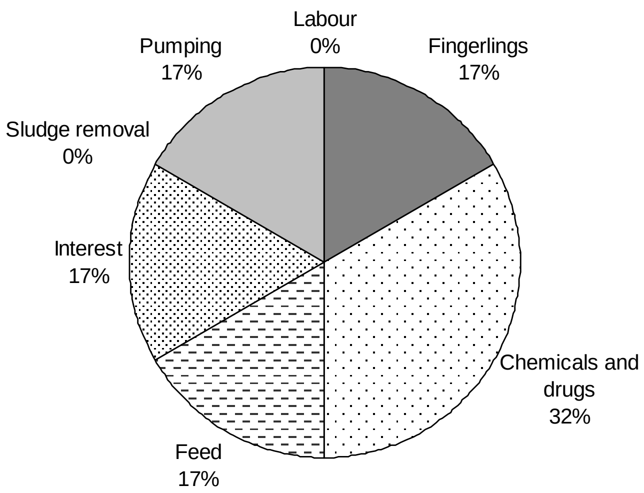

Figure 23. Cumulative percentage reduction in production costs per input from 2008 to 2010

5.6.2 A business case for family scale producers?

The apparent consolidation and integration within the pangasius industry has raised the central question as to whether there is a business case for the ongoing participation of family scale producers. The above analysis indicated that the process and economic efficiency of production can be improved through simple standards such as SQF. On this basis there may well be hope that family scale producers can continue to realize gains in efficiency through by upgrading with improved horizontal and vertical contractualisation. For many of these producers their choice to continue in the industry may be based more on the relative opportunity cost of exiting production or, alternatively their ongoing debt burden.

Before the upgrading cycles the average loss made by farmers was estimated at 708.9 million VND (US$44312) per crop. Leaving production therefore reduced their exposure to further losses, but also a drop in potential income given that pangasius brings in on average 242 million VND/ha (US$15125) more than rice production. The large losses experienced therefore have to be weighed against the opportunity cost of leaving production altogether. Given that the farmers cannot revert their land back to rice farming, because of the 2 to 5 metre depth of ponds (unlike shallower rice-shrimp systems) the farmers are locked into at aquaculture production. This is especially the case for the farmers in both Vinh Thanh Trung and Hoa Lac who have on average converted between 25 and 50% of their land into ponds leaving them with enough rice lands to maintain an alternative income stream. Debt, the perception of high opportunity costs (or alternatively 'boom crop' returns, see Hall 2004) and asset lock therefore combine to maintain what might be termed the 'latent capacity' of family farmers in the pangasius industry, and maintain the cyclical over-demand and under-supply cycles seen in recent years.

Table 18 shows the relative contribution of pangasius to overall household income. The figures indicate that overall income is heavily dependent on pangasius aquaculture. Although many of the households have more than one income source pangasius makes up a considerable proportion. In the second upgrading cycle the average household income increased by 204 million VND (US$12772), of which 89% was attributable to pangasius. However, taken together the famers made a cumulative loss of 29.1 million VND (US$1821). For farmers to make any return they would need two consecutive 'boom' cycles, such as seen in 2010.

It is the promise of these boom crops that made family scale producers 'downgrade' to alternative species, as described for the smaller household farmers in Chapter 6. Instead the farmers in Hoa Lac and Vinh Thanh Trung have in most cases elected to keep their ponds vacant until prices improve and they can re-enter production. Unlike the very small or micro farmers with ponds less than 0.5ha, these farmers are usually 'too large to fail' given their high debt burden (see Belton and Haque Forthcoming). Although overly dependent on pangasius for their main source of income, their other sources of income do facilitate this by allowing them to maintain some cash flow. The rest coming from extended family or informal credit.

Table 18. Contribution of Pangasius to overall household income.

Income source	Pre-upgrading 1 July-Dec. 2008		Pre-upgrading 2 Jan.-June 2009*		Upgrading cycle 1 June-Dec 2009		Upgrading cycle 2 Dec-Apr 2010	
	US$	**%**	**US$**	**%**	**US$**	**%**	**US$**	**%**
Pangasius	-12900	134	-4920	294	1090	61	12430	67
Rice and cash crops	2437	-25	2437	-146	3938	32	5073	27
Trading	593	-6	593	-35	500	4	650	3
Salary and remittances	31	0	31	-2	31	0	72	0
Other sources	187	-2	187	-11	344	3	450	2
Total	-9650	100	-1672	100	5903	100	18675	100

* Livelihood data for pre-upgrading 2 cycle was not empirically collected – instead data is carried over from the first pre-upgrading cycle.

This latent potential of small holders throughout the Mekong Delta is one of the central reasons for the cyclical nature of production in the industry. What it also demonstrates is the vulnerability of these farmers livelihoods given their ongoing dependence on the pangasius industry. However, faced with long term redundancy of their ponds many of the farmers towards the end of the second phase had started to take steps to move into alternative species.

A central question that the exit of family farmers from the industry in recent years raises is what 'business case' exists for family scale producers? And more specifically, what business case exists for upgrading production of these producers to comply with international certification? It is apparent that as pangasius has emerged as a low value globally traded commodity, the small unit margins in pangasius production means that production efficiencies will benefit producers with a larger economy of scale. Another question is whether the small marginal value of pangasius justifies investment by family scale farmers, especially given the apparent unwillingness of the market to recognize and pay for these increases. Without business-to-business arrangements essentially placing market access requirements on produces it may be indeed prove difficult to justify upgrading investments.

The project has tried to determine whether small holders can also realize the benefits of higher quality production. Based on the relatively imprecise results gathered, due to a range of data collection factors, we have few decisive results demonstrating improvement in the livelihoods of farmers through upgrading. The lack of a clear economic incentive or reward structure for upgrading was a major deterrent for the 13 farmers that originally joined the project and remained members of the collective group, but did not engage in any further upgrading activities. Their main justification was that there was no difference between the market price between certified and non certified fish. In the final workshop of the project the farmers pointed out that even an increase in costs of 400 VND/kg (US$0.03) is enough to cancel out any profit. This is true of an (up or down) turning market, such as seen in the first half of 2009, but in oversupplied markets (July to December 2008) farmers need to make up 1440VND (US$0.09). Alternatively, as demand in the markets picks up (December to April 2010) farmers can maintain a 2880VND (US$0.18) margin. Whether farmers are willing to make the necessary investments in upgrading in order to improve efficiencies to minimize losses in periods of oversupply is yet to be seen.

The twelve farmers that completed the second grow-out cycle had a more positive opinion about upgrading. These farmers believed that their only means of staying in the industry was first to continue to reduce costs and second to be certified. They agreed that the SQF standards provided little incentive to upgrade, but argued that by reporting they were better able to monitor and economize their inputs. Two of the more active members in the group were also aware of the range of other standards now entering the pangasius industry and realize these require a even higher investment in upgrading production. Even though the farmers do not know the content of the new and emerging standards they believe SQF has provided a stepping stone to higher levels of compliance.

5.6.3 Reducing vulnerability in the value chain

The formation of the two collective groups under the Tan Phu Clean Pangasius Club provided some interesting results in terms of livelihood strategies and the bargaining of pangasius farmers. The major success of forming the collective groups was the formulation and negotiation of collective water management. The use of the rice fields as an artificial wetland demonstrates what government and NGOs have been advocating for both pangasius and shrimp production in Vietnam (see Anh et al. 2010; Anh et al. Forthcoming) and internationally (see Schulz 2003; FAO et al. 2006). The use of community-based arrangements in Hoa Lac and Vinh Thanh Trung to establish both the physical and social infrastructure necessary to deal with waste water demonstrates the possibility for increasing compliance of farmers with state and non state standards. It also demonstrates improved negotiation with other farmers within their community. The support given to the collective groups by the commune level office also shows the potential for improving the legal status of small holder pangasius farmers, further strengthening their bargaining position within the community.

Over the two upgrading cycles the famers involved in the cooperative groups were unable to coordinate their provisioning practices. First, this was because of the different timing of stocking and harvesting. For farmers to gain the maximum benefit from collective bargaining for inputs their production cycles need to be aligned over time. Although there was more coordination over the duration of the project an optimal timing was not reached.

Vertical contractualisation also brought mixed results in terms of upgrading the terms and conditions of incorporation in the value chain. Overall there was little improvement in the contract conditions for the farmers enrolled in the project. Without production contracts there is little improvement in the incentive or reward structure for upgrading production. The use of sale contracts maintained through agents reduces the risk of processing companies but continues to disadvantage producers. The ambiguity involved in grading fish at the point of harvest and the apparent (quality-based) regionalization of farming areas leave farmers in a vulnerable position in contract negotiations. A longer term goal to overcome this might be to better coordinate harvesting through the cooperative groups. This was never achieved in the project, but would undoubtedly result in greater bargaining power.

It also became apparent that the individual harvesting of pond and contract negotiations means that farmers were not able to benefit from the payment conditions negotiated in the sale contract. Processing companies continued to make payments to farmers in 2 to 4 installments at unspecified dates instead of the agreed one time payment in a window three days around an agreed date. In financial terms this adds up to approximately 2 to 4% of total operating costs and between 12 and 53% of family scale profit margins. The reasons for these payment conditions remain unclear. Anecdotal evidence from European importers suggests that pangasius is the easiest product to get purchasing credit on. One importer reported they are often given 90 days credit when they originally ask for 30 days. Further investigation is needed, but it is plausible that the favorable payment conditions passed on to buyers are being passed on to family scale farmers in Vietnam.

This poor repayment schedule is indicative the wider market conditions in which pangasius farmers are operating. Favorable payment conditions for importers have been caused by high competition between Vietnamese exporters. The declining price of pangasius over the last five years from €5.00 (US$6.60) to €2.50 (US$3.38) per kg is indicative of this trend and illustrates a typical 'push market'. The Vietnamese government has attempted to coordinate the pricing of exports between provinces without success. Attempts have also been made to create grower associations similar to the rice growing associations in Thailand – of which AFA is representative. These too have failed, representing what is widely considered an endemic lack of institutional agreements between exporters across a number of sectors in promoting export cooperation in Vietnam – from processor to farmer level.

The failure of many farmers to continue recording in the second phase raises question around free riding and the durability of the group over the long term. The farmers that have not continued recording have continued using the practices they learnt through the recording process and they are still active members of the Tan Phu Clean Pangasius Club. This raises a question around the wider role of certification and cooperation. It may well be that both forms of contractualisation have not led to functional improvements in production that reduce vulnerability. A reason that most of the farmers did not continue was because there was no improvement in the contract conditions with processing companies. However, there may well be an overall improvement in efficiencies (as illustrated throughout this chapter) that reduce their overall vulnerability.

Despite the overall trend towards consolidation and vertical integration, innovative ways of including family scale farmers continue to emerge from the private sector. At the end of the project three of the project farmers from the Hoa Lac were approached by the Thuan An company to sign a production contract. The design of the contract is new for both the company and the farmers. Importantly, Thuan An is one of the companies that does not have their own production, nor an association of producers making them more vulnerable in obtaining adequate and good quality supply. The company has agreed to provide the necessary investment in all inputs and has provided a guarantee of 1000 VND/kg (US$0.06) profit margin. If such a contract will be successful it indicates two important developments. First, that processing companies are interested in contract farming small holders who demonstrate adequate ability. Second, it reflects the continued pendulum of innovation in production management, this time away from collective groups and back to individual farming.

The invitation to two of the farmers in Chau Phu also reinforces Belton and Little's claims around preferential access to processor-led contract arrangements. Although it is difficult to 'prove', we suspect the two farmers approached by Thuan An gained access because, 1. they knew the farmers through the project, 2. they had SQF 1000 certification, 3. they had a personal connection with the company (maybe through the district who had given the 100ha to the farmers). Furthermore, one of the farmers had previously failed in their attempt to complete SQF reporting lending weight to the claim that social relations come before functional capacity.

Another remaining question surrounds the durability of the upgrading activities in reducing the vulnerability of farmers. The project was able to provide the necessary technical support to the target farmers, but structural support is needed for long term change. The small holders involved in the cooperative groups are the first to be members of AFA. This is seen as a major accomplishment. Overall though, little support was provided by the organisation and distrust remains on the side of farmers who see a conflict of interest in also allowing processors to have AFA membership. At present this is the only organisation with a mandate to provide both support to producers. If small holders are to maintain any position within Pangasius GVC AFA, or an organisation like AFA, is needed to provide technical services and advocate on their behalf.

5.7 Conclusion

Upgrading the process and contractualisation of family scale producers in the two target communes had mixed results. While the horizontal contractualisation has been successfully put in place and appears to increasing the reputation of the farmers in the market place the gradually declining active membership makes it uncertain as to whether the group will persist. Attempts to improve vertical contractualisation of the group with processing companies was problematic because of unwillingness of companies to provide favorable contract conditions. Finally, process upgrading was successful in terms of gaining SQF1000 certification which led to considerable savings in costs for producers. However, such statements hide a series of lessons and reflections that have been drawn with respect to the potential and pitfalls of upgrading family scale producers.

At the start of the project horizontal contractualisation of farmers was designed to increase the productive area and output of family scale producers to improve their bargaining power and production efficiencies. While farmers were willing to engage the idea of a cooperative group, overcoming their considerable skepticism, many were unwilling to fully participate. Seen in isolation from the wider value chain their decision appears to be a cynical – those abstaining from active upgrading waiting to see how the other farmers fair. But seen as a governance tool within the value chain we see a series of successes. The 'group' brought together new constellations of actors that would have otherwise had difficulties in engaging with family scale farmers, including certifiers, DARD, AFA, SGS and, most importantly, processing companies. The cooperative group structure was also successful in creating a trusted brand amongst processing companies and facilitated the first recorded collective sedimentation ponds for pangasius.

The results therefore show there that a degree of skepticism about the potential of horizontal contractualisation was overcome. The question remains as to whether the group will persist without improved vertical relations with processing companies. Because SQF1000 is not market based, in the sense of rewarding farmers with market access or an explicit price premium for their fish, farmers are less unlikely to expend the effort in upgrading their production. Ironically, despite the declining number of active members there is some (albeit anecdotal) indication from processing companies that the group has built a reputation and has therefore attracted higher attention from sourcing agents. Because the group is certified as a unit, all 32 farmers benefit while only nine farmers participated in the last upgrading cycle. How the group will overcome this new dilemma is a question for ongoing research.

This chapter has also indicated the position and sourcing strategies of processing companies in the global pangasius value chain. The failure of the companies to agree to any production contract with family scale producers demonstrates two things. First, the companies are situated in a highly competitive market with declining margins in lucrative markets such as the EU leading to high volume push market conditions. Second, the risk associated with this competitive market is passed on to family scale producers because of their poorer bargaining power. Family scale producers contribute the surplus variable supply within the market. Coupled with the (apparently purposeful) perception that family scale farmers produce lower quality, and therefore lower value fish, there is a low likelihood that companies will ever offer production contracts.

A key conclusion of this activity was that despite the lack of explicit premiums, or more favorable production contract, farmers are able to benefit from upgrading in terms of production efficiencies. In some cases, such as the reduction of probiotics and vitamins, this led to absolute reductions. In the case of feed, the switch to industrial pellets incurred no extra cost per unit of production while reducing pumping costs. These cost savings might be termed a 'learning dividend' given one of the most important factors appeared to be greater reflection by farmers on the process of recording production statistics. However, given these savings are only 1 and 2% of overall costs, the project clearly showed that farmers remain price takers.

The increased attention given to certification as a means of upgrading the environmental performance of the pangasius industry will continue to hold consequences for family scale producers. Our results indicate that improvements in production process, coupled with group formation, may well succeed if efficiencies are clearly demonstrated to farmers. It is nevertheless clear that for ongoing success of the group improved vertical contract conditions need to be made more explicit.

Consolidation and integration in the industry may continue to negatively impact family producers. Given pangasius ponds are not easily converted back to rice fields it is likely the majority of these farmers will continue in some form of aquaculture. This means that the industry as a whole will maintain a high latent capacity, with farmers returning to pangasius in 'boom times' and temporarily exit in periods of low demand. Given they are unlikely to exit altogether attention will have to be given to alternative downgrading and outgrading. It is this that the next two chapters now turn

6 Process upgrading for nursing farmers

6.1 Introduction

The movement of smaller family scale producers out of grow-out farming has seen a concurrent rise in the number of nursing farms. This 'downgrading' strategy is thought by many in the industry to present both risks and opportunities. On the one hand, an increase in the number and quality of nursing farmers can improve access for grow-out farmers. On the other hand, the rapid increase in the number of nursing farmers means has reduced quality control over fingerlings, which is already noted as a major problem throughout the Delta (see for example Sinh and Hien 2009; Phuong and Oanh 2010). The shift to nursing farming also brings its own risks of higher mortality. However, the high mortalities during the first stage of growth are offset by lower capital costs. Taken together these farmers have a more modest income, but also lower overall risk.

The Vietnamese government has been very active in managing the quality of pangasius fingerlings. As the industry has expanded, the challenge of ensuring an adequate quality of fingerlings is maintained has become a central objective. Since the breeding cycle was closed in 1998, thereby eliminating the need to source wild fingerlings, the production of fingerlings in private hatcheries has rapidly increased (Belton et al. 2008). This led to a subsequent rise in the number of nursing farmers; who take on a specialized role of growing the fish to a size large enough to stock in grow-out ponds. This role is particularly important in many aquaculture systems throughout Vietnam, and Southeast Asia more generally (e.g. Litdamlong et al. 2002; Little et al. 2007), because of 1. the vulnerability associated with early life stage of fish, 2. increase the availability of certified fingerlings to farmers in rural areas, and 3. increase traceability of fingerlings in global value chains. To overcome this the government has actively promoted SQF1000 quality certification through the An Giang Seed Centre (AGSC).

This chapter reports on an intervention to assist family scale pangasius farmers to downgrade to nursing, and subsequently upgrade the quality of their production through increased vertical and horizontal contractualisation, as well through certification. The aim in doing so is to reduce the vulnerability of a group of farmers that, already having invested in aquaculture infrastructure, have found it hard to consolidate their position in the global pangasius chain. Supporting this group brings secondary benefits for family scale grow-out farmers by improving the quality of fingerlings, and further reducing the environmental impact of pangasius farming. To achieve this aim three upgrading strategies were implemented and researched:

1. Increase collective productive area and output to a more commercially viable scale through the establishment of farmers group.
2. Process upgrading through compliance with SQF1000, thereby increasing process and product quality
3. Reduce production risk and increase market access and value through vertical contractualisation with the An Giang Seed Centre..

This activity was implemented in conjunction with the AGSC, DARD and SGS. The activity was begun at the same time as the grow-out farming activities in 2008. However, due to considerable delays in negotiations with these different partners and the farmers, as well as financial delays within the project, implementation did not start in earnest until the last six months of the project. Further internal problems meant that livelihood and environmental data for the second nursing period were delayed beyond the deadline of the project. This chapter therefore focuses predominantly on the negotiation process for the formation of the satellite group of nursing farmers and their incorporation in the AGSC nursing network. The final sections reflect on the first process upgrading cycle. Based on this data, a tentative comparison is made with grow-out production and how changes to income have affected livelihood vulnerability.

6.2 Identification and enrollment of key actors

During the preparation phase of the project all actors unanimously agreed that assisting family scale farmers to downgrade to nursing was a positive intervention. Their reasons were also very similar. First, many grow-out farmers in An Giang province and across the delta had already taken the decision to downgrade and were to this point unsuccessful. This was seen as a lost opportunity given the growing demand for quality fingerlings. Second, the rapid rise in nursing farmers and their low level of experience is an inherent risk that the quality of seed will decrease. Hien et al 2008 (cited by Phuong and Oanh 2010) emphasize this trend in finding that approximately one fifth of grow-out farmers experience increases in mortality during the rapid growth of the industry from 2003 to 2007. Supporting grow-out farmers to downgrade to nursing farming was therefore an exercise in ensuring higher quality as much as it was an exercise in increasing output.

