Shrimp farming in Central Vietnam:

A value chain analysis

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List of Abbreviations

DARD	Department of Agriculture and Rural Development
EU	European Union
FAO	Food and Agriculture Organisation
GPN	Global Production Network
GSO	General Statistics Office
GVC	Global Value Chain
NGOs	Non-governmental Organizations
SSF	Small-scale Farmers
USA	United States of America
VASEP	Vietnam Association of Seafood Exporters and Producers
VCA	Value Chain Analysis
VietGAP	Viet Good Aquaculture Practice

1 Introduction

By the year 2050, the world could witness a significant growth in global population, which is projected to increase from over 7.7 billion people in 2019 to 9.7 billion people in 2050 (United Nations, 2020). In general, population growth leads to increased wealth and thus higher purchasing power, which results in higher consumption and demand for processed food, meat, dairy and fish (Godfray et al., 2010a, p812). Typically, global food production not only responds to market demands but is also considered crucial in policymaking with regard to societal and environmental goals, specifically those that aim at reducing malnutrition and poverty; improving accessibility to a healthy diet; managing fresh water resources; enhancing the use of renewable energy; and protecting the climate, ecosystems and biological diversity (Schneider et al., 2011, p204).

According to statistics of the Food and Agriculture Organisation (FAO), the value of global food production has increased from US$ 1,803 billion in 2005 to US$ 2,323 billion in 2016 (Statistical Pocketbook, 2018, p46). Factors such as technical progress, increasing demand, and the availability of agricultural land have contributed to an increase in total food production (Schneider et al., 2011, p210). In addition, food consumption patterns have changed across the last few decades, with increased calorie intake, as well as increased consumption of meat, eggs, dairy products, sugar and oils. These changes are the result of a reduction in the price of food, new marketing channels, expansion of supermarkets, increased income and free trade and globalisation of the food economy (Schmidhuber, 2004; Bairagi et al., 2020). The consumption of milk, meat, fish and egg has risen particularly rapidly in developing countries, with Eastern and South-Eastern Asia, and Latin America and the Caribbean having had the strongest growth (Sundaram, 2012, p18). In contrast, technical progress contributes to a reduction in food commodity prices and may also cause an increase in production factor prices. As a result, the per capita food consumption levels increase with income growth, without consideration of technical change (Schneider et al., 2011, p214).

Global food demand is forecast to increase for at least another 50 years, while competition has increased for land, water, labour and energy, and there is an increasing threat from climate change (drought, flood, rising sea levels, salinization) (Dobermann & Nelson, 2013, p4). However, increasing future demand for crops can be supplied through increasing yields. Cereal yields and production have tripled in the last 50 years, and to meet the expected demand, the yields will have to reach the same absolute rate for the next 40 years (Gregory & George, 2011, p5237).

1.1 Development of the food market

Along with food demand, there is a parallel development of the food market, which is a result of changes in consumers' tastes, in technology, in relationships between actors of the food supply chain, and in current policies and business environments (Regmi & Gehlhar, 2005, p1; Samoilyk et al., 2017, p60). The last two decades have witnessed significant growth of developing countries in the export sector, which was a result of support from world economic growth, lower trade barriers and improved supply abilities of developing countries. These factors have all contributed to raising the share of import and export in total output, so that this is the main source of growth in developing countries. Although world agricultural trade flows are still governed by trade among industrial countries, expansion of trade has changed positively among developing countries, especially during the 1990s. These changes were stimulated by the faster growth of developing countries and their regimes in trade liberalisation. Notably, large share of agricultural export from developing countries was provided by seafood, fruits, vegetables and processed foods (Aksoy & Beghin, 2004, p21; Gombkötő, 2019, p28).

The aspect of food safety standards has come into focus in recent years with regard to global trade in agricultural and food products (Henson & Jaffee, 2008, p548). Consumers can be protected from health risks and deceptive practices by food safety standards, and this may also contribute to overcoming market failures. Safety risks associated with food products originating from animals or plants are mitigated, and common norms for quality of products are established based on standards and technical regulations (Wilson, 2008, p36).

It has been shown that the contribution of agriculture to economic activity is different in each country and that agriculture has a pivotal role in poorer countries. In developing countries, private-sector investment in agri-food, in both domestic and foreign markets, contributes to change in agricultural and food marketing, processing and retail sectors. However, agriculture and food systems worldwide are facing many problems involving climate change, natural resource constraints and competing demands, and smallholders are considered a core factor in responding to these requirements (Sundaram, 2012, p28).

Smallholders played an important role during the Green Revolution in Asia by applying new technical innovations, raising productivity, and producing enough food that contributed to a reduction in real food prices, creating jobs and generating income for the rural poor. In combination, this created the right conditions to ensure food security for all (Sundaram, 2012, p30). The livelihood of most people in poor rural communities is still dependent on farming, and poverty remains a challenge in Asia. The extent to which agricultural production is

implemented by smallholders in the region and the increasing number of small farms has highlighted the role of small-scale agriculture in food security and poverty alleviation (Fan & Chan-Kang, 2005, p144; Wong et al., 2017, p50). Although over half a billion small farms in the world are producing much of the world's food, smallholders are struggling with accessibility to markets and self-provisioning. It is very difficult for smallholders to improve their living conditions while they are dependent on growing crops, feeding a few animals on a small-scale or using low-input technology (Dobermann & Nelson, 2013, p5).

1.2 Contribution of aquaculture to global food production

Alongside agriculture, capture fisheries and aquaculture also play a vital role in global food production. In 2016, global fish production, excluding aquatic mammals, reptiles, seaweeds and other aquatic plants, reached nearly 171 million tonnes, of which 90.9 million tonnes was from capture fisheries with the remainder coming from aquaculture production. In global capture fisheries production, marine fishing occupied around 87% while13% was production from inland fishing. In contrast, the rate of inland aquaculture production was higher than marine aquaculture production in 2016, with 64% and 36%, respectively. In monetary terms, fisheries and aquaculture production generated US$ 362 billion first sale value, of which aquaculture production made up US$ 232 billion in 2016 (FAO, 2018b, p2,3).

Of the 171 million tonnes of total fish produced in 2016, humans directly consumed 88%. Global fish consumption has risen on average about 3.2% annually from 1961 to 2016. Globally, per capita fish consumption was only 9 kg in 1961, peaking at 20.3 kg in 2016 and is expected to continue to rise in the future. Increased consumption is a result of rising production and rising demand (FAO, 2018b, p2). Fisheries and aquaculture thus are shown to be providing a vital source of food and economic well-being for humans in the world, and play a crucial role in food security in developing countries (Akpaniteaku et al., 2005, p28, 31). For example, in many communities in low-income nations, catching fish and crustaceans from rivers, lakes, floodplains and lagoons is vital, contributing around 15-20% of global aquatic food (Godfray, 2010b, p2772). Moreover, the fisheries and aquaculture sector serves as a source of income and livelihoods millions of people globally (FAO, 2018b, p30).

The number of participants in the fisheries and aquaculture sector tends to vary by region. Europe and North America have shown a rapidly decreasing number of participants in both sectors. On the other hand, with higher population growth, the number of participants in Africa and Asia has increased in both sectors, and standing in between these extremities is the Latin American and Caribbean region. Globally in 2016, 40.3 million people were engaged in

capture fisheries, and 19.3 million people in aquaculture. In terms of the percentage of participants split across the two sectors, fishing has declined from 83% in 1990 to 68% in 2016; in contrast, the percentage involved in aquaculture rose from 17% to 32%. Asia was major contributor in both sectors, with 85% and 95% participants in capture fisheries and aquaculture respectively in 2016 (FAO, 2018b, p5, 30).

In terms of food trade, fish and fish products are considered some of the most important commodities in the world. In 2017, the volume of export fish and fish products was 65 million tonnes, equivalent to US$ 156 billion. Moreover, developing countries have witnessed significant growth in the export of fish and fish products, which has increased faster than in developed countries. Major exporters in 2017 were China, India, Vietnam, as well as Norway (FAO, 2019, p43, 47). In contrast, the largest importer of fish and fish products in 2016 was the European Union (EU), followed by the United States of America (USA) and Japan. These markets combined made up 64% of the total value of world imports of fish and fish products. Demand for high value species, including shrimp, prawns, salmon, tuna, groundfish, flatfish, seabass and seabream, is high, typically in prosperous markets. However, there has also been an increasing trend in developing countries to import high value species (FAO, 2018b, p7,62).

The development and growth of aquaculture are considered to be a typical characteristic of the modern food sector; its production has steadily increased in most parts of the world (Godfray, 2010b, p2772). Similarly, aquaculture is one of the fastest growing food producing sub-sectors in a number of developing countries, which have shown an increase in total production in the last decade (Ahmed & Lorica, 2002, p126; Prasad et al., 2019, p1). Statistics of the FAO indicated that there are 202 countries and territories currently participating in aquaculture production. Notably, 89% of world aquaculture production volume has been situated in Asia for over two decades (FAO, 2018b, p26).