The project enrolled farmers that had already made the decision to downgrade production. Three main areas of intervention were focused on: first, technical process upgrading based on the SQF1000 standards for nursing farmers; second, the formation of a satellite group (horizontal contractualisation); and third, improved contract relations with the AGSC (vertical contractualisation) (see Figure 13). Together these three activities were designed to reduce technical failures by providing ongoing technical support through the nursing network, measured through fingerling mortality, improve prices, and ensure stable market demand through direct linkages with a contracted buyer.

Like the activities with grow-out farmers, the project drew the nursing farmers into a wider network of actors, all of which are interested in increasing the quality of pangasius production. As outlined in chapter 2, the AGSC is a leading state hatchery in the Mekong Delta which has invested heavily in certification. In addition to SQF1000, the centre is now applying for GlobalGAP certification. In doing so, the centre is feeding into the wider aspirations of the government to improve traceability for global markets. AFA continues to support farmers with information. Another first for the project is the group membership of these nursing farmers. Finally, SGS was responsible for auditing the SQF1000 standards, but in this case did so first through the internal control systems of the AGSC.

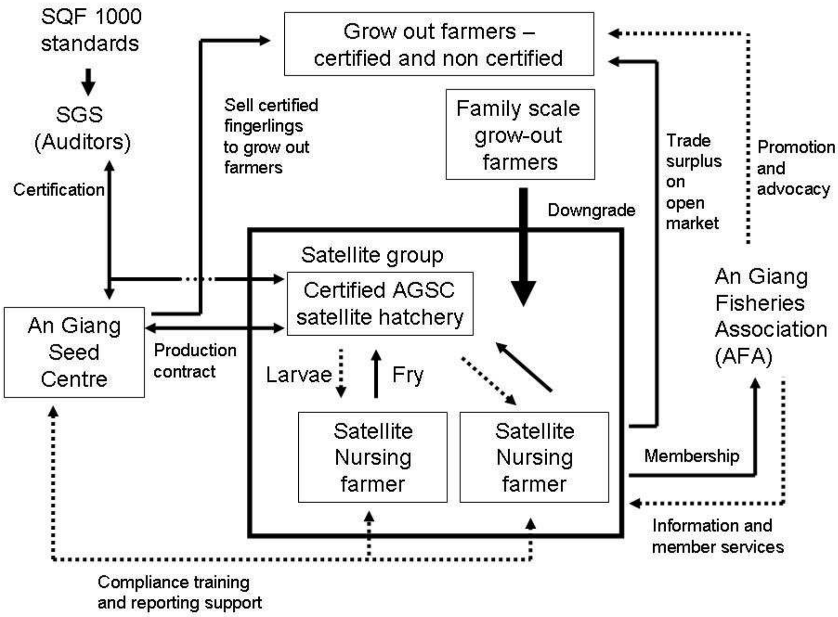

Figure 24 New linkages between key actors as a result of process and product upgrading of nursing farmers

6.2.1 Nursing farmers

The project enrolled seven nursing farmers who had already downgraded from grow-production between 1 and 3 years ago and wished to specialize in nursing larvae to fingerlings (Table 19). Some of these farmers had moved in and out of pangasius grow-out farming over a longer period of up to 5 years. The most recent move back to nursing farming occurred in response to the uncertainty and high losses in recent years. All of these farmers had a pond area of less than 1 ha, with five of the seven with a total pond area less than 0.5 ha, and individual ponds of approximately 0.1 ha.

The vulnerability of nursing farmers was also apparent in their current position in the value chain. About three quarters of farmers had either oral or written contracts with hatcheries. In the case of oral contracts, orders are placed through telephone one week before purchase. The only quality indicators observed when buying fingerlings were observations on the 'healthy look' of the fingerlings, including their mobility and agility. These indicators are the key indicators as the quality of fry is one of the most important factors that contribute to the success of a nursery. According to the nursery farms, 90% of the fingerlings meet informal quality standards – defined by the satisfaction of grow-out farmers. In judging the quality of fries, 70% of farms reported that they based their decision solely on their own experience, 30% used own experience and skilled acquired from training, the remaining 20% used skills acquired from training that were provided by An Giang Fishery Association.

The ability of nursing farmers to negotiate prices of fry from hatcheries appears to be highly variable. The survey of project farmers indicated that price of fry from hatcheries ranges from 1 to 7 VND/unit (US$0,0001 to US$ 0.0004), with an average of 3.6 VND/unit (US$0.000225; 5-10 days old). Likewise the costs associated with the nursing operations appear to be highly variable indicating a variety of bargaining power for key inputs such as feed. Depending on culture practices such as the feeding rate, duration of nursing, and the size at time of stocking and mortality rate, the average added cost per unit was 92.7 VND (US$0.01). The total cost of nursing one fingerling therefore amounts to approximately 96.3 VND/unit (US$0,006). As the average nursery price of fingerlings is 195 VND/unit (US$0.02) farmers make an average profit of 95 VND/unit (US$0,006), varying from -50 to 249 VND/unit (US$0.003 to US$0.02).

Table 19. Basic statistics on fingerling farmers enrolled in project

Name	Education (years of schooling)	Pond area (m2)	Experience in *Pangasius* breeding & nursery
Nguyễn Minh Trường	12	10000	5
Nguyễn Ngọc Cương	12	1000	4
Trần Đắc Khan	12	1500	3
Nguyễn Minh Tài	10	2000	3
Nguyễn Cao Bá	10	2000	3
Nguyễn Thị Hoa	12	4000	6
Lê Văn Đẹp	11	10000	3

As these cost figures cover a range of size classes they do not provide any specific insight into the difference between 40 day fry to 80 day fingerling nursing. To gain more clarity figures we tuned to the literature and recent production figures from the AGSC. The AGSC models its extension material on the assumption that 40 day fry nursing has a total variable unit cost of 30 VND (US$0.001) – including larvae, pumping, and feed. They advise that nursing from fry to fingerling has a total variable cost of 450 VND. Both of these figures are reasonable close to the estimates made by Sinh and Hien (2009) and Belton et al (2008). We therefore use them as a baseline to upgrading.

There was a variety of selling strategies between the farmers. The farmers interviewed sold an average of 300-400 thousand fingerlings per crop - 48% were sold to family scale grow-out farmers, 37% to processors (which has increased with more vertical integration in the industry) and 15% fingerling traders. The marketing strategy adopted was largely dependent on the size and quality of the fingerlings. Unfortunately, the price figures from the survey were misreported. We therefore use figures from Sinh and Hien and Belton et al. who list the farm gate price of fry as 40 VND/kg (US$0.003) and fingerlings as 750 VND/unit (US$0.05). Our survey found that when selling to grow-out farmers, written contract was prepared one week before delivery of fingerlings. Sales to processors and traders did not involve any contracts. Total annual income from these two nursery systems are estimated as ranging from between 58.9 million VND (US$3688) to 1.4 billion VND (US$88000).

Farmers perceive the relatively small amount of primary investment and the ease of acquiring and trading fingerlings as major advantages of nursing. The lower capita costs are seen as a particularly important advantage over grow-out farming. About half of the nursing farmers said they planned to expand their operation because of the high rate profit and higher demand for fingerlings. Other farms plan to maintain the present scale because it suited their financial and labor capacities. Farmers who planned to expand their scale of their operation said they would be able to avoid high interest rates by mobilizing capital through family or business networks. The relatively lower feed requirements also meant that feed companies were more willing to extend more favorable credit arrangements – another advantage over grow-out farming.

Similar to the findings of Belton et al. (2008), the farmers enrolled in the project are also an important source of employment for other members of the community. The number of family workers in nurseries varies from one to four. Men were principally engaged in the breeding and nursing of pangasius, working on a permanent and part-time basis. On average two laborers were hired per farm, involved in a range of activities including feeding, observing and taking care of the fish, changing of pond water and harvesting. Only one third of those employed on the farm had some form of training related to fish farming. Overall, those hired had an average of seven years schooling. This labour was more accessible than for grow-out farmers which is increasingly requires higher education of farm managers. Nursing farms hired workers with an average of three years experience working in fish breeding fish. They worked about 29 days per month and from eight months to 12 months per year with an average monthly salary of VND 1.14 million (US$71). None of the farms surveyed had any form of insurance nor were involved in any form of labor union.

In addition to permanent and part-time labor farms also hired an average of eight people on a casual basis during peak times of the year. Casual labor is also dominated by men, hired principally in harvesting and distributing fingerlings to nursing and grow-out farmers. The education level of these casual workers is lower than those employed on a permanent basis, with an average of five years schooling. A period of employment usually extends from one to two days in each growing cycle, usually around harvesting. Wages are 60,000 VND (US$3.75) per day.

Nursing farmers fall along a scale of production categories divided into brood stock and hatchery raising, first stage larvae to fry (1g) and third stage fry to fingerling nursing (1-2cm). The highest risk stage of nursing is from larvae to fry. During this stage the fish are highly sensitive to changes in water quality and temperature with survival rates ranging between 8 and 30% (Belton et al. 2008; Sinh and Hien 2009). A survival of 30% is noted as being high when considering the AGSC sets a target level of 20%. We use this second figure more conservative figure as a baseline for fry nursing. However, these farmers require less land and feed. Farmers that nurse fry to fingerlings take on higher capital requirements.

The large variability in nursing operations there are no standard figures of mortality and costs. Table 20 uses the sources cited above to make a general estimate of profit margins for nursing from larvae to fry and from fry to fingerlings in a 0.1ha pond. The margins for 80 day nursing give a profit margin of 32.4 million VND (US$2025) per crop. If kept in continual production this would give an estimate close to 1.4 billion VND (US$88000) – a finding similar to Sinh and Hien. The figures also support Belton et al.'s assertion that shorter 40 day cycles have a *relatively* modest income, closer to the lower estimate of 58.9 million VND (US$3688) per year. However, to achieve this income the farmers would have to have a rotation system over a minimum of three ponds.

The choice to nurse fry over fingerlings is predominantly driven by access to capital. Nursing larvae to fry incurs only 9% of the variable costs of the 80 cycle. Farmers that opt for larvae also tend to be considerably smaller than 80 day farmers. For example, Sinh and Hien (2009) report that the average size of these farmers is 1.1 ha made up of between three and seven ponds and turnover of approximately 560 million VND (US$35000) per year. To reduce their costs and, therefore exposure to risk, smaller farmers may opt for the shorter cycle.

Table 20. Estimated profit margins (US$) of 0.1ha, 40 and 80 day nursing ponds

Item	Larvae to Fry (40 days)	Fry to Fingerlings (80 days)
Unit cost US$	0.001875	0.0375
Number	2000000	360000
% Survival	20%	60%
No. survival	400000	216000
Total cost	750	8100
Farm gate price US$	0.0025	0.0478
Gross Profit	1000	10125
ROI	1.33	1.25
Net Profit	**250**	**2025**

6.2.2 Policies affecting the operations of breeding and nursery farms

To ensure the quality of fingerlings both the government and private actors have implemented a range of initiatives ranging from quality certification to a brood stock traceability programme. As these quality systems become more ubiquitous nursing farmers, like grow-out farmers, will have to upgrade their production to maintain their position in the industry. Sinh and Hien found that implementation of even the most basic best management guidelines provided by the government were not currently implemented by farmers. In fact, only 10% of nursery farms are aware of the policies related to production quality management for pangasius industry, including antibiotic residues (Sinh and Hien 2009). This was mainly due to the high cost of implementation and the reportedly low return on the investment in compliance. Although not providing clear evidence, Sinh and Hien also argue that "if the nursery site owners applied [guidelines for improved production] then they harvested a better yield of fingerlings. Changing the perception of the stakeholders participating in the industry requires an improvement in education and a better sector management" (p. 4).

In An Giang province the AGSC is responsible for production and quality control of fingerlings. To overcome the limitations of centralized fingerling production the AGSC has developed a nursing network as a means of increasing the capacity of hatchery to provide fingerlings to the industry, as well as ensure the fingerlings are distributed to farmers more easily. In addition, the AGSC, in collaboration with NAVIQAVED and SGS, have been actively developing a quality control system for hatcheries and fingerlings. The AGSC has been certified with SQF1000 standards specific for hatcheries and nursing farmers. However, to ensure their attempts to increase the capacity does not lead to a decline in quality, the AGSC has been actively trying to extend certification to their nursing network. In doing so the AGSC has tried to develop a brand name around good quality pangasius.

Like the grow-out farmers in chapter 5, the cost and technical capacity needed to upgrade production and negotiate membership to the AGSC nursing network is prohibitive for smaller family scale farms. The cost of membership to the nursing network costs 17 million VND (USD$1060.00) and pays the AGSC brand and SQF1000 certification. This feed is prohibitive for individual nursing farmers. This is understandable for 40 day larvae farmers (0.1ha ponds) with an annual income of 36 million VND (US$2250) from aquaculture, but less understandable for 80 day nursing farmers and hatcheries with considerably larger incomes. A means to overcome these costs is for certification of satellite groups – a methodology developed in partnership with SGS. Such a system has the advantage of dividing the cost of certification for farmers, and at the same time greatly increase the number of certified fingerlings available to the AGSC.

The main requirements of SQF certification, summarized in Table 21, fall under three categories. Like the grow-out standards, the SQF 1000 standards for nursing farmers refer to government Better Management Practices and regulations, as well as international standards for prohibited substances. First, standards refer to the preparation of ponds and stocking strategies. To ensure farms are located in areas with better water quality the government has designated special growing zones. Ponds within these areas then have to comply with a range of government stipulated requirements such as the construction of the pond, stocking densities and water quality measurements. The second set of standards refer to feeding and health management. These specify that input materials must come from certified sources and refers to banned drugs and chemicals. The final set of standards refer to sanitation guidelines for harvesting and transportation to grow-out farms.

6.3 Horizontal contractualisation - Nursing production group

The first activity in supporting nursing farmers was to create a cooperative or satellite group in Vinh Thanh Trung. At the start of the project there was general support for the group and in late 2008 an agreement was reached with seven farmers. The project team then assisted the farmers to formalize the group following the same methodology used to support the Tan Phu Clean Pangasius Club. However, in following months there was considerable disagreement about the form and function of the satellite group. First, farmers believed they were not given favorable contract conditions for incorporation in the AGSC seed centre. Second, they could not agree on the roles and functions of the group.

The initial design of the group was also based on the idea that all of the collective group would collectively become a satellite of the AGSC (Figure 25). This fit well with the expansion plans of the AGSC, whose production is limited by nursing capacity. Initially, the project intended to create a cooperative group with equal membership, similar to what was negotiated with the grow-out farmers in the Tan Phu Clean Pangasius Club. Leaders of the groups were elected, the organization structure was prepared, and by-laws were prepared with the help of AGU legal expert.

Table 21. Upgrading actions on nursing farmers to attain SQF 1000 standards certification

Upgrading activity	Standard	Control reference
A. Preparation of pond and stocking of fingerlings		
6. Site of pond	• Aquaculture zoning	Reference to Decision 3354 Dec 2007 of An Giang People Committee on Aquaculture Zoning.
7. Pond construction	• Pond construction according technical specifications	Standards and technical specifications provided by Document 28 TCN 55:2009 of STAMEQ (Vietnam Standards System)
8. Preparation of pond	• Pond preparation following specified process • No use of forbidden chemicals	Forbidden chemicals for treatment of pond listed in MARD specification document.
9. Water management	• Control of pond water environment following standards of BMP • Checking water source before taking in water to pond	Water quality control following standard of BMP. Pond water quality specified in NAFIQAVET document.
10. Stocking of fingerlings	• Control of fingerling according to BMP and quarantine of fingerling before stocking • Procure from certified sources, sellers having government permission	Fingerling meeting standards & technical specification provided by Document 28 TCN 170:2001 of STAMEQ
B. Feeding and health management (feed, water quality, feeding method, health management)		
3. Feed	• Purchase of materials from certified suppliers, having certification of governance body • Checking of material before processing • No use of forbidden antibiotics • Control by BMP	Following standards of Vietnam and demand of importers. Forbidden antibiotics listed in MARD guidance.
4. Feeding and health management	• Provide sufficient feed • Daily monitoring of feed ration • No use of forbidden antibiotics specified in guidance of MARD	Following current standards of MARD and demand of importers and meeting hygiene and safety food.
C. Harvesting		
2. Sanitation guidelines	• Controlled by SSOP (sanitation standard operating procedure) and BMP. HACCP Based Program for Quality and Safety Assurance • No use of forbidden antibiotics specified in guidance of MARD • No feeding of fish 2-3 days before harvesting	

Six of the seven nursing farmers were willing to join such a group. However, the largest and most influential of the farmers did not think the group would provide her with any further benefit and she refused to join. The main problem was that she already had a contract with the AGSC. From the perspective of the project this was a strong positive for training purposes and a reason she was initially invited to join the satellite group. She had shown initial interest in the group because she thought membership would assist her renegotiate a improved selling contract. The other farmers were also initially interested in the group because this larger farmer with considerable experience would be able to provide them information on farming techniques. When she pulled out, two other farmers pulled out leaving the project with four members.

It was subsequently decided that the group was too small to support SQF certification. There were also a number of technical requirements set out by the SQF standards and AGSC that were not feasible to support with only four members – including the formation of a collective water management system. The exiting farmers also sighted a number of other personal conflicts with SQF certification. They were not prepared to remove trees around their ponds, and they were also not prepared to forgo the practice of combining nursing with livestock raising in the same area, most notably ducks.

As a result of these constraints, combined later with funding constraints within the project, no further action was taken with the nursing farmers until October 2009. At this time the large nursing farmer that was not willing to join changed her mind about forming a satellite group for two reasons. First, she had upgraded her own production system to a hatchery and was facing her own constraints in finding adequate nursing area. Second, she felt the cost and technical requirements for independent SQF1000 certification were too high for her to pay alone (see Table 21).

By November 2009 the project had agreed to support these upgrading activities by investing in a new structure for a 'satellite group' focused around the satellite hatchery farmer (Table 21 and Figure 26). The satellite group model allowed her to replicate the AGSC nursing network on a smaller scale – extending her certification and control over fry quality to her members. In return her satellite farmers sell back 20-30 day old fry (similar to a model described by Belton et al 2008 in Cao Lanh province. Because the larger farmer had previously held the SQF certification through her AGSC nursing network membership, she was able to outline the technical requirements these farmers had to meet. The smaller farmers saw a benefit in this model because they couldn't individually meet the requirements of certification. The group also enabled the rotation of ponds to maintain monthly delivery of fry and/or fingerlings.

Because the group adopted a satellite structure no formal by laws were adopted to govern the internal management of the group. Instead membership was determined by having an adequate size of the land, a requisite level of production capacity sell to take over fry from the lead farmer and a clean source of water. These barriers to entry do limit membership of very small farmers. The size of land is a general limitation because farmers need to build their own sedimentation ponds. Based on the land prices outlined in Chapter 4, this can cost up to 20 million VND (US$1250) for a 0.1 ha pond. There are also geographical barriers for nursing farmers such as access to a high enough quality water source – the most common reason for high mortality rates.