Aquaculture has developed faster than other major food production sectors. In 2017, China was one of lead producers of farmed fish, followed by India, Indonesia, Vietnam, Bangladesh, Egypt and Norway (FAO, 2019). Pre-existing aquaculture practices, population and economic growth, relaxed regulatory frameworks and expanding export opportunities were the main elements leading to the rapid growth of aquaculture in Asia (Bostock, 2010, p2897).

In fact, there has been a significant increase in global farmed fish production over the past four decades, which provided a large volume of the world's fish for human consumption. The development of aquaculture has changed from small-scale, non-commercial and family based, to large-scale, commercial and industrial production, with high value species. Additionally,

the trade of fish is not only at national level, but has also expanded to regional and international levels (Subasinghe et al., 2009, p2).

Aquaculture thus has an important role in improving income, providing employment opportunities, raising the return on resource use, as well as eliminating hunger and malnutrition based on providing fish and aquatic products. In addition, economic growth has been boosted by aquaculture through generating income and producing tax and export revenue (Subasinghe et al., 2009, p4). However, there are still some aquaculture projects that fail. For example, in Africa and parts of Latin America, failures were caused by the lack of well-developed markets or lack of infrastructure to access the market, lack of adequate quality controls for export, weak institutional systems and lack of investment (Bostock, 2010, p2901).

1.3 Issues of food systems

Together with the positive changes in global food production, consumption, and demand in the agricultural, capture fisheries and aquaculture sectors, many unresolved issues remain. According to the FAO report on the state of world fisheries and aquaculture (2018b), in 2017 more than 800 million people did not have enough food to ensure an active and healthy life. Moreover, nearly 10% of the world population was facing food insecurity. Additionally, in recent years food availability in some countries has been impacted by political conflicts and climate-related disasters, leading to increasing global hunger (Statistical Pocketbook, 2018, p14, 16). Many researches have indicated that food security is negatively influenced by climate change and, due to this, developing countries are becoming increasingly dependent on imports. For example, sub-Saharan Africa and, to a lesser extent, Southern Asia has been pushed into food insecurity because of climate change (Schmidhuber & Tubiello, 2007, p19708; Abegunde et al., 2019, p2).

Climate, soil quality, genetic potential and human management are some of the factors that control crop yield patterns in the world (Licker, 2010, p772). However, decreasing investment in agricultural research, irrigation, rural infrastructure and rising water scarcity are causes of slow growth in crop yields in much of the world. In addition, climate change is a challenge to food security (Rosegrant & Cline, 2003, p19; Masipa, 2017; Richardson et al., 2018). More specifically, increasing temperatures, changing precipitation patterns and increased atmospheric carbon dioxide levels, have an impact on crop production (Parry et al., 2004, p54; Bhatla et al., 2020, p162). In addition, it is not as easy to increase agricultural production as it was in the past due to land scarcity and limited water resources resulting from soil degradation and salinisation of irrigated areas. Thus, climate change is considered to have a

negative impact on the production potential of agricultural resources in many areas of the world (Alexandratos & Bruinsma, 2012, p8). Taking present rates of population growth into account, if agriculture does not experience technical progress and intensification, in the future it will require a land area far larger than currently available for terrestrial food production to provide for present food consumption levels per capita (Schneider et al., 2011, p205).

2 Value chain concept and value chain analysis

Improving efficiency of production, distribution and consumption in the agricultural sector has to be considered to reach high effective in production and business in particular and sustainable development in general. As a result, research on agri-food value chains is considered as a solution for developing agriculture, as well as ensuring food security and food safety both nationally and globally, as value chain analysis (VCA) is considered to be a tool for building strategies and development planning of the agri-food industry. All phases of the chain are analysed to remove barriers in each phase for market actors. From these points, policy makers propose policies or action programs that will be more effective and sustainable at each national and regional level (Huy, 2019, p6); VCA becomes necessary to verify the current status of the chain and establish an improved future state (Fearne et al., 2012, p576); and the success of a business is based on how effectively it manages the different activities within the value chain (Kumar & Rajeev, 2016, p74).

The importance of agri-food supply chains and networks is illustrated in providing producers access to markets; and it contributes to achieving economic, social, and environmental sustainability in rural communities (Naik & Suresh, 2018, p270), while rural development can be faced both a threat and a challenge because the development of agri-food chains is increasing integration of local and cross-border. In which, with limited resources and low accessibility to markets and information, poor farmers struggle to apply technological innovations and they thus can become excluded from trade (Ruben et al., 2006, p2). Therefore, a sustainable food supply chain has to ensure the development of all aspects including the environment, technology, markets, regulations, and socio-economy, but this development requires the participation of the stakeholders in the food industry to work together without organisational boundaries (Naik & Suresh, 2018, p274)

2.1 Defining value chains

The value chain concept was described by Porter (1990) when he investigated the theory of competitive advantage. The value chain concept is understood as a method selected by a firm to implement a generic strategy to reach and maintain competitive advantage, through separating activities in the firm involving designing, producing, marketing, and distributing its product. Value is basically identified as the willingness of the purchaser to pay for the product (Porter & Advantage, 1985, p3). According to McIntyre et al. (2018, p4), value has four types: functional (quality), experiential (affective), symbolic (social) and cost (monetary), and

five sources: information, products, interactions (with employees and systems), environment (purchase and consumption), and ownership/possession transfer. Similarly, in a value chain value is added at each stage, and it then transfers to the last point of the business chain (Chyi Lee & Yang, 2000, p791).

The value chain concept can be simply explained in that there are linkages in all the stages of production, processing and distribution, which can be analysed in relation to previous and subsequent phases. In this the different stages of products or services are assessed from the source through different phases of production, and finally distribution to consumers and disposal after use (Kaplinsky & Morris, 2000, p4; Russell & Hanoomanjee, 2012, p9; Calatayud and Ketterer, 2016, p4). Decisions at one stage can have an influence on the following phases and may be irreversible (Russell & Hanoomanjee, 2012, p9).

The distribution of goods or services is at the centre of supply chain contexts while adding or creating value of goods or services is the focus in the value chain approach (Govindan et al., 2015; Linkov et al., 2020). The value chain concept also involves other factors, which are important for chain activities, including the macroeconomic landscape, policies, laws, regulations, standards and institutional elements (UNIDO, 2009, p2). The activities of the value chain are separated into two components: primary activities and support activities. Primary activities relate to creating and delivering a product, and support activities are those involved in raising effectiveness or efficiency of primary activities (Russell & Hanoomanjee, 2012, p9; Calatayud and Ketterer, 2016, p5). In fact, the complexity of a value chain is shown in the relationship of many interlinked activities and industries, with many different firms operating in different regions of one country, or different countries (UNIDO, 2009, p2).

2.2 Value chain analysis

Value chain analysis is understood as the process of segmenting the chain into its different stages, in order to facilitate analysis of chain structures and functions. Thus, important steps in VCA are: determining actors involved at each phase, as well as their functions and relationships, identifying the chain governance or leadership, and value adding activities as well as determining cost and value added by each of those activities. In addition, based on estimating the goods, information and financial flows, problems or opportunities are determined, which form the base to enhance the contribution of specific actors in the chain and the overall performance of the chain (UNIDO, 2009, p4).

Value chain research is a development process, and it has to be implemented according to the theory of VCA. According to Macfadyen et al. (2011, p11), VCA consists of a number of

steps including, 1) review of the national context and the market in which the value chain operates; 2) establishing a map of the value chain in which involved actors are described (employment, revenues, profits and unit product values); 3) estimating the performance of the value chain (change over time and competitive capacity); 4) identifying the challenges and impact factors on value-addition; 5) recommending solutions to overcome challenges; and 6) proposing a specific strategy for implementation. Besides, support actors or external actors e.g. from the private sector, government or donors need to be carefully analysed in relation to the value chain as well.

VCA is an integral part of developing value chain upgrading strategies, which requires the mapping of the key elements of each node of the value chain, the identification of target groups and their rewards, and as the determination of risks, (Riisgaard et al., 2010, p205). Based on the resilience approach in VCA, increases or decreases in resilience and related support can be identified, which helps decision makers to reach value chain management objectives (Linkov et al., 2020, p2)

The need for VCA becomes apparent in the increase of a global division of labour, global distribution of component production and a growing importance of systemic competitiveness. In order to participate in global markets, one of the necessary conditions is efficiency in production (Kaplinsky & Morris, 2000, p9). As a result, new producers, including less-wealthy producers and under resourced countries, can use VCA to enable entry into global markets to ensure sustainable income growth. VCA can also lead to better understanding of the policy environment, the financial and social benefits of economic activities, as well as to determining important elements that influence financial and social performance. VCA is also considered a useful analysis tool to increase efficiency in dividing resources within the domestic economy (Kaplinsky & Morris, 2000, p2; Macfadyen et al., 2012, p27). Through VCA, an operation system of a company can be developed, in which key interdependencies are verified that highly influence revenue of the company (Linkov et al., 2020, p4), and companies can reduce the costs or increase delivery efficiency that contribute to promoting company's revenues (Nauhria et al., 2018, p36).