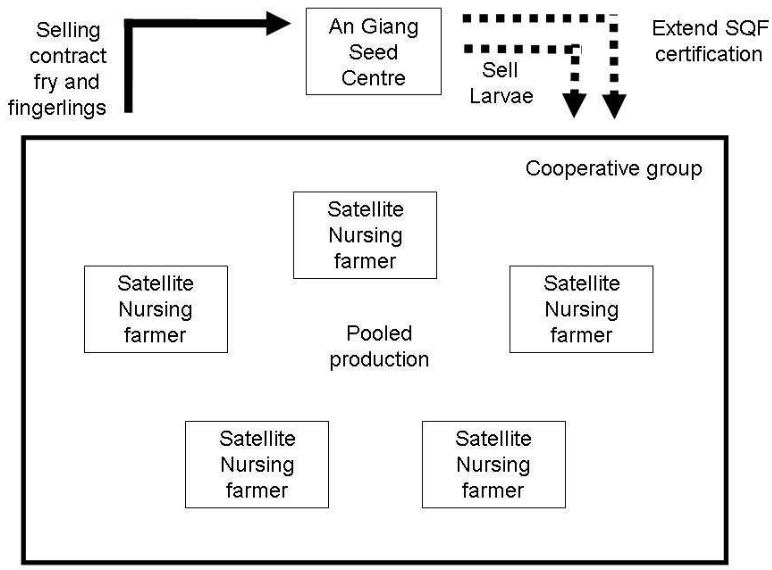

Figure 25. Original design of the nursing farmers cooperative group

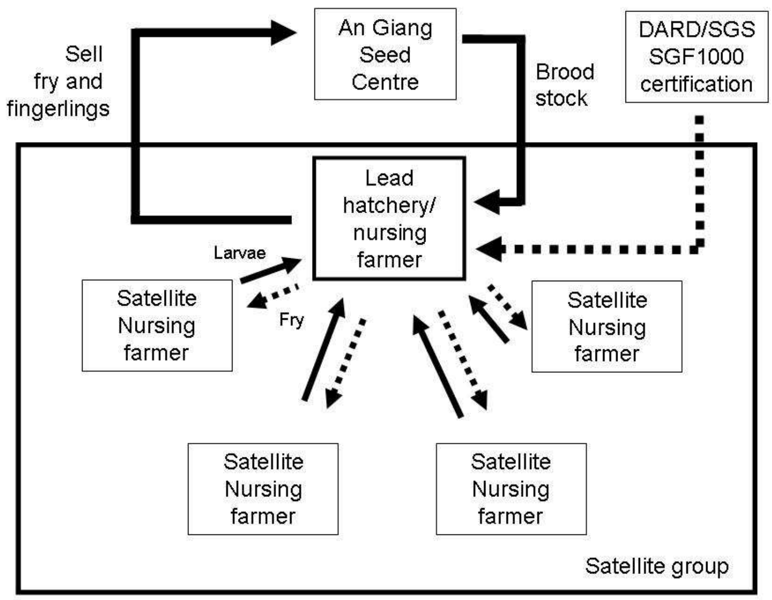

Figure 26. Final design of the decentralized satellite group

6.4 Vertical contractualisation - the An Giang Seed Centre

The renegotiation of the group formation involved a degree of vertical contractualisation within the lead and satellite farmer model. In addition, the project had to renegotiate the conditions of membership to the AGSC nursing network. Through this contract arrangement the nursing farmers are expected to produce higher quality products with lower risk of fingerling mortality through compliance with SQF1000 standards. In addition it was anticipated that the farmers would achieve more stable market access by selling their fingerlings back to the AGSC. The following explains why there were continual delays in negotiations over membership to the nursing network by outlining the changing interests of the AGSC and the farmers.

The aim of the satellite model is to ensure that the quality of the seed meets SQF standards with the help of Research Center for Aquaculture 2 (RIA2) and An Giang province, AGSC has high quality parent stock of pangasius for breeding and producing quality seed. AGSC has the capacity to supply enough pangasius fries for the province. However, the centre has limited land area for nursing and is negotiating with farmers to establish satellite farmers who are willing to contract with the center to perform nursing and supply fingerlings back to the center or to other farmers. The project therefore focused on the needs of both farmers and the AGSC in negotiating the contracts.

Improving the quality of seed is part of wider strategy by the government to create a trusted seedling 'brand'. Similar to initiatives in other Southeast Asian countries, most notably the Thai Shrimp Label, the idea of branding is to improve the quality of seed in the Delta and therefore reduce the risk of production failure. This strategy has been supported by a number of institutions including the Research Centre for Aquaculture No. 2 (RIA2) in Ho Chi Minh City. Another key part of the government initiative is to increase traceability of fingerlings with a view to assisting the industry as a whole meet the requirements of the various international standards available to producers. As all of these systems require certified sources of seed (as well as feed) traceability remains a major objective.

The longer term plan to ensure traceability is the development of the electronic monitoring of brood stock from RIA2. This system has already been set up and is active throughout the Delta. The AGSC takes part in this programme but, as outlined above, also faces the main constraint of meeting demand for fingerlings in the province. A central negotiation point with the AGSC was to ensure that the farmers not only met the SQF standards, but that they would sell all of the fry back to the AGSC. This way the AGSC could meet supply but also ensure that the supply was traceable. Farmers were reluctant to limit themselves in selling all of their fry back to the AGSC because, they believed, the price offered by the centre would not be competitive with the market.

For the project, traceability set up a central dilemma of centralized vs. decentralized production. By April 2009 the AGSC had agreed to the terms of the new production contract for the satellite farmers under the first model described in Figure 25. Before this agreement the AGSC required all farmers to pay a licensing fee to cover certification costs and the goodwill associated with the AGSC name and logo. However, the slowdown of demand for fingerlings, because of grow-out farmers leaving the sector and overall declines in production 2009, has delayed the implementation of the contract. This was followed by a further delay was then caused by the internal breakdown of the cooperative group described above. The negotiations with the AGSC only restarted after demand picked up and the centre once again foresaw a deficit in supply. However, a breakthrough in contract negotiations only came once the AGSC redesigned their fee structure and recognized the internal quality control systems of the satellite group led by the larger farmer.

The final point of conflict in the negotiations was the licensing and membership fee for the AGSC nursing network. In the cooperative model first designed by the project, the farmers would have to pay 70 million VND (US$3000) for membership and branding rights. This was later reduced to 17 million VND (US$1060). The farmers were then obliged to sell a contracted amount back to the AGSC, leaving them the possibility to sell any potential surplus on the open market. As a result of the internal negotiations, and the wishes of the lead farmer to develop an independently SQF certified hatchery, these negotiations again broke down. Finally the AGSC was hired to train, monitor and audit the farmers, giving the satellite group total independence in terms of certification and trading.

6.5 SQF1000 certification

6.5.1 Training and support

All of the farmers had received some form of SQF training from DARD before the start of the project. However, like the grow-out farmers in Hoa Lac and Vinh Thanh Trung, they had very little experience in implementing any of the proposed monitoring and reporting. Like the grow-out farmers, this situation made it relatively easy for the project to support both farmers and government staff to start the upgrading process. To create consistencies with the other activities, the nursing farmers received SQF1000 training at the same time as the grow-out farmers between March and June 2009.

The project intended to support the nursing farmers to work progressively towards meeting their individual upgrading plans. Again like the grow-out farmers, the project supported the DARD staff to assist implementation by providing support for documentation and technical upgrading. AGSC staff were also directly involved throughout the trainings because the initial plan was to extend their SQF certification to the farmers. However, as the objective and structure of the upgrading changed the AGSC staff were rehired as consultants to provide monitoring, technical assistance and support for internal auditing.

The upgrading plans for the farmers went through two major planning phases – first at the beginning and then again when the plans changed mid-way through the project. In each phase the project supported farmers to write an individual upgrading plan for SQF 1000 certification. Each of these plans outlines the specific steps that farmers need to take in order to be certified by the end of the first two upgrading cycles. The ensure that the farmers were able to understand the requirements of the certification a highly interactive approach was taken, with AGSC staff visiting the farms three times a week throughout the first and second phases. The main focus of these visits was to monitor water quality such as pH, oxygen measurements as well as feed and health management. The final audit for the farmers was conducted at the April 2010.

6.5.2 Evidence of upgrading farming practices

The key requirement of the SQF standards was to meet the national BMP guidelines for establishing a sedimentation pond. As with the grow-out farmers this proved the most difficult upgrading strategy for the nursing farmers. It quickly became apparent that only those with more than three 0.1 ha ponds would be able to spare enough space for the construction of such a pond. To overcome this the project set out to design a shared water treatment pond or wetland modeled on the success of the grow-out farmers in Hoa Lac (see chapter 4). However, it became clear that such a system was not feasible. Unlike the system established with the grow-out farmers in Hoa Lac, none of the farmers had land to donate. Furthermore, the nursing farmers were all located some distance from each other, again in contrast to the grow-out farmers, making a new canal system necessary. The high cost of digging, at approximately 200000 VND per cubic meter (US$13; equivalent to two days of labour), made construction too expensive.

Water treatment was therefore left to individual farmers and became one of the main determinants of involvement in the group. Faced with continued pressure from the AGSC consultants to establish a sedimentation pond four of the farmers left the group. Only those farmers with more than three ponds, and therefore able to set aside one for water treatment, were able to continue their involvement. The guidelines stated that farmers should have a minimum of 0.5 ha of pond area, sufficient for two sedimentation ponds, one to contain water before pumping to nursery pond and one for treatment of discharge water. Based on land prices of 20000 VND (US$1.25) per m^2 in the area of Vinh thanh Trung, a combined settling area of 0.1 ha, this would cost 20 million VND (US$1250). The farmers also see this as a loss of productive pond area. Only three members of the target group met these requirements in addition to the hatchery farmer.

The exiting farmers were able to meet most of the basic requirements of the standards. They were able to build adequate storage housing, separate storage area for feed, drugs and chemicals, the farms acquired the necessary papers for operation. Clothing for workers remained an issue which was not taken up seriously by the farmers. The standards that were not met and led to their exit included fencing, measuring equipment and the removal of animals and trees from around the pond. Testing was paid for by the AGSC during the project, but will have to paid by the farmers after the project. The exiting farmers felt that the cost of this testing is too expensive – totaling 608000 VND (US$38) per crop, or between 10 and 25% of current net profits. Fencing was a cost also not considered feasible by the farmers – although no costs were given. Animal and tree removal were not acceptable to the farmers given their important household value.

6.6 Impact on upgrading on income

The farmers specialized in the production of 40 day fry to maximize output and reduce feeding costs. This size class also allowed for minimizing feeding costs, which increase by 36% when raising fry to 80 day fingerlings. The size class was also selected because grow-out farmers are increasingly stocking smaller sized fingerlings. However, they are only willing to do so if they come from certified sources. The hatchery farmer also played a role in selecting this smaller size. The high mortality rates of 40 day fingerlings means the lead farmer spread their production risks across her satellite farmers. If any one farmer experienced a catastrophic loss of a stock their losses, and the losses of the hatchery farmer, would be minimized.

One of the key indicators of improvements in decreasing economic risk is improvements in the survival rate of fry. As outlined above the AGSC sets a target survival rate of 20% in its production guidelines – a figure they say is achievable based on full compliance with the water quality, good sanitation, and drug and feed management. The results of the first upgrading cycle reveal that farmers had an average survival rate of 16%. The lead farmer reached their target of 20% while the lowest survival rate of 13%. We consider these figures as a success given some of the farmers in the group had previously only recorded survival rates of 10%. If farmers were reach the target of 20% they would on average increase their income by 23% or 3 million VND (US$190). The calculations show that every percentage point increase in survival for the project farmers would bring with it a 768000 VND (US$48) increase in gross profit.

The cost and profit structure of fry nursing is, as Belton et al. (2008) point out, relatively modest compared to fingerling nursing. On average, the project farmers made 5.2 million VND (US$327) for the first cycle (based on one 0.1ha pond), which is 1.9 million VND (US$117) more than was anticipated. Overall the farmers had only marginal increases in the unit cost of production. The data collected from the AGSC on feed, pumping and drug use showed no change between the pre and upgrading cycles – however, because these were presented as averages their accuracy is uncertain and they are not included in the report. The capital costs of upgrading were also not recorded by the group making any analysis of upgrading costs difficult. We can only assume that as the price of larvae remained constant and water management increased, it is most likely that any efficiency might have been seen in feed. Further clarification of the cost structure is needed to make any meaningful conclusion.

The nursing model has a series of advantages over grow-out farming. First, the price of fingerlings is more stable than the market gate price of grow-out fish. Because between 30 and 40% of fingerlings are eventually sold to larger farmers and processing companies who are turning to certification to increase legitimacy in international markets, demand for certified seed is likely to remain high. Nursing also gives the farmers a degree of flexibility in terms of marketing. If demand for fingerlings did drop the farmers could offset any losses by delaying the sale of fry until they reach salable fingerlings (cf. Belton et al. 2008).

In absolute terms the income from nursing is, as Belton et al. also point out, extremely modest. Based on net profits of 5.2 million VND (US$327) per 40 day cycle a farmer with a three pond rotation would be able to earn a minimum of 47 million VND (US$2943) per year. We assume that at worst the farmers may lose 15% of these crops (Sinh and Hien 2009), reducing the income to 40 million VND (US$2502) per year. This would leave a per capita annual income of 8 million VND (US$500), some 5.6 million VND (US$350) above the national poverty line. However, if they could have maintained this income over the two year period of the project, from 2008 to 2010, they would have made 94.2 million VND (US$5886). Based on the net two year profit of the grow-out farmers from chapter 4, and recalculating for the smaller pond size of 0.4 ha, this would mean the nursing farmers could have made 64.4 million VND (US$4026) more than grow-out farmers.

Table 22. Upgrading cycle 1 - nursing farmers in Vinh Thanh Trung commune, Chau Phu district (0.1 ha ponds)

#	Name	Expected output (1000 units)	Costs (US$)	Cost per unit (US$)	Selling price per unit (US$)	Total output (1000 units)	Gross profit (US$)	Net profit (US$)	ROI	Survival rate %	Cost of mortality per crop (US$)
1	Nguyễn Thị Hoa **(Lead farmer)**	400	750	0,0019	0,0031	400	1250	500	1,67	0,20	0
2	Lê Văn Đẹp	300	375	0,0019	0,0028	200	563	188	1,50	0,13	281
3	Nguyễn Minh Trường	300	413	0,0019	0,0029	220	646	234	1,59	0,15	235
4	Nguyễn Ngọc Cương	300	391	0,0016	0,0028	250	703	313	1,81	0,17	141
5	Trần Đắc Khan	350	506	0,0017	0,0028	300	825	319	1,65	0,17	138
6	Nguyễn Minh Tài	400	563	0,0019	0,0030	300	900	338	1,60	0,15	300
7	Nguyễn Cao Bá	400	540	0,0017	0,0029	320	940	400	1,77	0,16	235
	Average	**350**	**505**	**0,0018**	**0,0029**	**284**	**832**	**327**	**1,66**	**0,16**	**190**

6.7 Conclusion

The upgrading activities for nursing farmers returned very mixed results. The difficulties experienced in forming the cooperative or satellite group was fraught with conflicting interests, leading to long delays before any further action could be taken. This is in direct contrast to the grow-out farmers, who were more cooperative largely because, we conclude, of more homogenous characteristics of the members. The lead farmer was an important asset to the group because of her experience with certification and nursing. But her ultimate goal of independence of the AGSC, by developing a hatchery, outweighed her interest in reducing costs through the group. This stresses the 'prisoners dilemma' of many of the nursing, and even grow-out farmers: the balance between increasing efficiencies of production through collective action vs. maintaining their independence to capture upswings in market prices.

The restructuring of the cooperative group from satellite of the AGSC, into an independently certified hatchery and nursing group, was a novel development. Such groups do exist elsewhere in the Mekong Delta (Belton et al. 2008), but without certification. The initial small number of farmers enrolled indicates the difficulty of finding suitable, and willing farmers in one commune for nursing. The exit of the smallest of these farmers also indicates there is a critical size of approximately 0.5 ha for participation in nursing – a threshold already identified by the AGSC. The main constraint to these farmers is the size of land and considerable costs needed to purchase the extra land needed to build sedimentation ponds. We expect the three remaining farmers to continue their activities given their ongoing profitability.

The results also show that while nursing 40 day fry returns a modest income of only 5.2 million VND (US$327) per crop they may well have earned nearly six times more that their grow-out farming counterparts over the course of the project. This is a promising result, indicating the lower overall risk associated with downgrading to nursing farming. However, if farmers observe the higher boom cycle returns they may well be tempted back to grow-out production. Their participation in the nursing group, and the growing realization of demand for certified fingerlings, may well be a way of providing them the necessary confidence that lower, but steady returns are favorable to the boom and bust cycles experienced in grow-out farming.

7 Outgrading household farmers

7.1 Introduction

As argued in the preceding chapters, the exodus of farmers from grow-out farming has been led by the very smallest farmers, with a pond area less than 0.5 ha. Those farmers that did not have the infrastructure or capital to invest in nursing farming have opted to exit the pangasius value chain altogether. The very smallest of these farmers have proven to be the most vulnerable given they are indebted after failing to turn a profit with pangasius. Exiting the value chain has reduced their risk to market fluctuation but has also left them with lower overall income. Accessing new income streams to pay off debts has been hindered by the fact many of these 'household ' farmers have ponds of around 0.34 ha in area and their total rice area is also smaller than the average in An Giang Province at 1.8ha.

The household farmers targeted in the project are typical of what Phuong et al. label 'household' scale farmers with small ponds either built at the start of the pangasius boom, or previously as part of their own household consumption. These ponds contained both pangasius in combination with other fish and have a semi-subsistence orientation. The household scale label was assigned by Phuong et al also in reference to the fact they received their blocks of land under land reforms in the early 1990s. The persistence of these producers indicates what has been reported in other countries of Southeast Asia; once a pond is built it is rarely abandoned (Little et al. 1996; Funge-Smith 1999; Prein 2002; Bush and Kosy 2007). This also marks a difference between pangasius and shrimp ponds in the Mekong Delta. Whereas shrimp ponds are often rotated with rice production, the depth of pangasius ponds means they are kept as either water reservoirs or infrastructure for aquaculture.

Many of these household farmers attempted to enter into the commercial production of pangasius as the industry went through the large expansion from 2005 to 2006. The high demand of processing companies looking to expand into new global markets meant these farmers regularly found a market for their fish. However, faced with a poor economy of scale their bargaining power was significantly less than larger farms. As costs increased and farm gate prices began to fall these farmers were amongst the first to exit production. As such, this third target group in the project is typical of rural communities which have been somewhat disarticulated from the global markets, with an annual household income of 26.3 million VND (US$1645) per year, or 5 million/person/yr (US$312) (see Table 23).

Despite leaving pangasius production the household farmers have maintained their ponds, largely because it would be too difficult to convert them back to gardens, but also because they have remained a source of protein from stocking either wild caught fish from the canals, or a number of self-recruiting species. As found in other parts of Southeast Asia these farmers may enter or exit fish production, but the ponds remain an important household asset (e.g. Demaine et al. 1999; Gregory and Guttman 2002; Bush 2004). The project therefore focused on assisting these farmers to upgrade their existing use of the pond by supporting the improved production of a number of alternative fish species which are commonly found in the domestic market.

The overall objective for this activity was to improve the diversity and efficiency of aquaculture production by producing more fish for sale in domestic markets and, where possible, export markets. The specific action research strategies for this target group focused on both process and chain upgrading:

1. Reduce the livelihood vulnerability and improve environmental performance of household farmers by supporting process upgrading of production practices for alternative species to pangasius.
2. Increased competiveness of these producers in domestic and (potential) export value chains by negotiating the terms and conditions of access to higher value chain segments

This component of the project was conducted in partnership with an existing DARD programme for assisting household scale producers and landless farmers. The specific activities within this programme supported by the project included training on management techniques, input use, and health care of alternative aquaculture species to pangasius. A farmer field school, led by staff from DARD, enrolled eight households. The extended impact of this extension activity was then assessed with a survey at the end of the project. The results of the project are therefore divided into an analysis of those famers that had moved out of pangasius production and those that had no previous experience in pangasius.