Two main insights may be derived from VCA: 1) the complexity of global production networks (GPNs) and arms-length trade present a limitation to commodities that have low profits. Thus, joining in the global value chain (GVC) is a necessary action to access high-income generating activities; 2) to better understand the value chain, governance relations are analysed, which helps to determine key institutional actors, and then policy leverages that can have an impact on core stakeholders' behaviour in the value chain (Kaplinsky, 2004, p107).

Based on using the chain concept, analysing the different characteristics and the linkages between actors, planning the implementation of activities and enhancing competitiveness can be implemented (Caiazza & Volpe, 2012, p922).

Similarly, six dimensions of the value chain are illustrated by Gereffi & Fernandez-Stark (2016, p7-14) namely; *input/output structure*, this is the transformation process from input elements to goods, products or services; it contributes to identifying the main activities, and separate segments in the value chain. *Geographical scope*, value chains not only operate on a local scale, but also a national and international scale, and they continue to develop. In geographical analysis, trade flows are analysed at each phase of value chain. *Governance structure*, which analyses and explains the controlling and coordination of value chain. *Upgrading*, is considered to be the process of economic actors shifting value from low level to high level through activities in GPNs (Gereffi, 2005, p171). *Institutional context*, the value chain is dependent on economic (labour cost, available infrastructure, access to resources), social (availability of labour and its skill level) and institutional (tax, regulation, subsidies) dynamics. *Stakeholders*, companies, industry associations, workers, educational institutions and government agencies are the most common stakeholders in value chains. The stakeholder analysis has an important role in determining the relationship between actors and key players, or power in the value chain.

2.3 Value chain governance

Inter-firm relationships and institutional mechanisms are viewed as patterns of governance based on the structure of non-market coordination activities in the value chain. Thus, assessing governance patterns is another part of VCA. Governance comprises specific rules by which value chains are operating, coordination issues (e.g. formal and informal arrangements between actors), and strategies for linkages and trust between actors in the chain. Hence, "*how the individual actors operate, what is going on between the actors in the chain, what keeps the actors together, what information is shared, what power relationships exist and how the relationships evolve*", are questions that VCA aims to answer (Rosales et al., 2017, p12). For this, the different components of value chains as well as social and institutional aspects relevant for the operation of the chain are determined (Graef et al., 2014; Lowitt et al., 2015). Furthermore, relationship analysis contributes to identifying the elements of relationship foundation, relationship purpose and power relationship (Canevari-Luzardo, 2019; Canevari-Luzardo et al., 2020). There are five indicators to determine governance structures in value chains: market access, fast track to the acquisition of production

capabilities, distribution of gains, leverage points for policy initiatives and a funnel for technical assistance (Humphrey & Schmitz, 2001, p20).

To categorize different types of governance structures in value chains, the crucial distinction between buyer-driven and producer-driven value chains was described by Gereffi & Memedovic (2003, p3, 5). In producer-driven value chains, the main roles in coordinating production networks are fulfilled by producers/manufacturers, involving their backward and forward linkages; for example, aircraft, computers and automobiles that relate to capital and technology-intensive industries. Whereas in buyer-driven value chains, retailers, marketers and branded manufacturers have a critical role in establishing decentralized production networks (Gereffi & Korzeniewicz, 1994, p99). "*What is to be produced and how it is to be produced"* are two critical parameters in value chain governance that are regulated by the buyer. The level of specification, or detailed drawings may be provided by the buyer, the product can then be produced based on the specific technology and design. Thus, particular standards demanded by the buyer can contribute to the introduction of particular production processes, as well as monitoring procedures (Humphrey & Schmitz, 2001, p22). In other words, control at the point of production, is carried out by large manufacturers in producer-driven value chains, while marketers and merchandisers implement the design and retail steps in buyer-driven value chains. Profit in producer-driven chains is gained from scale, volume and technological advances, while profit in buyer-driven chains is earned from linkages of high-value research, design, sales, marketing and financial services (Gereffi & Korzeniewicz, 1994, p99). To better understand contemporary governance structures in value chains, Gereffi et al. (2005, p84) identified five types of governance:

"1. Markets. When transactions are easily codified, product specifications are relatively simple, and suppliers have the capability to make the products in question with little input from buyers, asset specificity will fail to accumulate and market governance can be expected. In market exchange buyers respond to specifications and prices set by sellers. Because the complexity of information exchanged is relatively low, transactions can be governed with little explicit coordination.

2. Modular value chains. When the ability to codify specifications extends to complex products, value chain modularity can arise. This can come about when product architecture is modular and technical standards simplify interactions by reducing component variation and by unifying component, product, and process specifications, and also when suppliers have the competence to supply full packages and modules, which internalizes hard to codify

(tacit) information, reduces asset specificity and therefore a buyer's need for direct monitoring and control. (…).

3. Relational value chains. When product specifications cannot be codified, transactions are complex, and supplier capabilities are high, relational value chain governance can be expected. This is because tacit knowledge must be exchanged between buyers and sellers, and because highly competent suppliers provide a strong motivation for lead firms to outsource to gain access to complementary competencies. The mutual dependence that then arises may be regulated through reputation, social and spatial proximity, family and ethnic ties, and the like. (…).

4. Captive value chains. When the ability to codify - in the form of detailed instructions - and the complexity of product specifications are both high but supplier capabilities are low, then value chain governance will tend toward the captive type. This is because low supplier competence in the face of complex products and specifications requires a great deal of intervention and control on the part of the lead firm, encouraging the build-up of transactional dependence as lead firms seek to lock-in suppliers in order to exclude others from reaping the benefits of their efforts (…).

5. Hierarchy. When product specifications cannot be codified, products are complex, and highly competent suppliers cannot be found, then lead firms will be forced to develop and manufacture products in-house. This governance form is usually driven by the need to exchange tacit knowledge between value chain activities as well as the need to effectively manage complex webs of inputs and outputs and to control resources, especially intellectual property."

Each type of governance is characterized by different aspects including simple market linkages, governed by price; modular linkages, governed by standards; relational linkages, governed by trust and reputation; captive linkages, governed by buyer power; and linkages within the same firm, governed by management hierarchy (Gereffi et al., 2005, p84; Ponte & Sturgeon, 2014, p203).

Yet, in order to bring goods and services to end consumers, it is also intermediary actors who play a significant role. However, this role differs for each type of governance depending on the level of transactional complexity, codifiability of transactions and supplier capacity in the value chain. Specifically, intermediaries are connectors between sellers and buyers in the modular governance model while they fulfill a role in reducing risks related to transactions and controlling on behalf of partners in the relational and captive governance model, respectively. On the other hand, within the market governance model of low transactional

complexity, high supplier capacity, and easily codifiable transactions, intermediaries have to accept some cost in order to participate in the value chain. In the vertically integrated hierarchy governance model with high complexity of transactions, difficulties of codifying transactions, and low supplier capacity, the whole value chain is well controlled and intermediaries are largely absent (Vik & Kvam, 2018, p220).

2.4 Value chain upgrading

The results from VCA can be used by private and public firms in order to (re-)define and implement goals, including vision-setting and upgrading of strategy, implementing chain promotion projects and planning supportive actions. Thus, VCA and chain upgrading are closely connected (Springer-Heinze, 2007, p53).

Upgrading of value chains relates to natural and activity changes in each stage of the chain and in the distributing activities of the chain. This can be done through 4 types of upgrading: (i) Process upgrading is increasing the efficiency of input-output processes through reorganizing the production system or applying more advanced technology; (ii) Product upgrading or making more sophisticated products; (iii) Functional upgrading, introduces a new function (or abandoning existing function) to improve the overall skill content of the activities; and (iv) Inter-chain upgrading which refers to moving into new chains (Kaplinsky & Morris, 2000, p38).

Depending on products or services, and conditions and opportunities in each firm or country, different activities can be implemented in the upgrading operation. Value chain upgrading has to take into consideration both vertical and horizontal dimensions. According to Scholz (2010, p54-55), specific activities such as process upgrading are affected by changing and improving technology in processing and collection, and developing networks between actors in the chain. Product upgrading relates to the development of new products or improving old products faster than competitors. Product upgrading can be implemented through changes in product development processes such as producing, labelling and marketing. Functional upgrading aims at increasing added value by changing the organisation of actors, and their functions. In the case of chain upgrading, a new chain is established through cooperation or association with other actors, to change to a new product.