The first four households who did have previous experience with pangasius were supported to change their production to snakehead and snakeskin gourami. The four households that did not have previous experience were also the poorest households, with little or no land for pond construction. These farmers were supported to produce eel and frogs in pens. The decision to support this second group of farmers was made in negotiation with DARD. Although they do not represent inter-chain upgrading the farmers shifting to snakehead and snakeskin gourami do. As such special attention to the results from those farmers that had previously grown pangasius.

7.2 Identification and enrollment of key actors

The actors involved in the upgrading activities of household farmers were different to the two previous groups outlined in this study (Figure 27). When producing pangasius the household producers were never well connected to private sector actors, for either sourcing feed or selling to processing companies, and had a very poor economy of scale. These reasons combined meant that these farmers made up the bulk of the 37% of farmers that have left the industry since 2007. Outgrading these farmers away from pangasius to alternative species was therefore seen as a logical continuation of this wider process. In doing so the project sought to improve the performance of these farmers within these new species and value chains.

The extension services selected eight farmers to participate in field schools, based on their previous experience with aquaculture and interest in investing in innovative new production systems. All of the farmers fell within the household farmer category, with pond area less than 0.3 ha. Four species were selected by the extension services based on both familiarity by farmers and innovation. Snakehead was chosen because it has ben identified by DARD as having potential in both domestic and export markets. In addition, many household farmers had started to grow both of the species when they exited pangasius grow-out production. Because many of these farmers did not manage to make a profit with snakehead they were interested in learning more about their production. Snakeskin gourami, eel and frogs were also identified by DARD as target species, the production of which were all new to the farmers. Snakeskin gourami was selected because wild rice field populations of the fish are reported to have declined dramatically over the last decade. Eel and frog were selected because they can be grown in pens rather than ponds, which met the poverty alleviation objectives set out by DARD and the An Giang People's Committee.

It was recognized from the outset that the dependence of snakehead on marine fish and the collection of glass eels from surrounding water ways have potentially serious impacts on overall sustainability of these production systems. It should be noted that the choice of species was a negotiated process with the DARD who maintained their mandate for diversifying aquaculture production in An Giang. The only concession given to sustainability was the introduction of snakeskin gourami which is noted as declining in rice fields throughout An Giang because of changing hydrological patterns and chemical fertilizers. Domesticating the fish is seen as a means of supplementing these declining wild stocks.

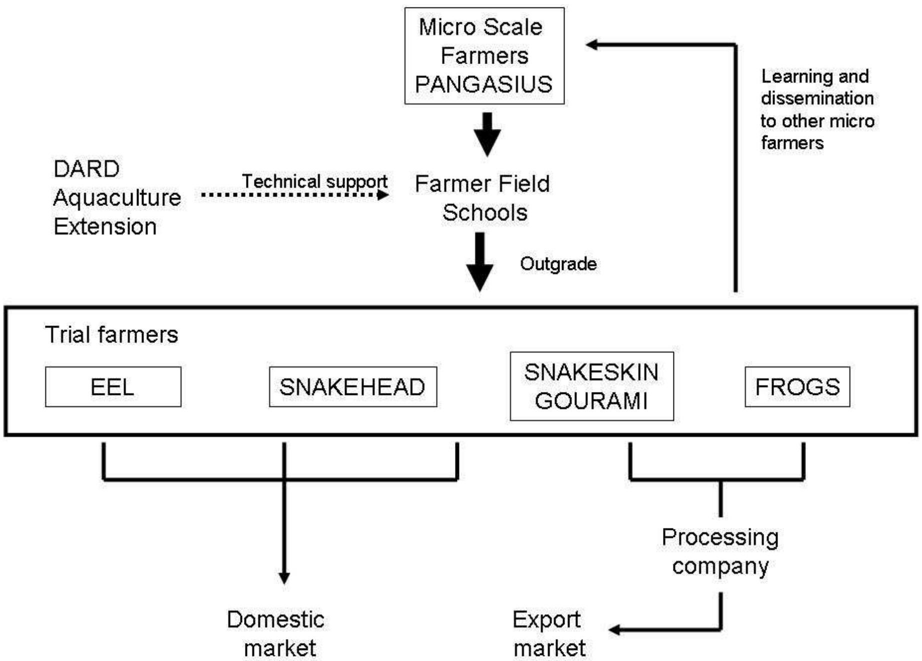

Figure 27. New linkages between key actors as a result of process and product downgrading and upgrading of household farmers

7.3 Characteristics of household farmers

Household scale fish farming in the Mekong Delta was developed under rural aquaculture policies in the 1980s and 1990s. The main aim of government policies supporting this production was to promote food security. The initial growth of the pangasius industry was supported by the expansion of cage culture along the mainstream branches of the Mekong River. However, farming also developed in parallel with smaller farmers using ponds dug originally for alternative species being used to grow pangasius. Farmers that were able and chose to convert their rice fields to ponds upgraded their position in these markets.

In response to the variability of rising input costs, market prices and ever higher food safety requirements, these household farmers have exited pangasius production. In order to understand the nature of this exit, or 'outgrading' from the industry, the following reports on a baseline survey conducted with 100 farmers in five villages (Hoa Lac, Vinh Thanh Trung, Binh My and My Phu and Phu Hiep) in Chau Phu and Phu Tan districts. The following provides a description of these farmers as well as identifying key indicators of vulnerability, including details of their previous crop, as well as livelihood data on labour, and income.

7.3.1 Household aquaculture systems

Household farmers practice aquaculture in three different production systems: ponds, pens and hapas (or netted cages). Earthen ponds, used by 37% of the farmers surveyed, are the most versatile production system, used to grow snakehead, tilapia, pangasius, eel and clarias catfish. Hapas are used inside ponds and are the most common production system used for snakehead, which makes up 80% of production across all three production systems (Figure 28). In addition, pens constructed from cement or plastic are used to raise tilapia, snakeskin gourami, eel and snakehead. These systems are most common amongst farmers with the smallest land area as they can be built in gardens adjacent to the family house. They have been included in the project to meet the wider poverty alleviation and livelihood diversification goals of DARD.

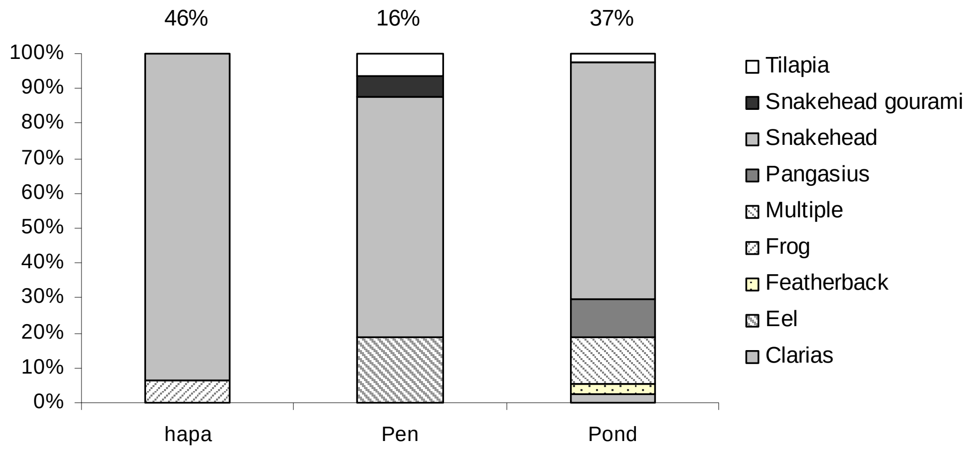

Figure 28. Proportion of farmers by production system and species

Households practicing aquaculture in hapas and pens are generally poorer than those with ponds. These farmers have a smaller area of land with less than half the area dedicated to aquaculture and a per capita income only two-thirds that of pond owning households (Table 23). The average land area per household of these farms is very small at 0.23 ha; approximately one fifth of the average farm size in An Giang. A larger portion of the land is devoted to rice planting, about 0.028 ha is used for aquaculture. 62% of the sample households have land area smaller than 0.02 ha. More than 80% of the households have aquaculture area smaller than $500m^2$ with average pond area of $237m^2$.

Household farmers are quite homogenous with an average size of 5.3 people and an average of 2.2 working members. The small number of working members combined with the reluctance of farmers to hire outside labour is also a limiting factor to pangasius production. Labour is also affected by education. All households have around the same number of years education and therefore the same literacy levels (Table 23). Most of the household heads did not complete elementary education. As a result, poor education was one of the key reasons pond farmers report having difficulty participating in the pangasius industry in terms of dealing with written technical and market information.

Table 23. General profile of household farmers

Farming system	% of farmers	Experience (years)	Land area (ha)	Aquaculture area (ha)	Education (years)	% farmers with training	USD/ person/ yr
Hapa	46	4	1,5	0,2	4,9	15	292,96
Pen	16	3	1,6	0,4	4,5	4	243,69
Pond	37	8	3,5	0,9	4,6	13	399,69
All	100	5	2,2	0,5	4,7	32	312,11

The results of the survey indicate that household farmers were early adopters in the expansion of the pangasius industry in 2003. The majority of farmers had constructed their ponds in 2003 and 2004 in response the large demand for pangasius. Before this time only a quarter of farmers had previously participated in aquaculture (see Figure 29). At the start of the increase of farmers involved in aquaculture two thirds were practicing aquaculture in ponds. Although there was a steady increase in the number of ponds, the number of farmers practicing aquaculture in hapas and pens also grew substantially indicating the shift to snakehead production. By 2006, the number of farmers growing fish in hapas appears to have exceeded the number of farmers with ponds.

Many of the households that shifted from pond to hapas between 2005 and 2007 were shifting from pangasius to either nursing farming or snakehead production. At the time of the survey only three of the 100 surveyed households continued to grow pangasius with a further ten households nursing fingerlings. Snakehead is the most popular species raised by approximately 40% of the households surveyed. Snakehead production has emerged as an important species in An Giang largely because of the success of household hatcheries and nurseries. One quarter of grow-out farmers source their fingerlings from these farmers. The production of snakehead from the An Giang Seed Centre is negligible with only 3% of farmers buying from them. A further 5% use juvenile fingerlings from wild sources.

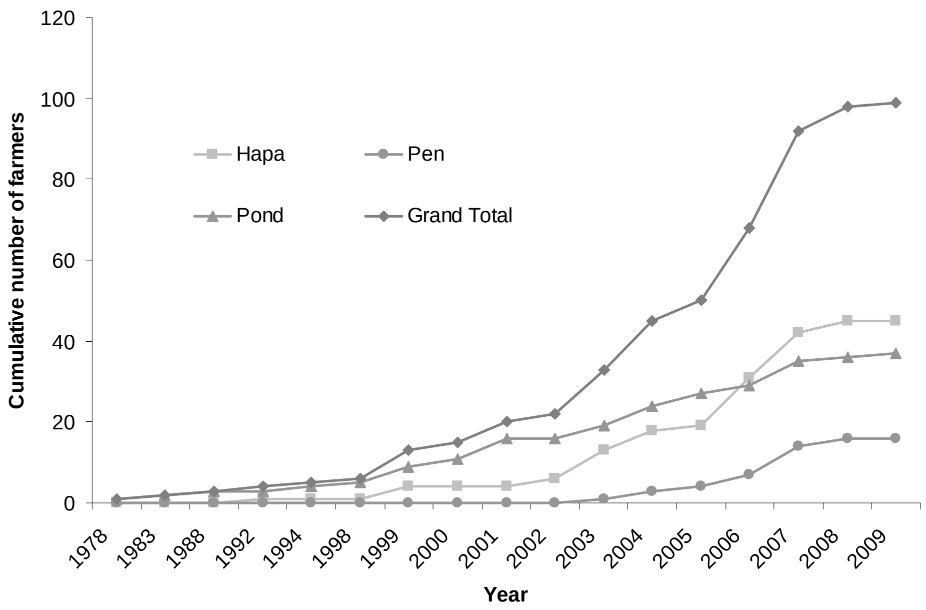

Figure 29. Cumulative frequency of farmers investing in aquaculture

7.3.2 Household farmer livelihoods

Average annual per capita income for household farmers is 5.2 million VND (US$326), with pond farmers being the wealthiest and pen farmers the poorest of the three categories (Table 24). The income for all three groups are higher than the official national poverty level of 200000 VND/person/month in rural areas, equivalent to approximately US$150 person/year. The three production systems, with 38% of hapa farmers, 25% of pen owners 14% of pond owners falling below the poverty line. However, the government is currently planning to revise the poverty line to 350000 VND/person/month, or US$220 person/year. This new figure would mean 43% of pond farmers, 53% of pen farmers, and 51% of hapa farmers would be considered as poor.

Aquaculture is the most important source of income for 43% of households surveyed. The only exception to this are pond farmers, who have approximately the same proportion of income from aquaculture and rice production. This is not surprising given they have only converted one quarter of the their land holdings into fish ponds (see Table 23). By comparison, farmers with pens and hapas are more dependent on off farm labour and petty business for additional income. Livestock and seasonal cash crops are not important for any of the groups surveyed. Those with pens, representative of those with the smallest land holding, are also dependent on social welfare (most commonly war pensions) for 12% of their total income.

Household farmers are dependent on rice for their subsistence. Rice is sold by 37% of respondents – the majority of which are those with pond aquaculture systems. Fishing is not listed as a source of cash income by any of the respondents. However, this is unlikely given the importance of rice field, floodplain and riverine fisheries for households in the Mekong Delta. The omission may reflect the subsistence nature of fisheries, especially given 256kg/year of fish is consumed by the surveyed households. This level of consumption, equivalent to 49kg/person/year, approximates previous studies which estimate consumption between 34 and 54kg/person/yr (Sjorslev 2001; Hortle 2007). Overall, the importance of fish for rural households, in addition to income through aquaculture, is clear.

Table 24. Average annual household and per capita income including non-cash income

Type of production	Hapa USD	%	Pen USD	%	Pond USD	%	All USD	%
Aquaculture	738	48	457	36	819	39	723	43
Fishery	87	6	0	0	41	2	56	3
Rice	272	18	98	8	825	40	450	27
Other crop	5	0	0	0	42	2	18	1
Livestock	45	3	0	0	51	2	40	2
Off farm labour	204	13	309	24	163	8	206	12
Petty Business	147	10	253	20	129	6	157	9
Remittances	0	0	0	0	10	0	4	0
Social welfare	27	2	150	12	0	0	37	2
Other income	15	1	0	0	0	0	7	0
Total household	1539	100	1267	100	2078	100	1697	100
Total per capita	296		243		400		326	

Figure 30 presents the average percentage increase or decrease of income from these livelihood activities. The results shows that the dependence of household farmers on aquaculture makes it the largest source of livelihood vulnerability. Nevertheless farmers regard aquaculture as the most important source of income, with approximately half of the respondents indicating fish farming having increased their income. This result is only remarkable when placed next to the relatively small changes in income from rice, hired labour, fishing and livestock raising. Interestingly, fisheries is the only income source with a net decline. Conversely, aquaculture has been the key activity responsible for declining income, making it the most risk prone activity in the livelihoods of household farmers.

The results show that farmers are highly vulnerable in the value chain, with a low income. These farmers are characterized by limited skill and knowledge of production practices and poor bargaining power with both input suppliers and post-harvest traders and processing companies. These household producers have limited capacity to participate in the export markets because of low quality product, poor economy of scale, lack of technical knowledge, low productivity producing for local market, facing consistently low unit price of fish. Limited skill and knowledge of producers, who collectively may constitute the largest group of farmers in the Delta, also contribute to a higher risk of water pollution; especially in village areas inland from larger canals and rivers (see Schut 2009).

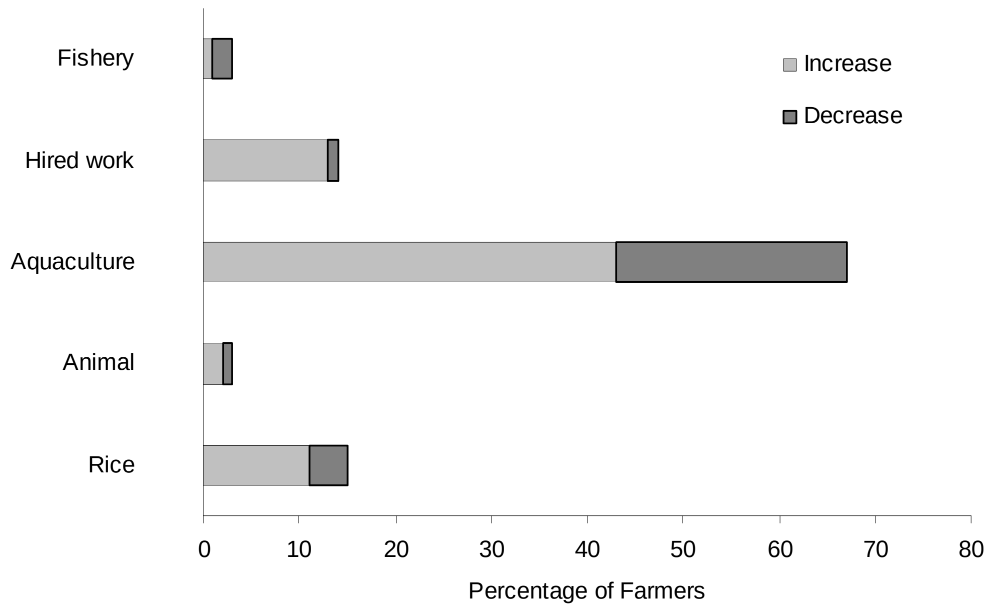

Figure 30. Change of income by livelihood activity

The average income per species before the project intervention ranged considerably (Table 25)Table 25. Snakehead had the highest return at an average of 11.2 million VND (US$ 700) per crop or 19 million VND (US$1190) per year. This was expected given the high prices of snakehead and experience many farmers in the Mekong Delta have growing the fish. Pangasius nursing, featherback and gourami returned the lowest annual incomes. The pangasius and snakehead farmers illustrate the path that many household pangasius grow-out farmers took leaving the industry. Most first downgraded to nursing farming before outgrading to snakehead. Many farmers reported they were not profitable at either farming system, leaving them with further losses and debt. Farmers were not able to estimate their costs because most, if not all, do not keep any records of their production activities. However, this is expected given their very small production scale, lack of access to quality water sources, and low technical knowledge would not have provided favorable conditions for pangasius nursing. The high cost of feed, with similar proportions of quantities of homemade feed as pangasius, is regarded the main factor making snakehead farming unprofitable.

All of the farmers interviewed wanted to expand their production. The main limitations to achieving this cited by the farmers was fish disease, lack of capital investment or a lack of technology. Nearly 90% of farmers said they would benefit from either assistance with credit and or technical assistance. Half of the respondents had borrowed money for aquaculture and had maintained an average loan size of 14 million VND (US$ 770) per crop. All of the loan was used to buy feed. Of the 47 farmers who had loan, only 11 were able to access to official credit from the Bank of Social Policies and the Bank of Agriculture & Rural Development. The majority of the small farmers had to depend on private lender for loan with interest rate ranging from 3 to 7% per month. As expected, many farmers wish to have more access to formal credit, technology training on raising fish species, combination of credit with technology support and access to good quality of seed.

Table 25. Income by species

Species	US$/Crop	Crop period	Volume per crop	Crops per year	USD/Year
Clarias	313	6	1250	2.0	626
eel	400	7	320	1.8	720
Featherback	280	8	300	1.0	280
Frog	200	2.5	400	4.0	800
Pangasius (nursing)	177	6	867	1.2	212
Snakehead	700	6	1400	1.7	1190
Snakeskin gourami	300	8	560	1.2	360
Tilapia	625	10	1670	1.0	625
Average	374	7	846	1.7	602

7.3.3 Domestic value chain

As only 2% of farmers were still involved in the pangasius value chain, research was carried out on determining structure and function of the value chains for snakehead, frogs, eel and gourami. The same methodology used in the value chain analysis for pangasius was applied (presented in chapter 3). In total 77 actors in the chain were interviewed, including 39 farmers and 30 retailers, with eight group discussions with traders at city, district and village markets. Questions focused on the structure of the chains and the distribution of value between chain actors. Attention was also given to the terms and conditions of market access for the producers. The results form a key basis of comparison for determining a measure of upgrading post project intervention.

The value chains for the four target species involve the same range of actors, from input providers through to farmers, traders, retailers and consumers. Each of the chains are, however, structured very differently, influencing the flow of finance and information to farmers, and therefore their capacity to negotiate market access and the value of their fish.

The most simple value chains were for eel and frogs. The frog value chain (Figure 31) is very linear with only one main strand extending to both city and district markets. Farmers are limited in their capacity to negotiate prices given there are a limited number of traders at the village level. Their input needs are also relatively basic – with industrial feed sourced from local suppliers at 7000 VND/kg (US$0.44 per kg) and tadpoles from the AGSC or from hatcheries located in surrounding communes at approximately 1000 VND (US$0.06) each. Capital cost are also very low at an 500000VND (US$31) for materials for pens.

The eel value chain is slightly more complex. Farmers buy 50kg of glass eels (juveniles) from fishermen for 1.6 million VND (US$100). Both marine fish and golden snail, at 5000 VND/ and 1000 VND/kg respectively, are used in home made feed mix. The capital costs are slightly higher than for frog at with start up costs estimated at 800000VND (US$50). The eel are then trader to collectors (traders) , who buy 80% of produce, or retailers who buy the remaining 20% (see Figure 32). The traders are more likely to sell the eel to distant markets in Ho Chi Minh City. These retailers pay on average 7000VND (US$0.44) or 7% higher than traders who sell locally or to Ho Chi Minh City. Although there were reports that eel is being sold to export markets such as Japan, this chain was not found in the survey.

Snakehead and snakeskin gourami value chains are more complex, both leading to domestic and export markets. The snakehead value chain farmers source fingerlings from local hatcheries and feed from a variety of local sources (see Figure 33). As most of the feed used is home made, farmers buy golden snail and crabs as main protein sources. Both cost between 500 and 2000 VND/kg (US$0.03 and US$0.12). The capital costs for the ponds are carried over from previous pangasius production. The farmers then sell to two strands. First, directly to traders who sell to retailers in regional markets, or to processors who dry or ferment the fish before selling to either domestic retail markets or regional and global export markets. Retailers also buy fish directly from farmers at prices 5000VND/kg (US$0.31) higher than traders. Fresh snakehead is largely traded to Cambodia for approximately 35000 VND/kg (US$2.18) while dried and fermented snakehead is traded to Asian consumers in the EU and US with an export value of approximately 80000VND/kg (US$5.00)

The snakeskin gourami chain differs slightly again. Farmers buy fingerlings from both fishermen who have caught juvenile fish as well as from hatcheries (Figure 34). Feed is also highly diversified, with homemade mix made up of commercial pellets (costing 7000 VND/kg; US$0.44), golden snail and rice field crabs (1000VND/kg; US$0.08). These farmers have no capital costs given they are using ponds previously built for pangasius production. Approximately half of the snakeskin gourami is sold to traders, while a further 10% is sold directly to retailers. Fish are sold fresh in both retail and trader strands to consumers in domestic markets. However, processors purchase 80% of the fish produced, either directly from farmers or from traders. These processors dry the fish before selling directly to domestic consumers for 150000 VND/kg (US$9.36), compared to 45000 VND/kg (US$2.81) for fresh fish. The remaining 5% of snakeskin gourami produced is sold to export markets in the EU and US.

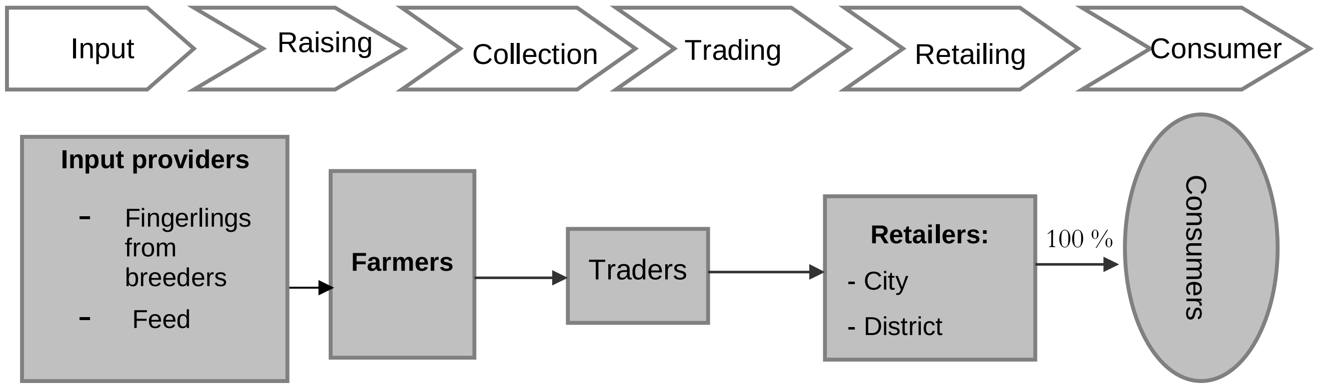

Figure 31. Value chains structure and value distribution for frogs

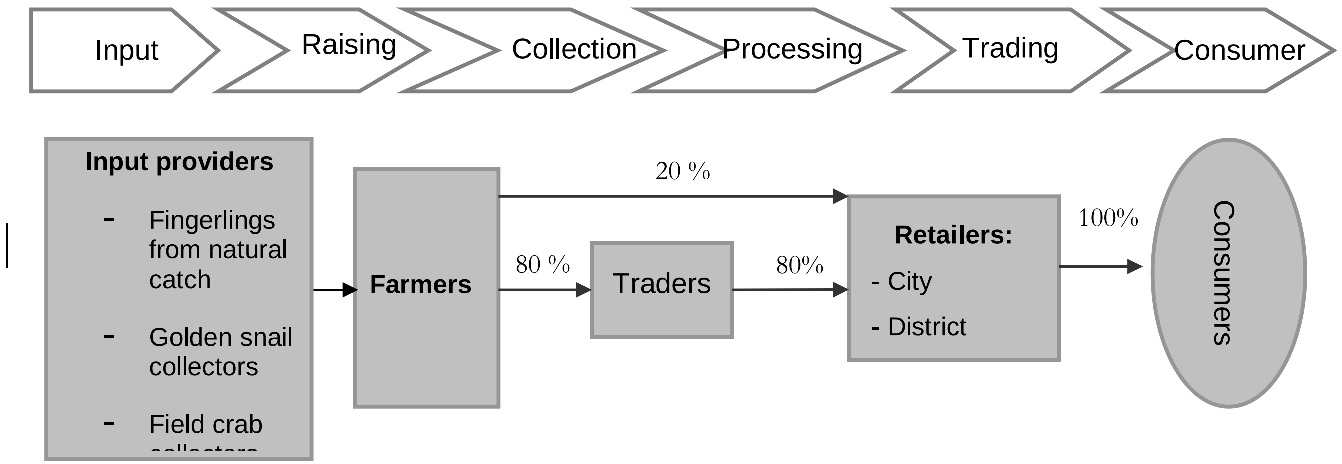

Figure 32. Value chain structure and value distribution for eel

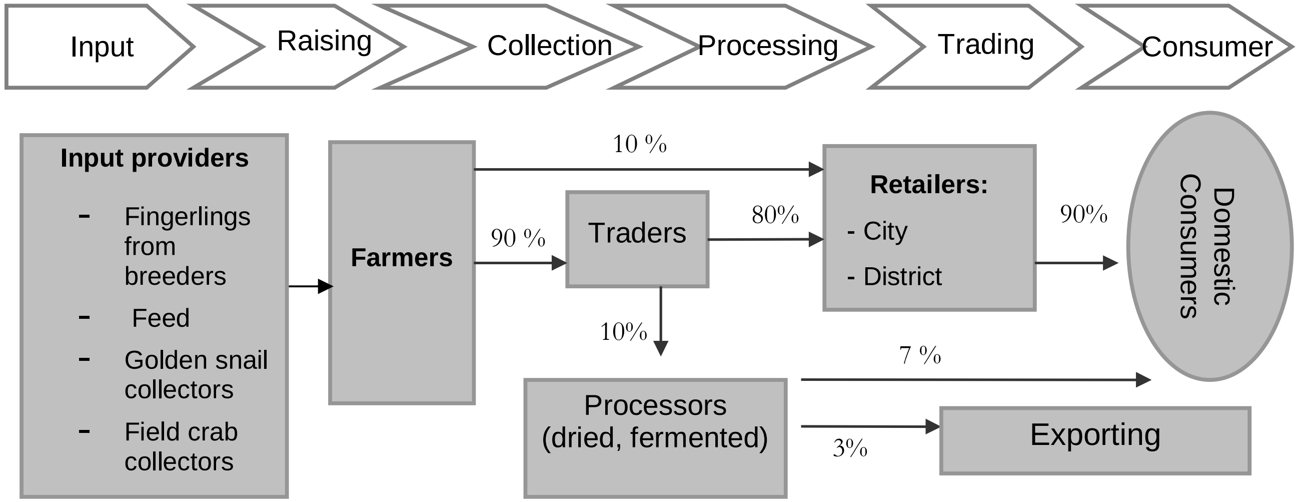

Figure 33. Value chains structure and value distribution for snakehead

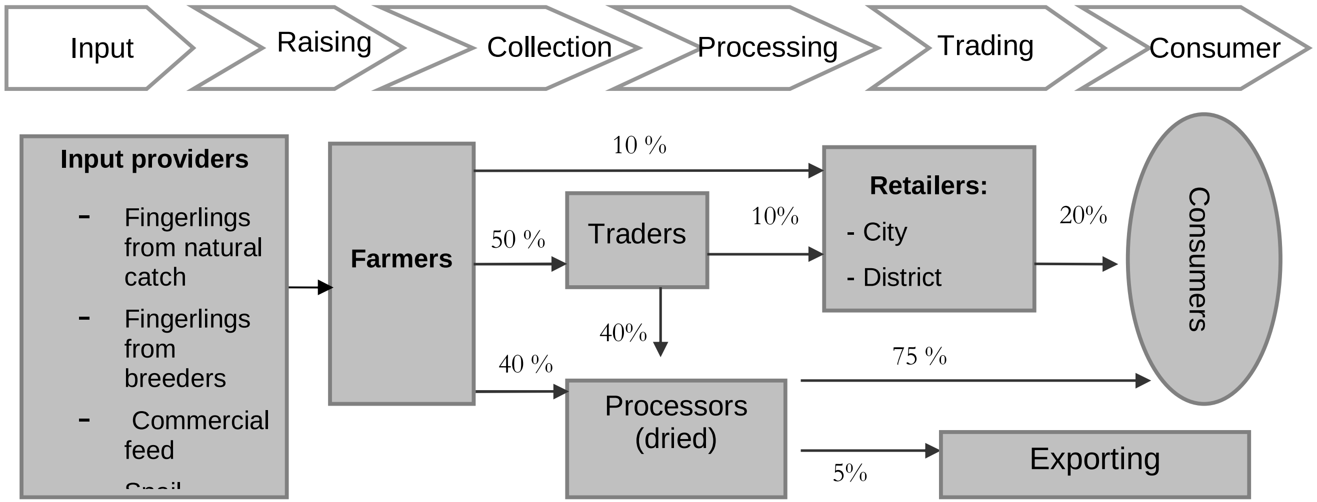

Figure 34. Value chains structure and value distribution for snakeskin gourami

Fish traders are key actors in each of the value chain in facilitating farmer's access to markets. Transactions are either made at the farm gate or at assembling points such as village markets, canal bridges or road crossings. These are largely 'spot markets' where traders, farmers and fishers meet. The collection points allow traders to increase their economy of scale and facilitates farmers to sell on an semi-open market. Most of the traders are known to the farmers as they live in or near to their communities, use only family labour and work exclusively in cash.

The average amount of fish that traders buy varies considerably. Those traders selling to district markets purchase as little as 12 kg a day, whereas traders selling to urban centers trade up to 140 kg per day. Both groups of traders concentrate on a small number of fish species. As Table 26 shows, the farm gate price for eel is the highest at an average of 81500 VND/kg (US$5.09), followed by snakehead and frog. It is not clear why the cost of frogs are three to five times higher than the other species – they are transported live with no costs in terms of aeration unlike the other species. The overall profitability of eel is highest.

Table 26. Added value for traders

Species	Buying price (1000 VND/kg)	Added cost (1000 VND/kg)	Selling price (1000 VND/kg)	Profit (1000 VND/kg)
Snakehead	1.81 (1.37 – 2.25)	0.07 (0.03 - 0.13)	2,41 (2 - 2,81)	0,38 (0,13 - 0,63)
Gourami*	-	-	-	-
Frog	1,47 (1,44 - 1,5)	0,41 (0,03 - 0,49)	1,56 (1,5 - 1,63)	0,09 (0,06 - 0,13)
Eel	5,09 (4,69 - 5,63)	0,18 (0,06 - 0,19)	5,47 (5 - 5,94)	0,48 (0,31 - 0,63)

* Data for gourami was not collected.

Three groups of retailers at the village, district and city markets were surveyed. The results show that the composition of fish traded by the three groups do not differ much. The most common type of traded fish is snakehead, including wild caught and cultured. This was available throughout the year while the availability of other fish species, including frog, eel, and climbing perch were dependent on season.

Those retailers selling in district and village markets, typically buy between 15 and 30 kg per day directly from farmers. In both cases farmers sell their fish to the traders and then receive payment at the end of the day when the fish has been sold. This mechanism ties farmers to traders, while at the same time facilitates a form of quasi-credit by reducing the risk of traders. By comparison, urban retailers purchase less than 10% of their fish directly from farmers, instead purchasing from traders who transport the fish to major collection points. Retailers trade considerably larger amounts of fish, from 30 to 100kg per day. They sell the majority of the fish directly to consumers, while a small proportion is sold to restaurants and small processors. These retailers sell a wider and varying selection of species, including pink tilapia, climbing perch and pangasius. Given their capacity to purchase from a range of traders their selection and quality of fish does not vary greatly through the year.

As outlined in Table 27 both frog and eel are the most profitable species for retailers in all markets. The purchase price of eel is lower than that of traders because retailers more often purchase directly from farmers. Snakehead has a lower retail than trader price because of the higher supply in urban markets. Frogs have the highest price difference between trader and retailers of approximately 20000VND (US$1.25) because of the relatively low availability in urban areas.

Table 27. Added value for retailers

Species	Buying price (1000 VND)	Added cost (1000 VND)	Selling price (1000 VND)	Profit (1000 VND)
Snakehead	2,03 (1,56 - 2,5)	0,08 (0,03 - 0,13)	2,13 (1,75 - 2,5)	0,25 (0,88 - 0,31)
Gourami*	-	-	-	-
Frog	2,44 (2,19 - 2,69)	0,09 (0,06 - 0,13)	2,81 (2,5 - 3,13)	0,38 (0,31 - 0,44)
Eel	4,69 (3,75 - 5,63)	0,09 (0,06 - 0,13)	5,78 (5,63 - 5,94)	0,38 (0,31 - 0,44)

* Data for gourami was not collected.

Both tables show that frog and eel have the highest potential marginal increase in profit in the value chain for farmers. However, farmers are unlikely to renegotiate the terms and conditions in this chain given key constraints of a poor economy of scale, showing that while traders extract 20% from the total value, they provide a necessary provisioning function in the domestic value chain given the small unit scale and diffuse nature of production.

Although a complete analysis of the distribution of value along the chain was not possible, the results do show modest unit margins of between 4000 and 7700 VND/kg (US$0.25 and US$0.48) for the selected species (Table 26 and Table 27). The high margins made by traders and retailers means there remains adequate marginal value in the chain for farmers to increase their share of value in domestic markets. The expectations of the gourami farmers, for example, indicate their desire to add value to their fish by first drying the fish before selling to traders in Chau Doc. Alternatively, the small flow of snakeskin gourami and snakehead to export markets also offers an opportunity for farmers to negotiate higher value for their fish. There are also reports from DARD that eel is being considered for export to Japan. Although this is a niche market (if it currently exists at all) the potential for such trade would be of major benefit to household producers in An Giang.

The remainder of the report focuses predominantly on the results of the process upgrading of lead farmers and the impact to their livelihoods. Unlike the previous two chapters, this gives a predominantly production focus to the analysis. Nevertheless, attention is also given to what opportunities exist for farmers to upgrade their position in both domestic and international value chains for the four target species.

7.4 Training and extension

The main set of upgrading activities identified by the team focused on enabling these household farmers to shift their production systems to alternative fish species such as eel, gouramy, snakehead, tilapia, and frogs. Training workshops were conducted and alternative domestic and export value chains were introduced to lead farmers within a farmer field school model. Lead farmers were selected on the basis of their willingness, capacity and representativeness. The farmer field school model was chosen as an appropriate form of rural extension understood by both farmers and DARD staff. The objective was to determine the extent to which upgrading in an alternative chain would reduce the vulnerability of these producers. In addition, farmers outside the farmer field school were monitored to see the extent to which these new techniques were disseminated.

Training and extension was facilitated through a farmer field school model, which is designed to introduce new skills to lead farmers, who then through a process of demonstration, extend these techniques to surrounding households. The technique is used widely in Vietnam as a means of rural extension.

The selection of species was based solely on the physical capital of the farmers. Snakehead and snakeskin gourami was extended to farmers with ponds. Frog and eel were selected for farmers with no ponds. Each of the species was introduced to the target farmers and communities through a series of trainings in 2009 (see Table 28). Approximately 20 participants were chosen to attend each training by the local commune officials. In total 200 participants attended. Eight lead farmers were chosen from a group of volunteers based on their previous experience in growing each of the species, their location and suitability for the production system. To maximize dissemination of the results a series of television and radio programmes ran stories on the farmers.

Table 28. Training activities for household farmers

Content of training/workshop	No. of training	Participants/ course	No. of workshops	Participants/ workshop
Eel production technique	3	20	1	20
Frog production technique	2	20	1	20
Gourami production technique	3	20	2	20
Snakehead production technique	2	20	2	20
Tilapia production technique	2	20	2	20
Total	**12**	**100**	**8**	**100**

In line with the action orientation of the research, information was generated on the farming practices with the use of logbooks. Farmers were asked to record both the inputs and outputs in the new aquaculture systems. Given some of the farmers were illiterate, staff from DARD were employed by the project to provide day to day assistance. This close support provided more direct technical assistance.

7.5 Impacts of process upgrading

7.5.1 Income benefits for lead farmers

The results of the project show that the eight lead farmers in the project all increased their income from the pre-upgrading cycle. The average pre-upgrading profit margin was 2.6 million VND (US$160) per crop, which was raised to 8.4 million VND (US$522) in the first upgrading cycle and then 12.2 million VND (US$762) in the second cycle. In addition to increasing production, the farmers were able to make cost savings of approximately 10% by improved recording and following prescribed feeding regimes between the upgrading cycles – amounting to approximately 1.6 million VND (US$100). With the exception of eel, the farm gate prices increased by 9% Table 29 and Figure 35). Labour is not taken into consideration in the cost calculations because the household scale farmers do not employ anyone outside the family.

Snakehead remains a higher risk species given the high cost of feed, which makes up the higher proportion of total costs. The reliance of snakehead on homemade feed also makes production more vulnerable. Although the cost is overall lower than for pangasius this species remains unsuitable for most farmers, especially given feed maintains their reliance on high levels of informal credit. A large number of farmers are attracted to snakehead by the similarity of production techniques to pangasius and relatively high ROI. But, as outlined above, many have failed with the species because of the high overall feed costs. The farmers were profitable in the two upgrading cycles giving them an average of 11 million VND (US$693) per crop.