Value chain upgrading can be achieved through the support of government and other external factors such as policy, institutions, subsidies, regulations, infrastructure, capital (Brown et al., 2010, p2). Improving the position of actors in a chain can also result from increased rewards or risk reductions in economic aspects (Riisgaard et al., 2010, p177). In developing countries,

upgrading is a solution for firms to maintain advantageous positions in value chains and thereby prevents them from being replaced by other firms which have lower production costs (Holste, 2015, p10).

Value chain upgrading has to be implemented according to an upgrading strategy, which includes: unifying the vision and strategy of value chain upgrading, analysing of advantages and disadvantages, establishing upgrading goals and preparing upgrading activities, determining participatory subjects to implement the upgrading strategy, and forecasting the impact of the value chain upgrading (Springer-Heinze, 2007, p78). Countries, regions and firms apply upgrading strategies to increase their advantages and improve their status within the global economy (Gereffi & Fernandez-Stark, 2011, p12; Gereffi et al., 2019, p4).

The upgrading vision reflects the general objective of chain upgrading, which is suitable for the benefit of the specific operators. Therefore, the vision will always reflect increased income of the chain or creation of value and increasing income of operators. Proceeding from the vision, the upgrading strategy also describes the methods to be used to reach objectives, through completing the implementation processes, capacity building and promoting relations between operators. These visions and strategies are compatible with an overarching goal such as improving the quality of existing products, developing new products, or reducing production cost (Springer-Heinze, 2007, p79).

In agri-food value chain development, upgrading strategies for smallholders can be implemented through improving value chain coordination (horizontal and vertical coordination), improving processes and products, changing and adding functions and upgrading the institutional environment. To upgrade a value chain, strategies should focus on enabling cooperation and collective action, affecting the governance or coordination patterns, and guiding research and innovation processes (Kilelu et al., 2017, p1105). In addition, strategies have to identify the most suitable actors of the chain, with the capacity and willingness to take over the main responsibility for implementing upgrading activities. If these leading actors do not meet this responsibility, those in supporting roles will not be successful either. In addition, upgrading strategies presuppose the acquisition of capabilities, as well as changing relationships with buyers and markets (Humphrey, 2004, p7).

2.5 Agri-food value chain

The contribution of food trade in promoting economic growth and stabilising markets has been documented (Hawkes & Murphy, 2010, p17). Yet, globalisation has led to many changes concerning the production and distribution of food. *Firstly*, trade liberalization has tended to

move agri-food trade from "east to west", so that former net exporters have become net importers of food, while the overall participation of developing countries in food trade increased. *Secondly*, the volume of global agricultural trade increased. *Thirdly*, the development of food standards increased food quality and safety demands, which increasingly impacted traders and producers in developing countries (Swinnen & Maertens, 2007, p90).

There was a significant expansion of international trade after 1990, which resulted in increasingly GVC. Not only the growing international division of labor an important key in the expansion of GVCs, but factors such as matching buyers and sellers, making relationship-specific investments, exchanging intangibles and living with limited contractual security. As a result, poor countries have experienced rapid growth while poverty was reduced (World Bank, 2020, p1, 31). In developing and transition countries, there have been significant changes in food and agricultural commodity value chains in the past decades. Transferring food supply chains from domestic to global, and changing agri-food systems from state controlled to private governance, are the most important transformations (Swinnen & Maertens, 2007, p101). In developing countries, the transformation of the agri-food industry is realised by changing from public to private standards, from spot market relationships to vertical coordination of the supply chain through contracts and from local to national, regional and global sourcing networks (Reardon et al., 2009, p1725).

The significant transformation in the strategy of producers from production orientation to a market orientation is caused by increased information exchange between members of agri-food chains. Product innovation is also an important change in agri-food chains in developing countries. These changes can be related to changes in consumer demand towards better quality and a larger variety of products. Currently, attention for food safety and production conditions for consumer protection is increasing as well. Additionally to these changes on the demand side, processors and retailers tend to be larger and more internationalised (Aramyan et al., 2006, p48).

Firms have organized the production system in complex GVCs. Goods or services can be designed in one country, but all parts of goods or services can be produced in several other countries, while final products might be used in yet another country. This is reflected in significantly increased international trade and investment flows (World Bank, 2020, p15). The complexity of the global agri-food market is increasing. A growth in value chain coordination has resulted in the pursuit of product variety, improved quality, reliability of delivery, new product differentiation and product safety, which complicate flows of information, products, finance and resources along the value chains (Humphrey, 2006, p16). The closer vertical

coordination of value chains is another development, which has led to a decreasing use of spot markets while increasing production and marketing contracts, franchising, strategic alliances and joint ventures. These shifts contribute to a change in consumer taste, the use of biotechnology and information technology, environmental pressures, credit and risk issues, and the reduction of global trade barriers (Young& Hobbs, 2002, p428).

Generally speaking, agri-food value chains consist of input suppliers (e.g. fingerling, chemicals, machinery), farmers and other agricultural producers, processors of agricultural goods (manufacturers of food and beverages), and trading companies and retailers (Caiazza & Volpe, 2012, p922). In addition, Memedović & Shepherd (2008, p5) noted that primary production, post-farm production, marketing and distribution services and eventually recycling, are additional phases in agri-food value chains.

Riisgaard et al. (2010, p199) mentioned that small producers face a number of problems regarding production and consumption, including small volumes and a lack of supplier capabilities, great uncertainty overprice, sales to many different buyers, low quality grades and standards specified, lack of traceability and poor transmission of complex product information. As a result, small farmers in developing countries are often limited to a position at the "raw material" stage of value chains (Pelupessy & Van Kempen, 2005, p370), creating a power asymmetry in the relationships with a majority of farmers and large actors further downstream the supply chain (Doherty et al., 2019, p5).

The actors further along the chain hold power in the value chain (Pomeroy et al., 2017, p552). Downstream actors are increasing their power in the governance of global agri-food chains, which can cause unequal distribution of the total chain surplus among its nodes, and smallholders in developing countries can be faced with losses or even exclusion from global food chains (Pelupessy & Van Kempen, 2005, p376). Traditionally, the marketing and distribution phase play a key role and make a major contribution to the success of an agri-food business. The connection between farmers and final consumers depends on marketers and distributors; they are regarded as coordinators between farmers, processors and final consumers (Memedović & Shepherd, 2008, p7). However, supply chain actors can collect agri-food products from different producers with the diversity of climates and social conditions, thus, they can face too many potential risks relating to political, social, ecological and biological (Rueda et al., 2017, p2481; Doherty et al., 2019, p6).

2.6 Fishery products value chain

The differences between species produced from fishing and aquaculture lead to different value chains which are regulated by production methods, product quality, marketing channels established and the middlemen involved. There are also variations in selling methods. For instance, fresh fish is mostly sold directly in the local community, while other products may be used for trading, storing, processing and transferring to consumers outside the community. Besides consumer preferences in different places, capacity and competitiveness of a given fisheries area influence the flow of products from fisheries and aquaculture (Burch et al., 2017, p5). To increase the value of products from fisheries and aquaculture, processing methods are applied to convert raw fish to finished or semi-finished products. Although fish and fishery products may be similar, their value is different, and is based on differences in product attributes such as geographical location, environmental stewardship and food safety (De Silva, 2011, p3, 4; Lem, 2012, p5).

The functions of trade in the fisheries sector lie in the development of consumer markets, supporting financial services and adding value to fishery products. However, the globalised trade also causes problems specifically for small-scale aquaculture producers. These include low bargaining power, poor marketing strategies, monopolies among large traders, poor storage infrastructure, difficulties in responding to quality standards and a lack of market information (Pomeroy et al., 2017, p545).

Asian fishery products suppliers, for instance, tend to respond according to the demands of overseas drivers in the value chain, such as price, volume, logistics, quality, innovation and food safety. Yet, this does not mean that long-term or equal relationships between actors are ensured, as the control over product innovation, value enhancement and the benefits of certification are captured and maintained by buyers of fishery products (Jespersen et al., 2014, p238). In monetary terms, small-scale fishers and fish farmers derive the least benefit from the products in the fishery and aquaculture value chain, while processors and retail markets derive higher benefits because they have stronger bargaining power (Lem, 2012, p6). The focus of many fishery products value chains is on international trading, resulting in rising prices between domestic and global scales (Caiazza & Volpe, 2012, p926). Adding to this, domestic markets and the value chain strategies of local suppliers are influenced by changes in governance structures and safety requirements in GVCs (Gereffi & Lee, 2009, p42).