Both snakehead farmers improved their return on investment between the two grow-out cycles. Both cycles were profitable, in contrast to the pre-upgrading cycles, largely as a result of reduced feeding costs. Because of the increase in the price of marine fish during the upgrading cycle, as also seen in pangasius grow-out, the farmers switched to golden snail, which is 4000VND/kg (US$0.25) cheaper. This reduced their unit costs by US$0.12 per kg and increased their ROI by 41%. This shift also addresses one of the key environmental concerns of the project – the use of marine feed. Concentrating on golden snail as a replacement also has the added benefit of reducing a rice pest. As the snail is largely collected by landless farmers who earn 1000 VND per kg (US$0.06). How durable this activity is remains to be seen given that there are reports that the golden snail is also reducing in numbers

Table 30 shows that the snakehead farmers are also the wealthiest of the household scale producers, with a total annual income of 43.4 million VND (US$2713), or 7.9 million VND (US$493) per capita. They also appear to have the most diversified income. Aquaculture is the largest contributor to total income but only makes up 43% of the total. While not diminishing the contribution of snakehead to household livelihood security, the farmers are relatively less dependent than farmers in the other production systems.

Table 29. Comparison of cost structure for each species between upgrading cycles

Item (US$)	Frog		Eel		Snakehead		Gourami*
	First cycle	Second cycle	First cycle	Second cycle	First cycle	Second cycle	First cycle
Production area (m2)	*30*	*30*	*40*	*40*	*30*	*30*	*30*
Construction	0,06	0,06	0,24	0,17	0,06	0,04	0,04
Seed	0,35	0,46	0,52	0,36	0,01	0,07	0,27
Homemade fresh feed	0,09	0,07	0,54	0,54	1,1	0,98	0
Commercial feed	0,35	0,45	0	0	0	0	1,18
Feed supplement, drug	0,03	0,08	0,15	0,12	0,06	0,1	0,08
Electricity & diesel	0,01	0	0	0	0	0	0,03
Total cost	0,89	1,12	1,45	1,19	1,23	1,19	1,6
Production (kg)	434	450	333	334	1600	1344	560
Farm gate price	1,60	1,70	4,50	4,40	1,50	1,90	2,20
Profit/loss	0,50	0,59	1,36	1,38	0,27	0,75	0,50
ROI	1,56	1,53	1,94	2,16	1,22	1,63	1,31

* The gourami farmers had not completed the second cycle by the end of the end of the project.

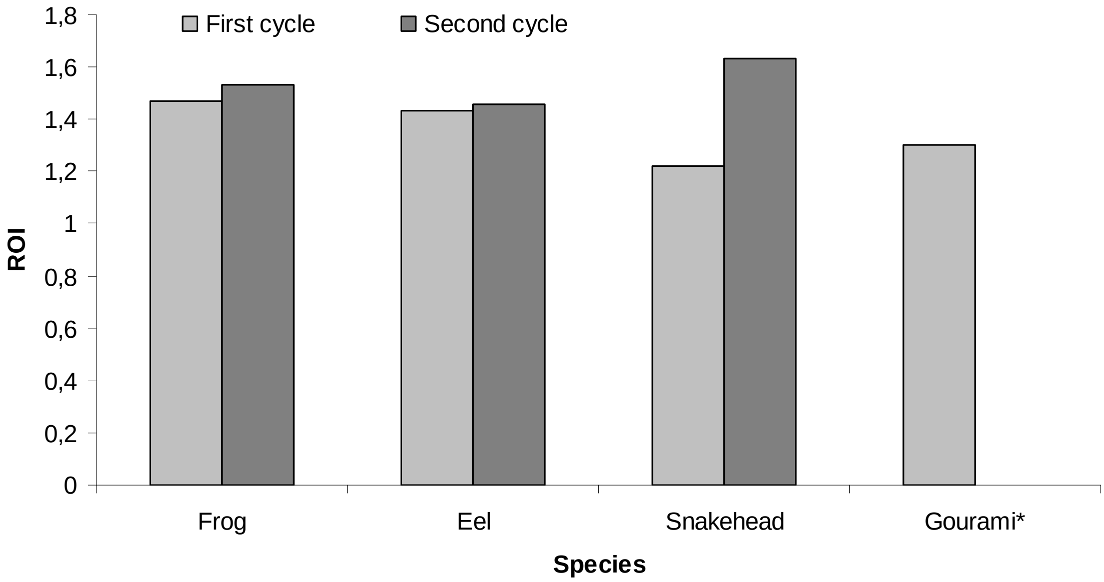

Figure 35. Comparison of ROI between cycles
* The gourami farmers had not completed the second cycle by the end of the project

Table 30. Livelihood contribution of target farmers

Item	Frog		Eel		Snakehead		Gourami	
	US$	%	US$	%	US$	%	US$	%
Aquaculture	1138,28	66	1879,011	72	1178,304	43	349	22
Fishery	20	1	150	6				
Rice	50	3	200	8	800	29	1200	75
Other crop					45	2	50	3
Animal	120	7	50	2	220	8		
Hired work	250	14	320	12	350	13		
Petty business								
Remittance	150	9			120	4		
Non agri.								
Salary								
Other income								
Average total	1728	100	2599	100	2713	100	1599	100

The two farmers that took up gourami production also appear to have improved their returns from pre-upgrading cycles. For these farmers gourami is the third shift in production they have undergone since leaving pangasius grow-out farming. They failed at nursing because of poor water quality and high mortality rates, and the high cost and effort of feed in snakehead production. Although only one grow-out cycle was completed during the project, because of the longer grow-out period, the farmers were able to turn these losses into a 30% profit margin. While the profit for the first cycle was 5.4 million VND (US$336), the eight to nine month grow-out period means farmers only make an average of 6.4 million VND (US$403) per year.

The farmers enrolled in the project had an interest in gourami because they see an opportunity to add value to this fish by drying it themselves and then selling to traders in Chau Doc. Drying the fish would increase the unit price by approximately 5000 VND/kg (US$0.31); which would raise annual income from aquaculture by 4.3 million VND (US$268). Unfortunately, given the length of the production cycle, and limitations within the project itself, they were not able to do so. However, without such functional upgrading it appears that gourami is not a suitable species for household farmers.

Because of the long grow-out period gourami makes the lowest contribution to annual income of the four production systems at only 21% (Table 30). Interestingly the livelihoods of these farmers are the least diversified, with no other sources of income than rice and minor cash crops.

Frog and eel production appear to be more consistent forms of production with relatively low production costs and strong farm gate prices. As such they appear to be a lower risk production system than either snakehead or gourami. The ROI for frog production ranged from 56% in the first cycle to 53% in the second cycle, bringing in 4.6 million VND (US$285) a crop. A major benefit of this production system is that the farmers can stagger the production of the frogs, selling the faster growing frogs first. This means that farmers have a constant source of income throughout the grow-out cycle. Overall, the short production cycle for frogs meant the target farmers earn 18.2 million VND (US$1138) per year based on the two cycles. Although modest, this income is only 3% less than the snakehead farmers, while total investment is 80% less.

Feed for frog production is considerably lower than other production systems, while seed is relatively expensive. The farmers use a mix of homemade and industrial feed which together made up only 49% of total costs in both cycles. These figures are approximately half of the relative investment in snakehead and gourami. The use of golden snail in the homemade feed was not only a factor in keeping the costs down, but also brought the added environmental benefit of pest eradication. Frog seed makes up approximately one third of production costs. Sourced from local hatcheries these frogs are bought once they have metamorphosed from tadpoles. Although investment is low, the time investment drives up the price.

Eel was the most experimental of the production systems, but also the most successful. The farmers adopting eel made an average ROI of 94% in the first cycle and 116% in the second cycle, equating to 13.7 million VND (US$1979) per year, or 5.7 million VND (US$359) per capita. The cost of this production system are kept low because of the relatively low amounts of feed needed and, like other systems, the use of golden snail in place of marine fish. The price of eel at around 71200 VND (US$4.45) per kg is more than double the other species. Although this is a modest income the production system has the potential to be scaled up with minimal investment in pen construction.

7.5.2 Comparison with Pangasius grow-out production

The first objective of supporting process upgrading of household farmers was to reduce their exposure to the market vulnerability they experienced in pangasius grow-out farming. To a large degree this objective was reached by virtue of the fact the producers had left the pangasius industry. The collective latent capacity of these household and family scale farmers means they will continue to evaluate the balance between the *potential* high return on pangasius farming and the lower, but more stable returns found in farming alternative species.

Based on the 2010 'boom' cycle for pangasius grow-out farmers (chapter 5), and taking into consideration the smaller size of household farmers ponds, the opportunity cost of not participating in the industry at that time is estimated at least 80.4 million VND (US$5023). However, during times of oversupply in the pangasius industry, the 'outgraded' household farmers are more likely to stay profitable. If we take the net profitability of the family scale pangasius farmers in the Tan Phu Clean Pangasius Club from 2008 to 2010, they made an average net loss of 29.1 million VND (US$1821). If we then apply the same rates of return to the household farmers, with ponds of 0.3 ha, this loss doubled to 34.4 million VND (US$2150). If the farmers are able to maintain the average incomes shown for frog, eel and snakehead, the all three species would have been more profitable from 18 million VND (US$1163) to a profit of 100 million VND (US$6263) per hectare per year (Figure 36).

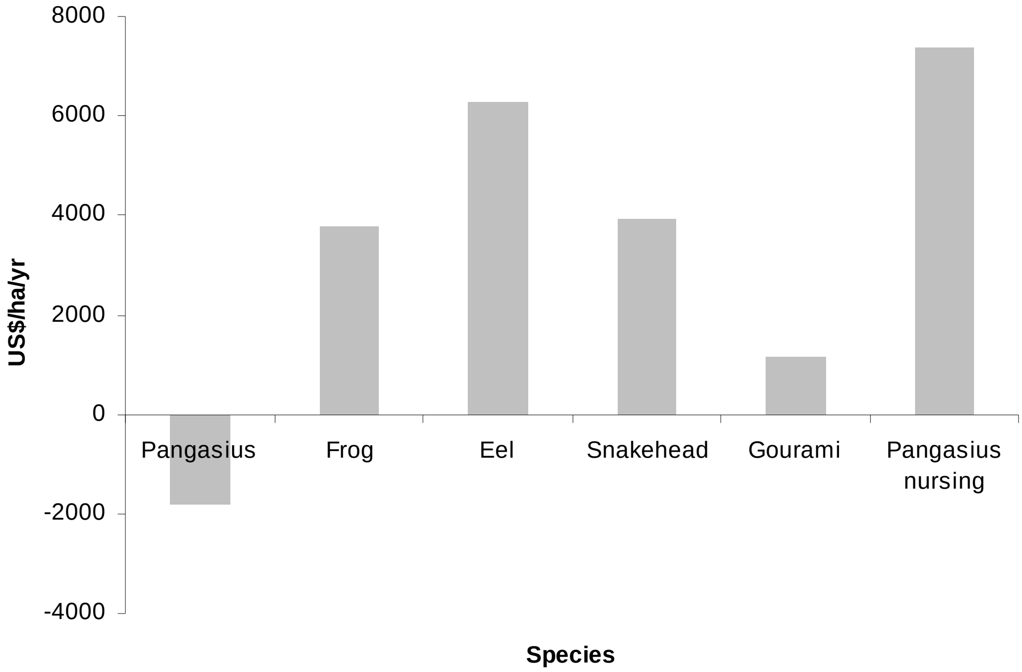

Figure 36. Comparison of cumulative profit of Pangasius and alternative species from July 2008 to April 2010
Note: Frog, eel, snakehead and gourami figures are back-casted based on average incomes from target household farmers. The figure for pangasius is based on actual changes over four grow-out cycles.

The 'boom crop' mentality of farmers, noted by several authors in tropical shrimp production (amongst other crops in Southeast Asia) (e.g. Vandergeest et al. 1999; EJF 2003; Hall 2003), drives the persistence of marginal farmers in the pangasius industry. The global economy is expected to recover from the financial crisis in 2010. With this recovery it is expected that the demand for pangasius will also rise – pending current political turmoil in the US (GLOBEFISH 2010). The rise in quality standards might well remove access for household farmers to return to the industry. It is yet to be seen whether the diversification of the industry to lower value and less stringent markets in South America, Eastern Europe and the Middle East, will provide adequate incentive to return to production or not.

7.5.3 Environmental benefits

The environmental benefits of outgrading household farmers to alternative species is rather ambiguous. If the species that were chosen by DARD for outgrading were herbivorous and artificially spawned, then forage fish consumption and water quality may have been improved and pressure on wild caught seed avoided. As it stands, the results show a mix of potential benefits and ongoing impacts.

The reliance on homemade feed for many of the species remains a central environmental concern. The farmers did shift away from marine fish on the basis of price. In addition, they started using golden snail more intensively in their feed mix. The eradication of this rice pest is seen as a major objective of farmers and the government alike. Its collection also reportedly supports landless laborers – although the extent of this support was not assessed by the project. Ironically, there are now 'concerns' that the rise of golden snail as an aquaculture feed has been too successful and that stocks are running short. Such reports remain largely anecdotal, but they do point to an important issue regarding the sustainability of such sources of feed.

The choice of species does also not lend itself to sustainable feed conversions. Snakehead has an FCR of between 3 and 8, while eel and frog have lower conversion ratios. For real environmental gains to be made in feed herbivorous species would have to be grown such as tilapia or carp. The reason that these species were not selected by DARD is instructive – they are of even lower value and, as such, only likely to provide adequate replacement incomes to pangasius farming if grown at high densities, or in large ponds. There is considerable success with such species in subsistence systems – most notably the integrated *Vuon Ao Chuon* systems. However, integrating these into new, higher value chains is limited.

Table 31. Key Indicators of water quality in household family ponds

Environment Indicator	National standard mg/L	Snakehead (in enclosure of 3 -4 m2) mg/L	Gourami (in pond of 1500 – 2000m2) mg/L	Frog (in pond of 3mx4m) mg/L	Eel (in pond of 15 – 30m2) mg/L
DO	≥2	3.5 – 2.4	3.7 – 4.6	3.5 – 4.5	3.5 – 4.9
TAN		0.023 – 0.57	0.023 – 0.57	0.3 – 0.55	0.023 – 0.57
NO2	1	0.003 – 0.57	0.02 – 0.35	0.1 – 0.45	0.05 – 0.65
NO3	1	0.088 – 0.263	0.03 – 0.45	0.02 – 0.55	0.09 – 0.75
TN		1.54 – 7.39	1.23 – 6.35	1.3 – 6.5	1.23 – 6.35
TP		0.045 – 1.69	0.035 – 1.09	0.05 – 1.2	0.035 – 1.09
TSS	80	75 - 193	70 - 103	60 - 93	50- 95

Three of the four species are artificially spawned. Eel is still collected from the wild. This remains of serious concern for wild stocks which are already noted as in decline in the Mekong Delta. In livelihood terms, this does provide a source of income for fishermen, who tend to be poorer than even household aquaculture farmers. Regardless of this tradeoff the practice remains of concern. Even though the other three species are also nominally artificially grown, many of the farmers interviewed in the extended surveys noted they also source their seed from fishermen. Again these practices are of concern because of higher pressures on wild stocks.

Unfortunately many of the water quality parameters taken in the grow-out farms were not replicated in for the household farmers making comparison difficult. However, TSS, N and P are all a fraction of what was found in pangasius ponds and fall under national standards. This finding is surprising for snakehead given the concentration of homemade feed. To make any meaningful comparison more testing, at regular intervals would be required.

7.6 Changing access to value chains

Due to a range of technical delays the project focused predominantly on process upgrading rather than (re)negotiating access to new value chains strands. As a result this activity did not meet the objectives of the overall project by following a value chain approach. Nevertheless, chain related matters did emerge during the project are worthy of reflection.

Unlike family scale pangasius producers, household aquaculture producers are strongly embedded in local trade networks. The traders within these networks facilitate the movement of aquaculture products to either domestic retail markets or exporters, as well as providing services. These 'services' differ between species. Because frog and eel farmers sell staggered amounts, self-transporting their harvest to retailers or factories (should an export trade emerge), would increase transactions costs. By specializing in such species traders are able to reach a profitable economy of scale. Because of the small amounts traded, three quarters of farmers surveyed sold to unrelated traders on a daily spot market. The relatively lower capital costs of these two production systems also makes them less dependent on informal credit, which also commonly comes from traders or family. A similar pattern to this is seen in shrimp production in Vietnam (Bush and Oosterveer 2007), limiting the degree of vertical integration. As such, farmers are therefore not tied to any particular trader.

Gourami and snakehead producers are more directly related to middlemen. Because of the larger quantities harvested at one time, these farmers are reliant on traders to provide a range of services. The service may include harvesting, as also seen at an earlier stage of the pangasius industry, or credit to cover the much higher feed costs. These relations strongly embed the farmers within their surrounding communities and within domestic trade networks creating a series of tied, or quasi-credit relationships (Platteau and Abraham 1987). As a result, the farmers involved in the project were twice as likely to make contact with traders they already had an existing relationship with. Information for snakehead and gourami farmers on new strands and markets is relatively limited in An Giang. Farmers have access to market prices via the state radio, but connections to new markets is very much 'regulated' through social and trade networks. Gaining access to new market strands is therefore made difficult due to social and informational isolation in the value chain.

Access to markets is also determined by the distribution of production. Figure 37 illustrates the distribution of pangasius (right) and alternative aquaculture species (left). The maps show pangasius production concentrated around the provincial capital, Long Xuyen, and Chau Doc in the north of the province. This concentration of production has allowed for more concentrated trade networks to develop. By comparison the alternative species are smaller in overall production but also more diffuse. For trade networks to develop, allowing access to either domestic or international markets, traders would need to negotiate the added costs associated with this geography of production. In practice, the diffuse, low volume networks are more likely to support extensive trade networks of the type described above.