3 Role and development process of Vietnam's fisheries and aquaculture sector

The fisheries sector has a key role to play in the socio-economic development of Vietnam; it provides food for people, feed for animal husbandry and aquaculture, as well as providing raw materials to produce fertilizer for agricultural production. In addition, products from fisheries are used in the production of food for human consumption. The fisheries industry also contributes to national revenue by creating goods that may be exported to other countries (DoF, 2019).

With 3,260 km of coastline, over 4,000 islands, 12 bays and lagoons, and many rivers and lake systems, Vietnam has ideal conditions to develop aquaculture and capture fisheries (VASEP, 2018). Thus, starting from being considered simply as a source of extra jobs, Vietnam's aquaculture has become an important commodity production industry with advanced technology, using all types of water bodies including fresh water, brackish water and marine salt water. The aquaculture industry, also follows the principles of sustainable farming and environmental protection, while working in harmony with other industries (DoF, 2019).

Aquaculture is gradually becoming one of the key commodity production industries, which tends to stimulate the establishment of concentrated production regions. Production of species with high economic and export value attracts investment and encourages development. Together with promoting natural potential, drawing capital and development of enterprises and individual farmers, aquaculture has been making a crucial contribution to the transformation of economic structures in agriculture, as well as to hunger elimination and poverty reduction in regions of the country (DoF, 2019). As a result, the fisheries sector has attracted over 5 million employees and provided the main income for about 8 million people in 2015. The fisheries sector reported that pangasius, shrimp, tuna, and molluscs (including clams, oysters, mussels, squid and cuttlefish), are the most important seafood products (Van Duijn et al., 2012, p12; UNIDO, 2015, p9; FAO, 2019).

The importance of Vietnam's aquaculture is also apparent in its contribution to providing citizens with an improved diet, growing export demand, job creation, and as a source of income contributing to rural development (Thi Thanh Vinh, 2006, p500). Rural aquaculture has increasingly proved crucial as a livelihood for farmers. The quality of life of poor farmers has been enhanced through an improved food supply and a greater variety of income sources (Duc, 2009, p28).

Marketing in the Vietnamese fisheries industry has changed in recent decades, which can be divided into two periods: The first period from 1995 to 2002 witnessed development of a production orientated approach which concentrated on inputs and farmers, where farmers were introduced to technology that helped to increase production and reduce costs, thus helping to attract consumers by decreases in price. The second period, after 2002, was characterised by the development of a market orientated approach, where the emphasis was on outputs and market demands, as well as the promotion of commercial linkages between farmers and markets (Cuyvers & Van Binh, 2008, p8; Van Binh, 2006, p26).

Vietnam is one of the countries considered to be taking a lead in the Blue Revolution, which is supported by the fact that production of farmed fish is now higher than production of caught fish, and it is dominated by small producers (Marschke & Betcherman, 2016, p1146). Additionally, becoming a member of the World Trade Organisation in 2007 was considered as great chance for Vietnam to increase fisheries exports, providing opportunities for processing companies to expand into world markets (Cuyvers & Van Binh, 2008, p6). Hence, Vietnam's aquaculture industry has great potential to improve the livelihood of stakeholders in particular, and socioeconomic factors of the country in general.

3.1 Changes in aquaculture area and production of Vietnam

In Vietnam, water surface area dedicated to aquaculture is divided into three types: marine aquaculture, water bodies for breeding and inland aquaculture. In 2017, inland aquaculture accounted for the largest area; the area of marine aquaculture showed the second largest extent and water used for breeding occupied the smallest area. Fish and shrimp are the main species being used in aquaculture. Shrimp farming has always occupied a larger area than fish farming in the case of marine and brackish water aquaculture, but fish farming has become more popular in freshwater aquaculture systems. Besides fish and shrimp, other aquatic species have been used in both marine and inland aquaculture; however, the water surface area for mixed and other species was small compared to these two main types (DoF, 2019). The changes in the area used for aquaculture are indicated by changes in the area for shrimp and fish farming (see Fig. 1 and 2).

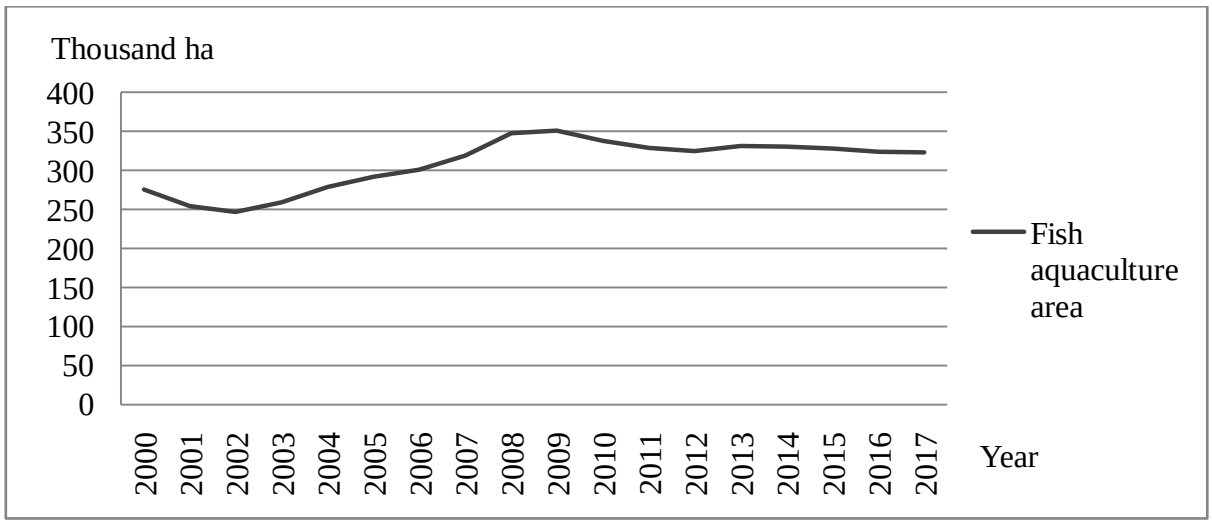

Figure 1: Fish aquaculture area from 2000 to 2017

Source: GSO of Vietnam

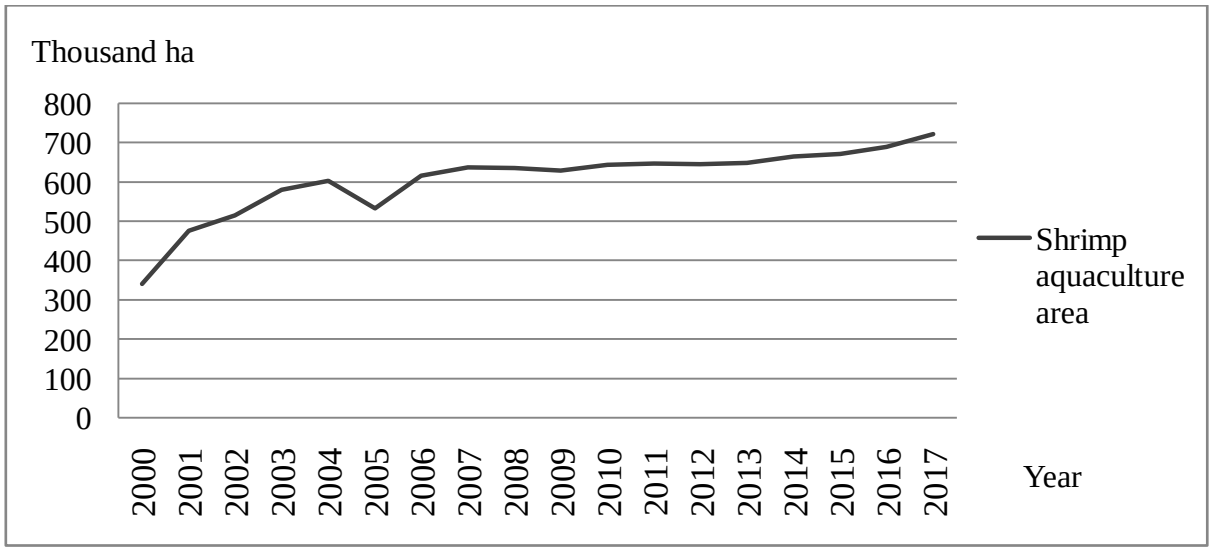

Figure 2: Shrimp aquaculture area from 2000 to 2017

Source: GSO of Vietnam

Figure 1 shows that fish aquaculture area has fluctuated between 2000 and 2017. It has decreased slightly from 275 thousand ha in 2000 to 245 thousand ha in 2002; after that, the area has grown significantly and reached 350 thousand ha in 2009. However, fish aquaculture area has tended to decline from 2010 to 2017. In contrast, shrimp aquaculture area has constantly tended to increase between 2000 and 2017. It was only 340 thousand ha in 2000, and nearly doubled in 2004 before decreasing to 530 thousand ha in 2005. The area has continued to increase since 2006 and maintained stability with over 600 thousand ha until 2016; when a rapid growth set in, which peaked at 723 thousand ha in 2017.

As mentioned above, fish and shrimp farming occupy most of the aquaculture area, yet, depending on the characteristics or development planning of each region or locality, there are

differences in aquaculture types, species and production volumes. These different forms include intensive farming, semi-intensive farming, extensive farming and improved extensive farming, as well as rice-cum-fish farming, rice-cum-shrimp farming and mangrove-cum-aquaculture (FAO, 2018a); in addition, as illustrated in the figures below, there have been changes in the production of farmed fish and shrimp over time (see Fig. 3 and 4).

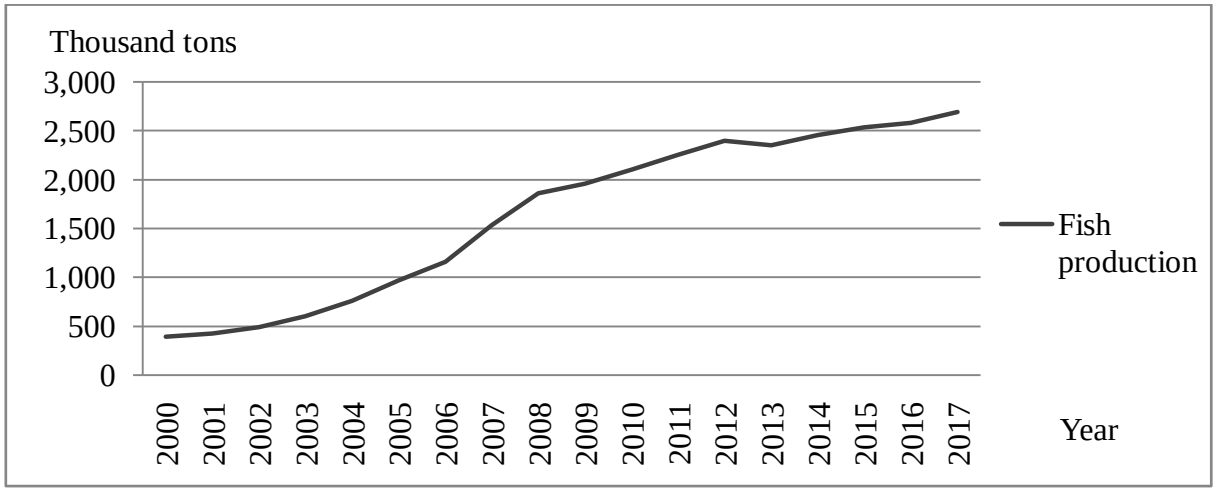

Figure 3: Fish production from 2000 to 2017

Source: GSO of Vietnam

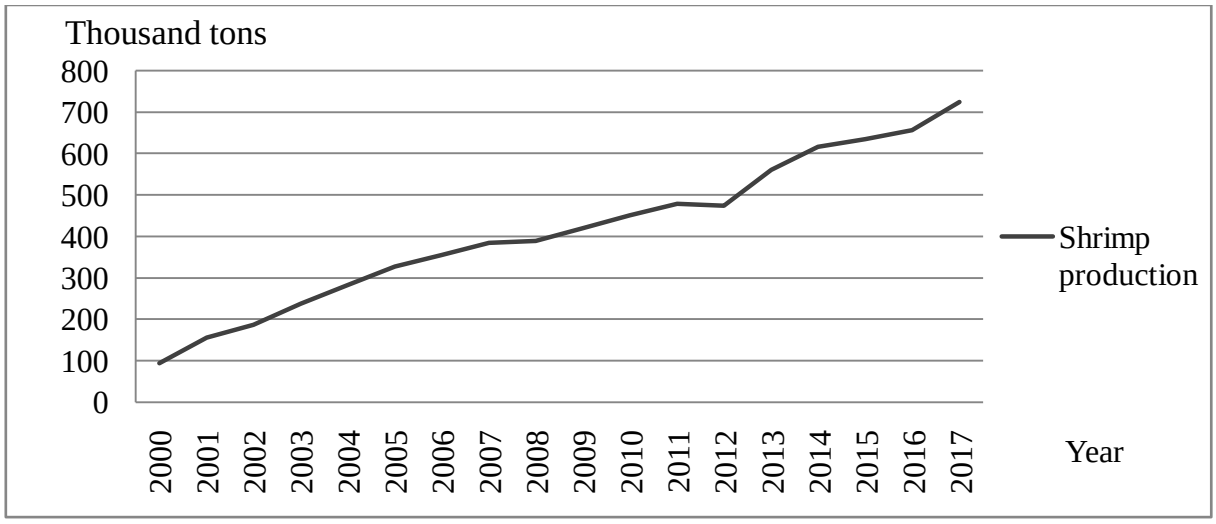

Figure 4: Shrimp production from 2000 to 2017

Source: GSO of Vietnam

As seen from figures 3 and 4, the total farmed shrimp and fish production has increased since 2000. Specifically, farmed fish production showed a significant increase: it achieved less than 500 thousand tons in 2000, but a five times higher production in 2017. Over the past eighteen years, farmed fish production has also been greater than farmed shrimp production; but the growth rate of farmed shrimp production is higher than the growth rate of farmed fish

production. Farmed shrimp production has increased from 93.5 thousand tons in 2000 to over 700 thousand tons in 2017.

The increased production and aquaculture area are results of changes in the form of aquaculture, and the development policies of the Vietnamese government. Specifically, according to Decree No. 09/2000/NQ-CP, the aquaculture area also increased because many less productive rice fields, uncultivated areas, and salt pans were converted into aquaculture ponds. In addition, farmers were encouraged to change their form of aquaculture from extensive to semi-intensive and intensive forms. The Vietnamese government also introduced different support programs for rural areas and farmers, such as improving infrastructure, bank loan mechanisms for both producers and processors, technical training courses, consultation programs and international trade promotion (Phuong & Oanh, 2010, p142).

3.2 Distribution of Vietnam's aquaculture

According to the general statistics office (GSO) of Vietnam, data of aquaculture activity was classified by division by regions, provinces and years. Vietnam's territory is divided into six regions: Red River Delta, Northern Midlands and Mountain, North Central and Central Coast, Central Highlands, Southeast, and the Mekong River Delta. Each region differs in aquaculture areas, production volumes and species farmed. For instance, the North Central and Central Coast have marine and brackish water aquaculture and farmers are focusing mainly on marine aquaculture and raising species such as shrimp, blood cockles, abalone and snapper. In the Southeast, farmers mainly focus on fresh and brackish water aquaculture, and the main species are grouper, cobia, tilapia and shrimp. The Mekong River Delta is also a vibrant aquaculture region, exploiting all types of water in which shrimp, catfish, blood cockles, clams and some marine fish are the main species (VASEP, 2018). To better understand the distribution of aquaculture activities in Vietnam, the differences in aquaculture areas in each region are shown in Figure 5.