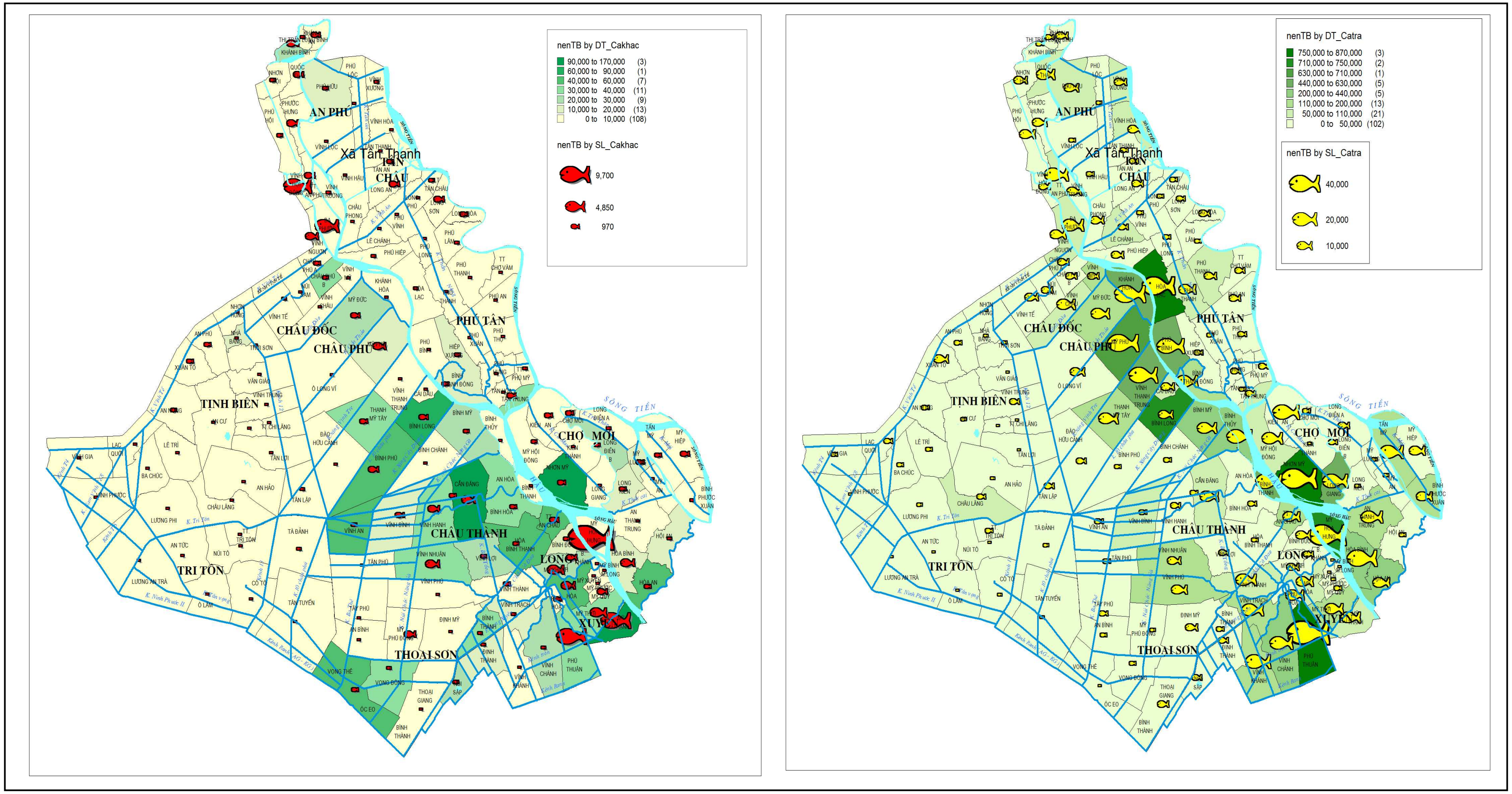

Figure 37. Comparison of the distribution of production (shading) and number of farmers (fish symbols) of Pangasius (left) and other aquaculture species (right) in An Giang province

Despite these difficulties there appears to be growing opportunities for farmers moving out of pangasius and wishing to invest in the aquaculture of alternative fish species. Two main factors appear to have driven the increased demand for fish in domestic markets. First, the growing wealth of the middle class in Vietnam has driven a increase in fish consumption. Second, food safety issues have grown considerably in Vietnam over recent years. This has emerged largely in response to the wider food scares around bird and swine flu.

A series of export markets also show potential for the four target species in the project. As outlined above, snakehead and gourami are already being sold to international markets. However, eel has also been identified as a potentially lucrative species for the Japanese market. Further research is needed to identify exactly what opportunities might exist and the potential for small producers to negotiate access to these chains.

7.7 Conclusion

The aim of this action research activity was to assist household farmers that have moved out of pangasius grow-out production to successfully move into domestic and export value chains for alternative aquaculture species. The assumption was that, because of the potential of alternative species, such inter-chain upgrading would reduce their livelihood vulnerability while also improving their environmental performance. It was also hoped that the farmers would improve their competitiveness in these alternative value chains by negotiating the terms and conditions of access to higher value chain segments.

The species chosen for upgrading all exhibit potential to reduce the livelihood vulnerability of household farmers through higher prices and more stable market demand. Each of the species is already traded extensively within Vietnam, from both cultured and wild caught sources, and prices appear to be relatively stable. Indeed, if wild stocks are in decline, as reported by DARD, then it is expected prices should at least remain stable if not increase. Although the project was unable to support farmers to (re)negotiate the terms and conditions of access to the various value chains in any substantial way, there are positive signs that new export and urban markets may continue to open. This may well provide further demand for products, but more research is needed to investigate the conditions under which these small and isolated farmers could maintain their access to such chains, should the opportunity arise. Reflecting on their experiences from their rise and fall within the pangasius industry would be a good starting point

This chapter has also shown the potential of more stable income from these alternative species relative to pangasius. Over the long term these smaller flows of income would benefit farmers if positioned within a wider portfolio of income sources. The small land holdings of the household farmers mean that aquaculture dominates total annual income. If the larger family scale farmers were to adopt these species, next to their already higher source of alternative income, they may well be better off overall. The question is whether family scale farmers would be willing to outgrade their production, thereby incurring the opportunity cost of a 'boom cycle'. A further question is whether household families would remain 'outgraded' if they saw an opportunity to also capitalize on high demand swings in the pangasius industry. The latent capacity these farmers hold and the impact this capacity has on the cyclical nature of production, makes this balance an ongoing concern.

Regardless of the livelihood benefits of the species extended to the household farmers, there are serious concerns over their environmental credentials. The ongoing reliance on wild caught seed for eel is a major constraint to ongoing sustainability. Research is currently being conducted on eel, as well as many other species by government departments. However, worldwide eel has proven especially difficult to artificially spawn and no advances have been made in Vietnam. Feed also remains a general concern that was only partially addressed in the project. The collection of golden snail does address directly mitigate the expansion of an exotic species in the Mekong Delta and reduces reliance on marine forage fish which brings an important benefit. If such practices prove too successful they could quite ironically lead to reduced stocks of the snail (which is perhaps already apparent), and the need for 'sustainable harvesting'.

Further research is needed to address both environmental and livelihood potentials of these and even more species for household farmers. More investigation also needs to pick up the value chain approach and investigate the potential role for upgrading within export and domestic strands. After a decade of private sector-led development in the pangasius industry, DARD extension officers once again have a vital role to play in supporting household farmers. However, far more coordination is needed with the private sector to ensure any sectoral upgrading (of any of the alternative species) does not exclude household farmers.

8 Upgrading: what works and what doesn't?

This report has presented the results of three upgrading strategies designed to reduce the vulnerability of small holders in the global Pangasius value chain. The main results of the study have outlined the poor bargaining power of these producers with buyers, their limited access to capital to invest in improved management practices, and the absence of contractualisation of family scale Pangasius producers leading to poor market coordination and periodic oversupply with low unit prices and variable income. The results of the study are particularly timely given the trend towards concentration and integration of the Pangasius industry leading to the exit of some 35% of family and household scale producers in recent years.

The three action research interventions conducted in the project aimed to assist farmers to upgrade their production and position in the value chain through increased horizontal and vertical contractualisation. These improvements were designed to raise producer's technical capacity to either maintain their existing functions or change their function and move 'down' their existing chain or 'out' and into alternative chains. The overall aim of these interventions was to better understand the potential for marginalized, vulnerable farmers in the Pangasius value chain to respond to the existing and future challenges of maintaining access and reducing their vulnerability in domestic and global markets, while at the same time improving the environmental performance of production.

The three action oriented research objectives of the project were to:

1. Analyse the structure and function of pangasius value-chain identifying the distribution of value and the net share of vulnerable producers.
2. Identify and implement upgrading strategies that assist farmers to adapt to changing production conditions, reduce their socio-economic vulnerability and improve their environmental performance.
3. Identify what support key facilitators in the value chain can provide to family scale producers to enable them to reduce their vulnerability.

This final chapter focuses on the second and third objectives. In discussing the second objective, attention is given to the potential role of renegotiating the terms and conditions of access to value chains based on the different upgrading strategies classified by Humphrey and Schmitz (2002) – contractualisation, functional upgrading, process and product upgrading, and inter-chain upgrading. In discussing the third objective we return to the question of governance and the potential of value chain governance to steer to 'win-win' outcomes of improved livelihoods and environment performance within the Pangasius industry.

8.1 The challenges of upgrading

The various upgrading strategies are constituted of different forms of process, product, functional and inter-chain upgrading. First, strategies to renegotiate the terms and conditions of access to a value chains have both a institutional and practical dimension to them (Gereffi and Korzeniewicz 1994; Humphrey and Schmitz 2004). The capacity of a farmers to innovate their practices, or conform them to wider rules or standards of production, are first determined by the type and degree of vertical or horizontal contractualisation with which are embedded (Gereffi et al. 2005). This contractualisation can take many forms, ranging from informal social relations to formalized rules of incorporation. Second, changes to practices are related to conscious decisions of farmers in balancing their livelihood needs. The factors that influence these decisions are varied, but include GVC conditions (such as standards) as well as wider market conditions, production risks, and access to alternative sources of income (Bolwig et al. 2010). Taken together these factors help us understand not only structure exclusion from GVCs but, as outlined by Ponte (2008a), also voluntary non-participation and partial inclusion.

The three upgrading strategies implemented and researched in this project illustrate a range of factors that influence the structural and voluntary exclusion of actors form the Pangasius value chain. The volatility of the industry since peak oil in 2008, and the current trend towards consolidation and integration to overcome highly cyclical production patterns, has meant small holders in the industry are in flux. The attempts made to upgrade, downgrade, and outgrade farmers has revealed a number of lessons about how farmers can renegotiate the terms and conditions of entry into new and existing value chain strands, what their structures of rewards are for doing so, and what the concrete roles of actors upstream are in assisting or hindering their efforts.

Table 32 summarizes the main findings from the upgrading activities undertaken the three target groups. Process and product upgrading was the most involved strategy, with farmers being directed to achieving SQF certification. The success of some the group to achieve certification was reaching through improving production practices related to key inputs such as feed and water pumping. However, the success of these functional upgrading activities is underlined by the defection of many producers because they believed there was no economic benefit from changing their practices. The results show that this was largely a misperception given the efficiencies that were created in the production process. We might conclude here that without an *explicit* premium, expressed directly in the farm gate price, farmers do not see the incentive to invest in upgrading.

Despite the difficulties faced in scaling up numbers of farmers involved in the upgrading activities a number of lessons regarding both vertical and horizontal contractualisation. In each of the three upgrading strategies – process and product, functional and inter chain upgrading - horizontal contractualisation led to considerably different outcomes. The grow out farmers were successful in forming a legally incorporated cooperative group. However, keeping farmers involved in the group in the face of market downturn proved extremely difficult. Defection of farmers from the group was made possible by the lack of a strong institutional oversight by either the cooperative group board or local government authorities. The 'wait and see' strategy of many farmers meant there was a lack of commitment to the process. They all wish to reduce their costs associated with production, but do not wish to create social (horizontal) dependencies that lock them in to a longer term arrangement.

Nevertheless, the group did succeed in providing the farmers with a collective identity in negotiating water management, as illustrated by the incorporation of a collective sedimentation pond in Hoa Lac. The grow out farmers were only willing to enter into the upgrading cycle because of being able to avoid investment in individual sedimentation ponds. Whereas farmer and researchers alike often cite the 'high cost' of sedimentation ponds, the results show that this cost is still low in rural areas such as Chau Phu, but made negligible when shared between farmers. While this might be a factor in the decision of slightly larger farmers, smaller farmer are particularly dependent on such solutions. For example, the failure to provide collective water treatment to the nursing farmers was the main reason they left the group.

Overall, it appears that in the case of commercial contract arrangements the group was less willing to use the group as a platform for negotiation. Without the commitment of joint commercial interest the group failed in the context of upgrading farmers in the global Pangasius value chain.

The decline in membership in the Tan Phu Clean Pangasius Club largely due to a changing perception of benefits. The group initially hoped to establish production contracts with processing companies at a time of low market prices. In response to high market costs they also wanted to establish bulk provisioning of inputs. However, in response to the failure of companies to give production contracts and as markets improved, the farmers elected to stay out of the group. As the reputation of the group grew those farmers that were not active in the group, bust still members did report finding buyers for their fish on the reputation of the group. The overall effect may well be growing distrust within the group, just at a time when there are signs that 'branding' of the Tan Phu fish is gaining traction in the market.

The decline in membership also reveals a wider dilemma of collective forms of production in Vietnam. Although 'new' cooperative groups have long been established under the 1997 Cooperative Law, groups or clubs for other production systems remain less popular in the Mekong Delta. The only groups within the aquaculture sector that appear to be durable are those that are sponsored by processing companies. This raises a series of questions around what motivates farmers to work together.

Group formation did bring benefits to the farmers, but it remained primarily a vehicle for negotiations over improved vertical contractualisation. This was true for both grow-out and nursing farmers. The results show that vertical contractualisation is the determining factor in the success of group formation, as well as providing important explicit incentives for process, product and functional upgrading.

The failure of the project to negotiate a new contract between processing companies and farmers reveals the high degree of mistrust between the groups, and the continued poor bargaining power of family scale producers. With the exception of payment terms, which were not subsequently not honoured by the companies, no real benefits emerged for grow out farmers. There were no benefits seen in terms of price premiums. This was expected based on the negotiations with the companies and the voluntary nature of SQF. But interestingly there was also no improvement in the 'grading' of the fish between upgrading cycles, which was more a surprise given the farms were certified and the practices of production no different from 'industrial' farms selling grade 1 meat.

The continued low grading of fish is a function of structural biases in sale contract negotiations. First, the farmers have very little bargaining power when prices are agree in the last weeks of grow out. The project was unable to address this practice because the companies were not willing to change the terms of the sale contracts. In addition there is an emerging notion of regionalization used against the farmers. What we saw through the course of the project was actually a negative reputation emerging based on the location of the fish. Our farmers were located in a government zoned area for Pangasius production. However, processors reported that the fish from this area is lower quality because, they argue, the acidity of the soil. There is little information to support this claim. But this is perhaps the point: in the end it doesn't matter whether the claim is true or not, it is how it affects the bargaining power of farmers disassociated from the processor associations.

The nursing farmer cooperative group was a more involved case of negotiation and collective incorporation. The first version of the nursing group failed because one of the farmers was too powerful, taking over the process. Building on various other studies on collective action, this case illustrates the vulnerability of collective groups to individual defection when the starting assumptions or expectation of payoffs from incorporation are not equal between group members. The failure of the farmers to change their provisioning practices in response to changing conditions of certification shows a central risk strategy of farmers. The lead nursing farmer was also reticent to enter into a long term agreement with the AGSC because she did not want to forgo any longer benefits from rising prices for fingerlings. However, this may be overcome when production contracts are in place, such as established in the internal nursing farmers satellite model.

However, the case also clearly demonstrated how a two tiered model of incorporation – labeled here as a *satellite model* – can provide an alternative collective mode of action that allows for different risk and benefit expectations. Having a more powerful, risk taking individual at the lead and then poorer and/or risk averse farmers attached to this individual allows for successful incorporation. The outcome of such a model is the successful incorporation of smaller, household farmers allowing them to maintain their position in the pangasius GVC.

The results therefore seems to suggest that the vulnerability of farmers in the value chain plays a role in setting a context within quality is negotiated. Conversely voluntary certification such as SQF provides no assurance of quality within the market place. One reason is that SQF is not specifically required by EU or US retailers. It is argued to be an equivalent system to GlobalGAP or BRC in the EU, but these systems have now been upgraded beyond the scope of SQF. This is an important lesson in Vietnam where attention continues to go to BMP and GAP standards, which are also yet to be recognized by the market.

Another factor that led to poor recognition of quality assurance was the highly competitive international market for Pangasius. The details of this are outlined in the first chapters of the main report. The uncertainty over access to markets coupled with the rapid diversification of the market meant processors were keen to maintain what is largely a two tiered provisioning system: stable core supply from trusted (larger scale) farmers, and variable 'spot market' supply from family scale farms. In the second phase the cooperative group seems to have negotiated better terms of sale, but this is difficult to assign to improved connectivity and is more likely due to the highly cyclical supply in the industry as a whole.

Table 32. Summary of upgrading strategies and results for the three target groups

Upgrading strategy	Target groups		
	Grow-out farmers	**Nursing farmers**	**Micro-farmers**
1. Process and product upgrading	*SQF1000 certification* – process reporting led to efficiencies in production. Overall, upgrading did not increase the unit cost of production. *Horizontal contractualisation* – no shift to collective provisioning practices. Collective water quality management through sedimentation pond a major accomplishment. *Vertical contractualisation* – changes in provisioning practices of feed and seed as a result of processing contracts and certification. Use of industrial feed leading to environmental benefits. No change in cost structures as a result.	*SQF1000 certification* – improvements water quality and feed management leading to improved survival rate of fry and fingerlings. *Horizontal contractualisation* – radical shift in group formation leading to changed provisioning, production and trade practices. Specific on farm practices remain individual, not collective. *Vertical contractualisation* – informal contract between satellite and lead farmer increased scale of production. Specialization in 40 day fry reduced returns per crop, but guaranteed buy back potentially shows highest annual profit of all three target groups.	*New skills* – farmers introduced to new farming techniques, including feed and water management, stocking densities. All farmers show improvements in profitability after upgrading. *Changes in provisioning practices* – shift from marine fish golden snail for feed bringing environmental benefits. Major concern remains over source of seed for eel, and possibly other species sourced from wild sources.
2. Functional upgrading	*SQF1000 certification* – increased reporting skills that led to learning dividends. Farmers still paid for cost of quality testing. *Horizontal contractualisation* – success in advocacy role in defending collective water quality technologies. No changes in unit costs or efficiencies detected. *Vertical contractualisation* – changes in provisioning practices of feed, seed, and payment conditions as a result of processing contracts and certification. Benefits passed on in terms of improved payment conditions.	*SQF1000 certification* – increased reporting skills. No learning dividends detected in study. Cost of upgrading forced smaller (pond area <0.5ha) out of production. *Horizontal contractualisation* – no further roles and functions as a result of group formation. *Vertical contractualisation* – changes in provisioning strategies of seed and feed as a result of connection with lead farmer and AGSC. Technical support provided by AGSC and DARD during project.	*Provisioning practices* – Farmers burdened with extra work in collecting golden snail. Employment remains within household. Impact on livelihoods not analysed. *Value adding* – plans in place for value adding fish into dried products. Not accomplished during project because of good prices for fresh fish.
3. Inter-chain upgrading	*Certification* – skills acquired in monitoring and evaluating SQF are transferable to forthcoming GlobalGAP and ASC standards *Vertical contractualisation* – two farmers approached for production contracts with processing company.	*Certification* – skills acquired in monitoring and evaluating SQF are transferable to forthcoming GlobalGAP and ASC standards. *Vertical contractualisation* – unfavorable conditions of contract leading to defection of lead farmer destabilized group process. *Horizontal contractualisation* – shift midway through project in structure and function of cooperative group to access new value chain strand.	*Value chain strands* – new chains to domestic and export identified, but no action taken in the project. *Latent capacity* – farmers show considerably higher livelihood resilience through stable income than Pangasius, but significant trade-offs exist during boom cycles which may draw farmers back to the industry.

The results indicate that it is not constructive to negotiate quality and the incorporation of family scale producers within the producer-processor market segment. The structural weakness of family scale farmers to negotiate their position in the market appears to be instead a function of the favorable payment conditions passed on importers in Europe. Negotiating the terms and conditions for the inclusion of these producers may therefore be better conducted at this higher level. Having said that, it is difficult to see what incentive there would be for importers and retailers in Europe to negotiate for the inclusion of family scale farmers. This raises the ongoing argument used against the inclusion of family scale farmers – safety and quality.

8.2 Business cases vs. boom crops

The starting point of this project is the movement of family scale farmers out of the Pangasius industry as a result of adverse market conditions over 2007 and 2008. The question that this raised, and continues to raise amongst standard setting bodies such as the ASC and GlobalGAP, is whether there is a 'business case' for farmers to upgrade their production. This argument is based on the very valid observation that there are very few cost savings or efficiencies to be made in Pangasius production. Because of this larger farmers will tend to have an economy of scale that supports mass production of the fish at very low margins. What this argument does not take into consideration is the continued hope farmers have of a 'boom cycle'.