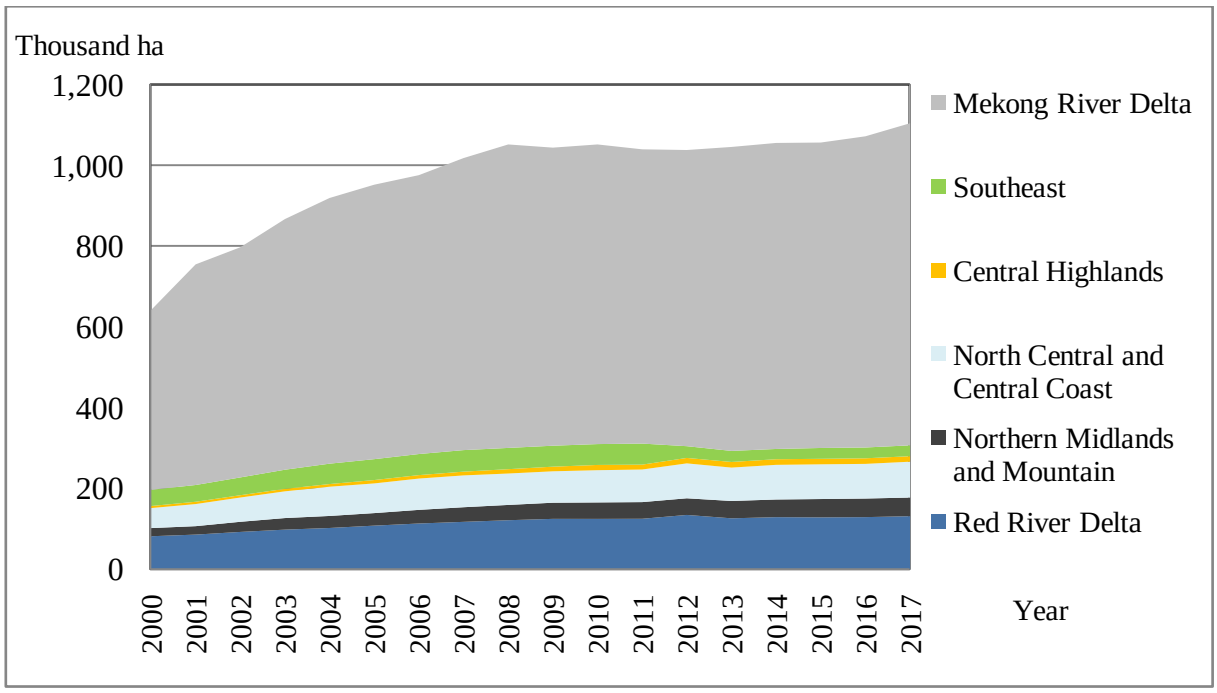

Figure 5: The distribution of aquaculture area from 2000 to 2017

Source: GSO of Vietnam

The area under aquaculture in the six regions of Vietnam increased between 2000 and 2017. The largest area of aquaculture can be found in the Mekong River Delta with 445 thousand hectares in 2000 and 798 thousand hectares in 2017, an area that is greater than the total aquaculture area of the remaining five regions. Following the Mekong River Delta, Red River Delta and North Central and Central Coast were respectively second and third largest in aquaculture area. The area under aquaculture has steadily increased in both regions since 2000; the aquaculture area of the Red River Delta has increased from 81.5 thousand hectares in 2000 to 131 thousand hectares in 2017, while the aquaculture area of the North Central and Central Coast increased from 49.6 thousand hectares to 89 thousand hectares in the same period. The remaining areas, belonging to the three regions of Southeast, Northern Midlands and Mountain, and Central Highlands, only make up a small part of the total aquaculture area in Vietnam.

Figures 6 and 7 illustrate that together with the different distribution of aquaculture areas in the six regions, there are also differences in the distribution of production of farmed fish and shrimp in each region.

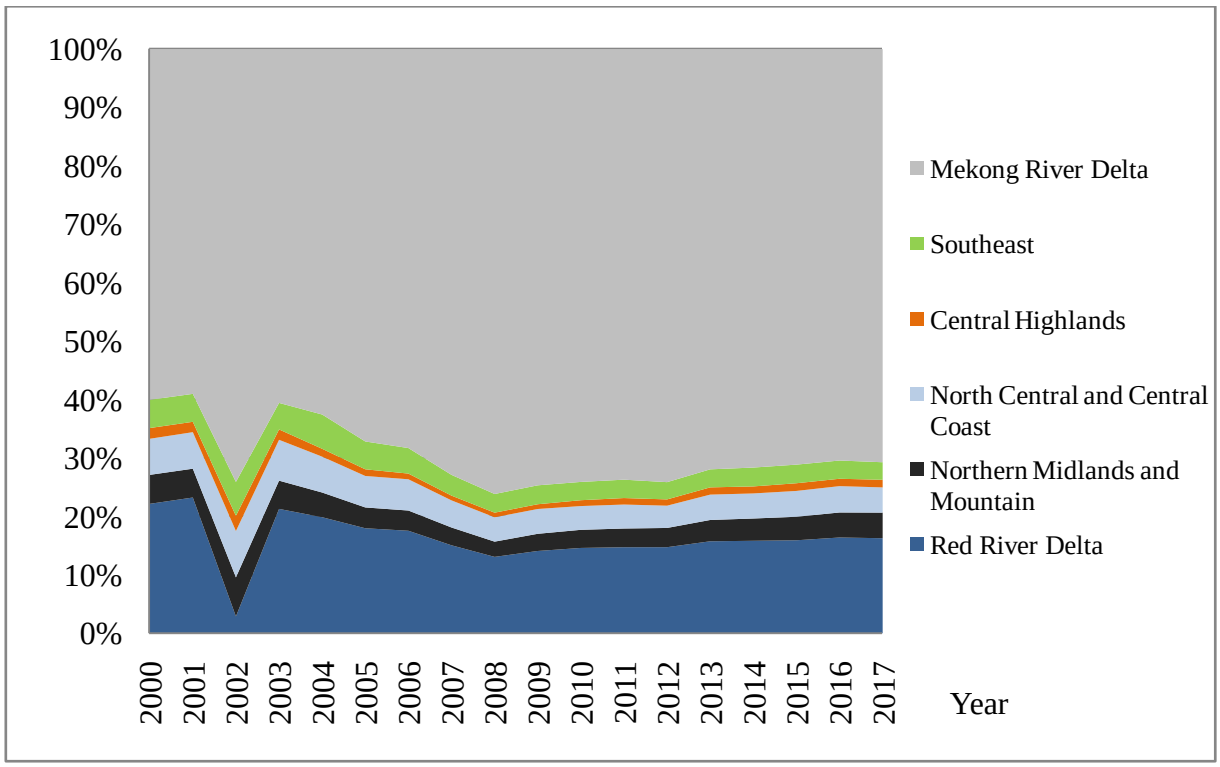

Figure 6: The distribution of farmed fish production from 2000 to 2017

Source: GSO of Vietnam

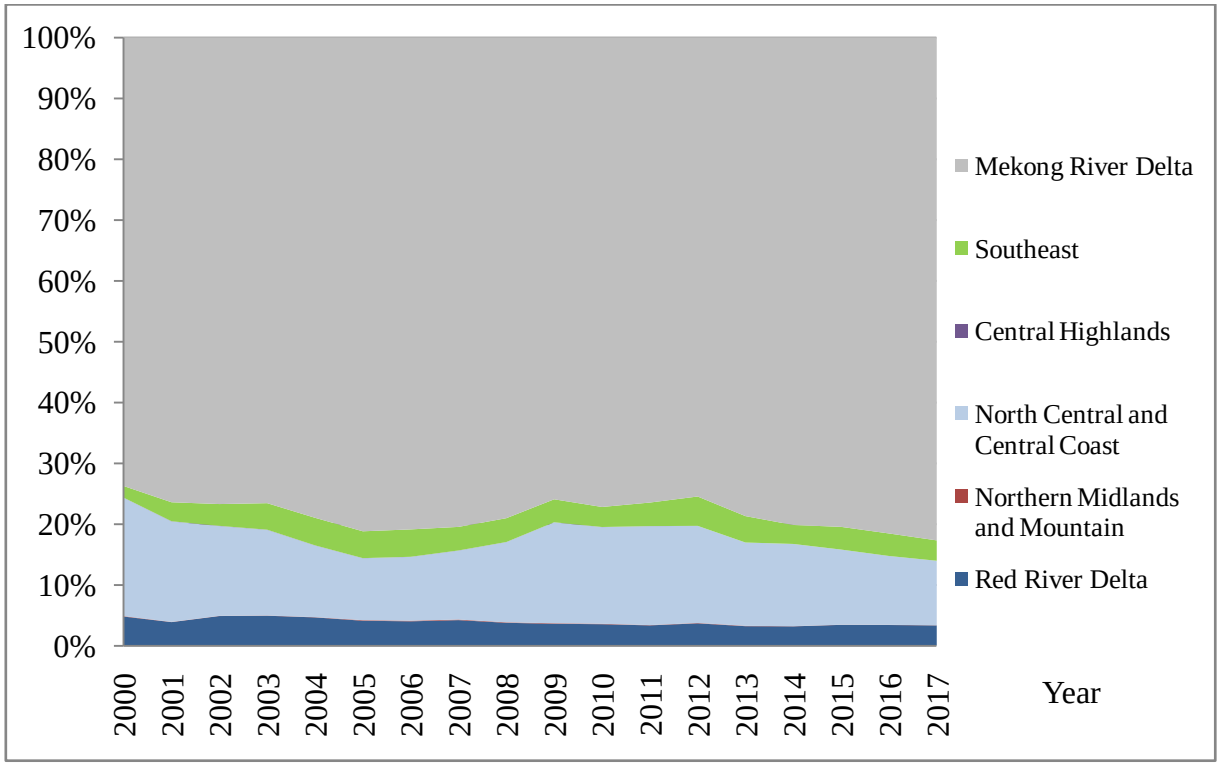

Figure 7: The distribution of farmed shrimp production from 2000 to 2017

Source: GSO of Vietnam

It is clear that fish and shrimp farming activities were most prolific in the Mekong River Delta, Red River Delta and North Central and Central Coast, while the Southeast, Central Highlands and Northern Midlands and Mountain have low production shares of both fish and shrimp. From 2000 to 2017 the Mekong River Delta has been the most productive region for both farmed fish and shrimp, and produced 60% and 70% of total production of fish and shrimp respectively. Following the Mekong River Delta, the Red River Delta ranked second in the production of farmed fish, making up nearly 20% of the total farmed fish production since 2000; the rest was made up by the other regions. Remarkably, in 2002, fish aquaculture production decreased in most regions, while the farmed fish production of the Mekong River Delta grew rapidly.