The results from the production cycles of the grow-out farmers shows only very minimal changes in costs between 2008 and 2010. In contrast the price of Pangasius changes dramatically in response to the oversupply of fish in 2007-2008. The current (re)expansion of Pangasius into US and EU markets in 2010, conversely appears to be follow the recovery in these economies, and a current shortfall in fish available because of the exist of family scale farmers in recent years. This situation has led to a 24% turnaround in ROI in the last two years, from -11% to 13%. However, based on these results we estimate family scale Pangasius farmers consequently made a cumulative net loss of 29.1 million VND (US$1821) per ha.

Compared to the other production systems focus on in this project this return is low. As illustrated in Figure 38, on a per ha per year basis their income is the same or lower than domestic species such as frog and snakehead, while providing only around half the income of Pangasius nursing and eel production. Such low returns do not offer the stability necessary for upgrading production, and in livelihood terms is also a poor choice given the high proportion of land these farmers give over to ponds reduced alternative agricultural income streams. As Figure 39 shows, nursing, frog and eel are all a more stable sources of income.

However, the high variance also illustrates the boom crop potential of Pangasius grow-out farming. It is the hope of riches associated with these an upswing in prices that motivate farmers to stay or return to production. The result in recent years following these conditions has been a return to oversupply, low market supply and losses.

The 'boom crop' mentality within many SE Asia commodities has been dealt with in detail by Hall (2004) and others. The closest related product to Pangasius is probably tropical shrimp, with which farmers have made enormous profits across Asia, up to 15 times above what they would have made with rice production (e.g. Flaherty et al. 1999). History shows the productivity of these systems then crash through a combination of disease and environmental degradation. Shrimp farmers in many countries were able, through their accumulated wealth, to then move on to new areas to begin the cycle again.

The difference in the Pangasius industry of Vietnam is that there are no crashes in productivity, but farmers are still unable to reconvert their land back to any other use than aquaculture without significant investment. As a result the latent capacity of the industry is maintained, and with the cyclical boom/bust nature of production, through the maintenance of ponds.

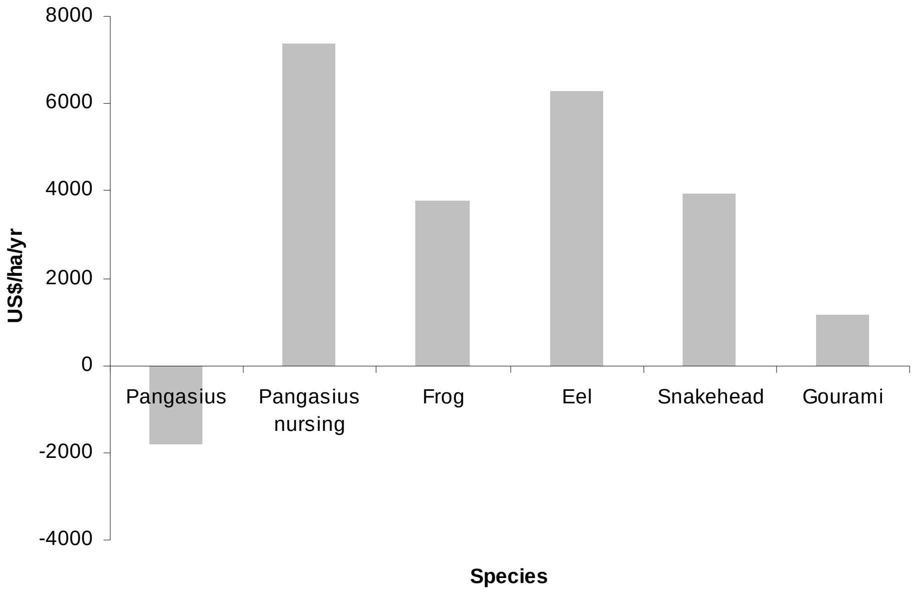

Figure 38. Comparison of cumulative income per ha per year for each of species 2008-2010

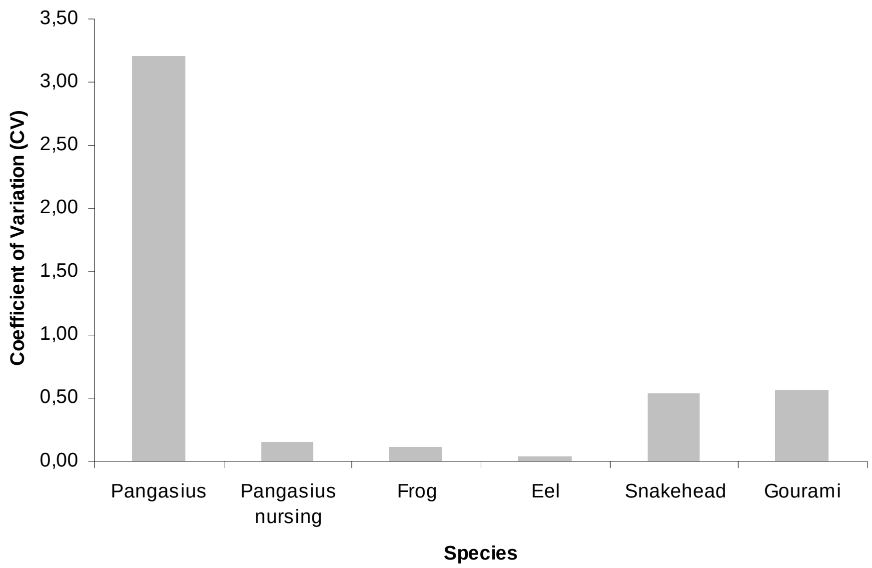

Figure 39. Comparison of variation in income for each of species 2008 to 2010.

8.3 Conclusion: Small holders and value-chain governance

The government has been debating the position of 'small' or household producers in the Pangasius chain. The position of small-holders in the industry has been raised in the Vietnamese government over the balance between 'high food safety and environmental risk' and ongoing support for the 80% majority of small holders. Historically the government has been supportive of small holders through a series of land allocation and public private support programmes. However, with the exit of around 35% of family and household scale farmers the government is discussing whether to continue supporting these farmers to produce Pangasius, or move them to alternative species. This would mark a major shift in government policy relating to 'peasant farmers' and raises questions regarding their ongoing position in the Pangasius GVC.

As illustrated in this report, the shift from government to governance in Vietnam has brought with a series of challenges in terms of defining roles and responsibilities for the private sector. One of the clear examples of increased private sector governance is the ongoing shift 'from quantity to quality' {Ha, In Press #3283}. Under this shift the government is promoting, or at least allowing, private sector regulation of food quality and safety issues, and is now turning to environmental quality. A clear example of such government in the context of the Pangasius GVC is the emergence of the processing company producer associations. However, as access to these associations is also limited through what might be termed 'alliance capitalism' (Beresford 2008), the question once again turns to whether similar formats can be developed for small holders.

The structure of the producer associations and their position as preferred suppliers to processing companies means there is little scope for small holders to increase their market share. In the terms of Gereffi (2005), the two value chains are a mixture of relational and hierarchical governance structures. The processor associations are predominantly hierarchical, given the gradual shift to increased organized surveillance over suppliers. The small holders are essentially part of a spot market, but don't have the high capabilities, codification that Gereffi discusses. Instead these producers are difficult to codify with relatively lower capabilities for upgrading. There remains no reason why these small producers could not be incorporated into their own producer associations that also constitute a more hierarchical governance linkage with processors. However, for such linkages to emerge contracts and agreements by processing companies must be enforced.

A broader governance challenge in the industry is to ensure that the linkages between producers and processing companies are also governed. Although AFA was developed to fulfill this role, they currently do not play any substantial role in supporting or negotiating on behalf of small producers. The third objective of the project did set out to support the development of this role, but no substantial changes were made other than registering the first small holder group membership to AFA for both nursing and grow-out farmers. The access to market and technical information this membership brings is welcomed by the farmers, but assistance with contract enforcement would be more appreciated.

Recognising the poor performance of AFA in the respect, it is also perhaps necessary to look to the importer end of the GVC. Competition between Vietnamese exporters in market such as Europe in part accounts for the gradual decline in prices and, which has in turn perhaps led to a perception of low quality. Reports around favorable payment schedules for European importers need be quantitatively verified. While it would require a huge change in retail practices to raise the product quality image of Pangasius in Europe, changing buying and payment schedules between importers and exporters may lead to improved payments conditions for producers.

The results of this study illustrate the need for explicit market incentives to get family scale farmers interested in upgrading. But an initial hurdle is one of awareness. Many of the farmers had not heard about ASC, GlobalGAP or even SQF, and were not aware of the consequences they hold for their ongoing participation in the GVC. Whether and how they will be able to comply remains a question. The ASC standards will target 20% of producers. Currently this would include those farmers that provide the 80% majority to the market and most probably exclude family scale farmers. The lessons of group formation may well prove useful to ASC, as well as GlobalGAP, who is also initiating their own small-holder programme for Pangasius.

Current initiatives of the government to promote BMP standards should be careful not to isolate themselves from markets. As seen in this project, and for the Vietnamese government programmes on shrimp, such isolation may well improve farmer skills, but without ongoing support from the private sector is likely to fail.

Further research is needed on the implications of including or excluding family and household scale farmers from the Pangasius GVC. What impact either option has for the wider rural economy of the Mekong Delta is poorly understood. Such research is particularly necessary given the that while the rate of poverty reduced slightly between 2008 and 2009 from 8 to 7%, malnutrition of children under the age of five increased by 2% (An Giang People's Committee 2009). It remains unclear whether this may not be related to the 9% reduction in area and 10% reduction in production in the province. The point, however, is that there is little understanding of the link between declines in the largest single rural industry over the last decade and the huge flux of family scale farmers in and out of production in recent years.

Based on these conclusions we make the following recommendations:

- Despite the challenges observed in this study, the scale of farming alone does not appear to pose a barrier for entry into the industry. Horizontal contractualisation of small producers into cooperative groups remains an option for upgrading family scale producers. To be successful government intervention is needed to create and enforce contracts and agreements between groups and processing companies.
- An alternative representative body to AFA, with the specific aim of representing family scale producers and cooperative groups in contract negotiations, would create greater leverage for improved terms and conditions. For this both private sector and political support for including family scale producers is required.
- To address high interest repayments faced by family scale farmers, pressure from European importers is required to ensure contracted payment schedules are adhered to.
- Current initiatives of the government to promote quality standards should be careful not to isolate themselves from market demand – such as currently the case with the government BMP and SQF 1000 standards.
- The small-holder programmes of GlobalGAP and ASC should take into consideration both explicit and implicit (efficiency based) premiums both need to promoted in partnership with both exporters and importers.

- Policy recognition needs to be given to the latent capacity family scale producers who have exited production hold for the industry. Programmes are needed to direct and support family and household scale farmers to find profitable alternative uses, such as the aquatic species trialed in this study, for their aquaculture ponds.
- Collective forms of water management as shown in this project show potential for Pangasius as well as other aquaculture systems. Supporting cooperative groups to develop the necessary skills required to develop these management systems should be supported at the provincial level.

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APPENDICES

Appendix Box A - Cooperative group by-laws

Rule 1. Principles of organization and operation

The group is organized and operated basing on the following principles:

1. Voluntary, democratic and sharing of responsibility and benefit;
2. Decision based on majority;
3. Financial independent, autonomous operation cost and guaranteed by the group assets and assets of members.

Rule 2. Name, logo of the group

Hoa Lac Pangasius Farmers Group

Rule 3. Responsibility of group members

1. Cooperation based on equality, sharing mutual benefit, and guarding the common benefit of the group;
2. Compensate for the damage to the group stemming from one's mistake;
3. Realization of the contents cited in the cooperative contract but not contradicting state legal law.

Rule 4. **The regulations are applied to the farmers and the ponds taking part in the project "upgrading value chains for improved rural livelihoods and environment performance", hereafter referred as "the Project".**

1. Join the group voluntarily.
2. Full commitments to the practice of growing Pangasius meeting the quality standards as required by the SQF 1000.
3. Restrain from practice or application of any procedure or techniques that different from the SQF 1000 without having consultation with technicians from the department of fishery.
4. Fully participate in the Project's training courses. In case one member cannot attend, he or she must inform the local technical advisor for later individual training.
5. Share the information and experience about the SQF 1000's fish raising procedure to other members of the group as well as other farmers.
6. Do not leave the group without prior informing the group. If one member unilaterally leaves the group, he or she shall refund all the expenses sponsored by the Projects up to the time he or she suggest of his/her leaving.
7. The SQF 1000 certification should be the common property of the group, each member must conserve and do nothing that may harm the common benefits of the group.
8. The Project aims at achieving the SQF 1000 certification for the whole group. If one member wants to have his or her own certificate, he or she must pay for the relevant expenses.
9. The group operates under the direct supervision of the Project and department of fishery, complying with the current Cooperative Group Laws.

Rule 5. Certification of the group

Certified by the Village People Committee (signed, sealed)

Appendix Box B - Terms of re-negotiated sale contract

Content No. 1: Name of the product, price, quantity:

- Product: *Pangasius* raised in pond
- Quantity: . . . tons (+/- 10%)
- Price: . . . . đ/kg, pond gate price

Content No. 2: Quality and sanitary standards

- Fish should be raised by industrial feed, > 600gr/head at harvest, average weight 1.3 kg/head
- Appearance: live and healthy, no signs of disease and parasites
- No content of forbidden chemicals and antibiotics: malachite green, leuco malachite green, choloramphenicol, nitrofuran (AOZ, AMOZ, AHD, SEM), enrofloxacin, ciprofloxacin, flumequine.
- Sanitary and safety: according to state regulation
- Date of delivery: (+/- 3 days)
- Site of delivery: at the pond address above
- Party A pays Party B in cash after receiving the product

Content No. 4: responsibilities of the two sides:

Responsibilities of processing company:

- Delegate technicians to check 1-2 days before harvest and stop feeding
- Party A has the right to refuse buying without any compensation if the fish do not meet the quality standards specified in Content No. 2 of this contract.

Responsibilities of farmer:

- After signing the contract, Party B has to practice growing fish according to industrial process. If disease or natural disaster happen, shall notify Party A in order to rectify by both sides.
- Shall not use the product on this contract to go into contact with another party without prior agreement of Party A.
- Party B shall stop feeding the fish at least 2 days before delivery.
- Cost of testing for antibiotic residues shall be born by Party B.

Appendix table C. Drug and chemical treatments in the first cycle

Drug/Chemical treatment	Number of farmers using treatment (n=16)	Number of applications	Total quantity (kg)	Average quantity per treatment
ADE Complex, Enzyme SB	1	14	28	2,0
Bio - Biovia	2	6	13	2,2
Biolactazim	1	1	2	2,0
Biolarizim	1	4	4	1,0
Biovitac 200 for fish	1	8	1	0,2
Biovizyme PNT	1	8	1	0,2
Fem - yeast	1	3	7	2,3
Gava Enzym, VL Vitac Antistress	1	16	32	2,0
Nova-Antishock	2	15	53	3,5
Prozym for fish	1	10	12	1,2
Vitalec, Nutric	1	10	12	1,2
Vitalec, Nutric, Prozym for fish	1	9	18	2,0
Vitamic, Prozym for fish	1	9	18	2,0
Vitamin C Mix	6	40	73	1,8
Novazyme F	2	17	57	3,4
Novazyme F, Nova antishock	2	48	96	2,0
Total/Average		218	428	2,0

Appendix table D1. Cost breakdown of production for first upgrading cycle (US$)

	Project farmers (n=16)			Control farmers (n=12)		
Inputs	**Minimum**	**Maximum**	**Average**	**Minimum**	**Maximum**	**Average**
Fingerlings	0,05	0,11	0,08	0,01	0,10	0,06
Chemicals and drugs	0,01	0,05	0,03	0,02	0,08	0,03
Feed	0,59	0,72	0,70	0,60	0,84	0,70
Interest	0,00	0,03	0,02	0,00	0,06	0,03
Sludge removal	0,01	0,02	0,01	0,00	0,01	0,01
Pumping	0,02	0,03	0,02	0,00	0,03	0,02
Labour	0,00	0,03	0,01	0,00	0,03	0,01
Total input costs	0,67	0,98	0,86	0,76	0,97	0,85
Selling price	0,88	0,97	0,91	0,83	0,91	0,88
Profit/Loss	0,20	-0,01	0,05	0,15	-0,10	0,02
ROI	-0.01	0.30	0,05	0,19	-0,10	0,03

Appendix table D2. Cost breakdown of production for second upgrading cycle (US$)

	Project farmers (n=9)			Control farmers (n=8)		
Inputs	**Minimum**	**Maximum**	**Average**	**Minimum**	**Maximum**	**Average**
Fingerlings	0,06	0,07	0,07	0,29	0,00	0,13
Chemicals and drugs	0,00	0,03	0,02	0,04	0,00	0,02
Feed	0,67	0,77	0,72	0,82	0,45	0,71
Interest	0,04	0,04	0,04	0,06	0,00	0,03
Sludge removal	0,00	0,01	0,00	0,03	0,00	0,01
Pumping	0,01	0,01	0,01	0,06	0,00	0,03
Labour	0,00	0,01	0,00	0,03	0,00	0,01
Total input costs	0,84	0,89	0,87	1,04	0,82	0,93
Selling price	1,03	1,06	1,05	0,96	0,91	0,94
Profit/Loss	0,19	0,17	0,18	0,13	-0,12	0,00
ROI	0,22	0,19	0,21	0,16	-0,11	0,01

Appendix table E1. Production statistics for first upgrading cycle

Farmer name	Village	Pond area	Expected output	Total cost (US$)	Output (tonnes)	Cost (US$/kg)	Grade	Selling price	ROI
La Bửu Tài	HL	0,8	200	103008	150	0,79	2	0,88	0.11
La Hoàng Thân	HL	0.3	150	47388	65	0,86	2	0,93	0.08
Lạc Hồng Thắng	HL	0,3	120	76850	120	0,81	2	0,89	0.10
La Văn Đực	HL	0,4	100	31122	50	0,76	2	0,88	0.14
Ly Cong Tam	HL	0.4		77952	120	0,84	2	0,93	0.11
Ngo V Cuong Em	HL	0.5		72215	120	0,81	2	0,93	0.14
Nguyễn Văn Thiệp	VTT	0.7	150	106450	150	0,83	2	0,92	0.10
Nguyễn V Trường	VTT	0,8	200	81276	120	0,79	2	0,88	0.11
Pham Van My	HL	0.4		72215	120	0,78	2	0,88	0.13
Trần Thành Chí	VTT	0.9	120	47766	70	0,83	2	0,93	02
Average		0,6	149	71624	108,5	0,81	2	0,90	0,11

Appendix table E2. Production statistics for second upgrading cycle

Farmer name	Village	Pond area	Expected output*	Total cost (US$)	Output (tonnes)	Cost (US$/kg)	Grade	Selling price	ROI
La Văn Đực	HL	0,4		64313	71	0,91	2	0,97	0,07
La Bửu Tài	HL	0,8		171188	185	0,93	2	1,01	0,09
Nguyễn Văn Thanh	HL	0,25		68188	80	0,85	2	1,03	0,21
La Hoàng Thân	HL	0,3		33750	38	0,89	2	0,93	0,04
Hồ Phú Lịch	HL	0,4		57438	62	0,93	2	0,98	0,06
Nguyễn Minh Công	HL	0,3		43875	50	0,88	2	0,93	0,06
Ng Huy Phong	HL	0,6		126281	150	0,84	2	1,03	0,22
Phan Huy Thiệp	VTT	0,5		106813	120	0,89	2	1,06	0,19
Ng Văn Trường	VTT	0,8		93438	105	0,89	2	1,06	0,19
Average		0,48		85031	96	0,89	2	1,00	0,13

Note: Five farmers had not yet harvested at the time of writing. * Missing question in second upgrading cycle.