In the case of farmed shrimp production, the North Central and Central Coast has ranked second behind the Mekong River Delta with about 20% of total farmed shrimp production for 18 years, but production has tended to decline in recent years. The Southeast and the Red River Delta ranked third and fourth, with their farmed shrimp production at around 5% during the same period.

3.3 Demand and consumption in Vietnam's fisheries sector

On global scale, Kobayashi et al. (2015, p296) estimated that aquaculture will provide 62% of fish for direct human consumption by 2030. In which fishery products producing in Vietnam such as shrimp, salmon, tilapia, pangasius and carp may feature strongly. Therefore, to benefits from increasing global demand, the fisheries sector was considered to be the first economic sector of Vietnam to adopt economic liberalisation and international integration (Nguyen, 2010, p7).

The economic efficiency of shrimp, prawn, crab, and finfish farming has been shown by the increasing domestic demand for fishery products in all urban areas (Nguyen, 2010, p8). In Vietnam, the domestic market for fish is growing. In 2011 the average annual fish consumption was 14.6kg/capita, and 66.7% of this consumption came from fresh fish and shrimp (UNIDO. 2015, p25). Growing demand for fish from the domestic market is explained by increasing wealth of the middle class (Khiem et al., 2010, p119).

The export fishery of Vietnam has developed significantly over the past 20 years, when fisheries export turnover reached a low level in 1995 but since then has grown at an average growth rate of 15.6% per year (VASEP. 2018). Vietnam was the world's fourth largest producer in the aquaculture sector and was ranked third in the world in terms of export value of fish and fish products in 2017 (FAO. 2019).

Currently, Vietnamese fisheries supply to over 160 markets globally. Consumer markets tend to be increasing, and Vietnamese fisheries have become increasingly important in supplying large markets such as USA, EU and Japan; these markets make up 50-60% of the value of fishery products exports from Vietnam (VASEP, 2018). The demand on the EU market for seafood such as pangasius, shrimp, tuna and clams from Vietnam, is increasing (Van Duijn et al., 2012, p24). China has become the fourth most important market for Vietnam in recent years, but this market is unstable, lacking enterprise and information. Moreover, most fishery products being exported to this market are raw materials, thus the value is low (VASEP, 2018). Export data of the fisheries sector is shown in Figure 8.

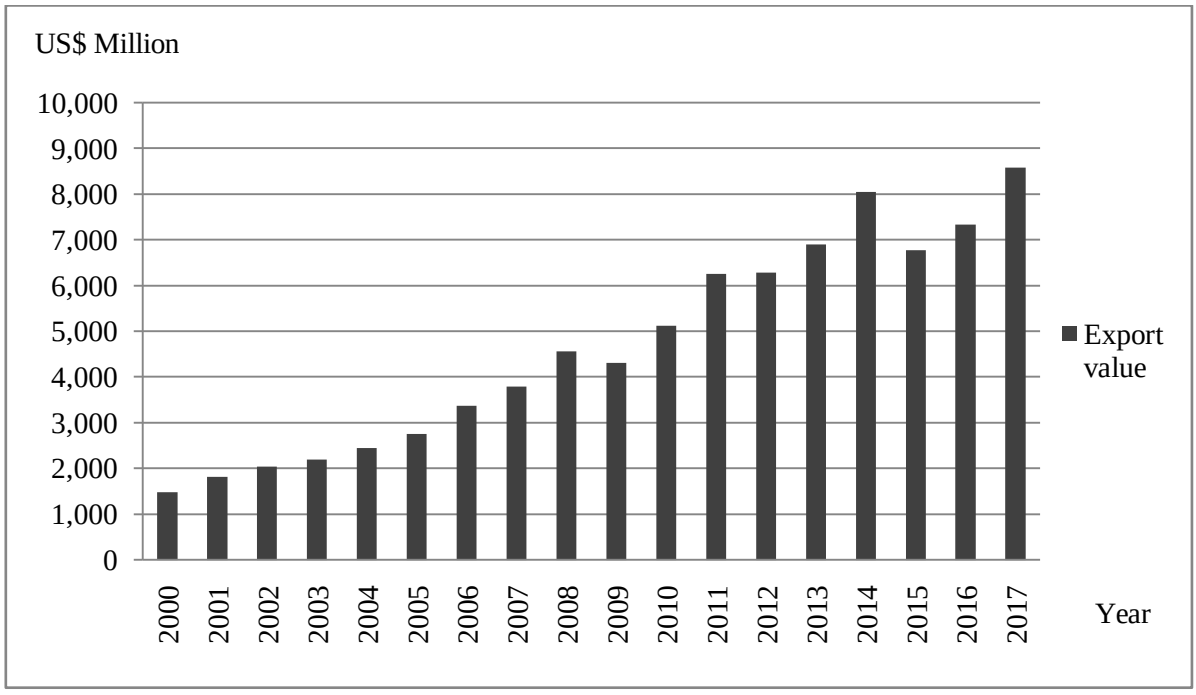

Figure 8: Export value of fishery products of Vietnam in 2000 - 2017

Source: FAO statistics, 2019

Since 2000 there has been strong growth in the export of fisheries products from Vietnam, based on aquaculture activity, especially catfish, white shrimp and black tiger shrimp. The fisheries sector has made some significant strides in recent years; the export value of Vietnamese fisheries has increased from US$ 1,484 million in 2000 to US$ 8,044 million in 2014. After that, export value showed a slight decrease in 2015 and then continued increasing in 2016, reaching US$ 8,586 million in 2017.

Fishery products of Vietnam have, however, not had a specific trademark on world markets, especially in the retail segment. Normally, fishery products are exported to importers, and then the products will receive a new label and trademark of the importers or distributors. A

specific trademark for Vietnamese fishery products might allow enterprises in Vietnam to demand higher prices for their products (DoF, 2019).

Domestic consumption has only become significant in recent years, when average consumption levels of fishery products per capita increased by 5% per year between 1990 and 2010. If this tendency remains unchanged in the next years, the annual consumption level of fishery products is forecast to increase from 33 kg to 37 kg per person between 2015 and 2020. Generally, the production model in fisheries is small scale and is usually characterized by unequal power relationships between producers and buyers. The Vietnamese production system for fishery products is usually dominated through buyers (VASEP, 2018).

3.4 Aquaculture value chain in Vietnam

Depending on the species, aquaculture forms and scale, there are differences in the actors involved in the aquaculture value chain, which can be divided into primary and secondary actors. The main primary actors include input suppliers (input dealers, hatcheries and nurseries), producers (farmers), collectors and processors. The main secondary actors are: Aquaculture Extension Services, Vietnam Association of Seafood Exporters and Producers (VASEP), Department of Agriculture and Rural Development (DARD), National Agroforestry, Fisheries Quality Assurance Department, banks and research institutions (Ho & Burny, 2016, p93). While the relationships between the main actors such as farmers, processors and input suppliers are generally weak, farmers can be considered as the most vulnerable actors in the production chain (Phuong & Oanh, 2010, p145).

Since 1994 many seafood markets have been exploited by enterprises that opened export-orientated opportunities for aquaculture in Vietnam (Tran et al., 2013, p331). However, small-scale farming still dominates aquaculture in Vietnam, while aquaculture is considered as a commercial large-scale industry (McCoy et al., 2010, p79). For example, small-scale farming is most common in shrimp farming, thus the collection of shrimps is implemented in different areas and provinces by brokers or middlemen (Anh, 2011, p2110). The main characteristics of small-scale aquaculture are: use of local resources, limited investment in assets, and farmer engagement in a diversity of agricultural activities (McCoy et al., 2010, p79).

In vertically integrated, export orientated chains, small-scale farmers (SSF) have the potential to generate higher value than fishers, but together they are the most vulnerable actors in their chains, in which their lack of bargaining power is the main constraint. As a result, SSF and fishers are the actors with the lowest gross profit and income in their respective chains, while

over two-thirds of the gross profit in the chain is captured by processors and retailers (Loc et al., 2010, p903).

In the global pangasius value chain, poor bargaining power, low financial capacity and low prices are the main barriers for incorporation of smallholders into the GVC (Khiem et al., 2010, p34). Similarly, a lack of market information, technical skills and financial capital leads to shrimp farmers occupying the lowest position, and having the least negotiating power in the shrimp value chain (Ho, 2012, p120).

At the same time, middlemen play a very important role in the shrimp farming sector in Vietnam and small farmers depend on them not only for inputs (e.g. fingerling, feed) but also for harvesting and marketing. Thus, the middlemen wield a great amount of power in the supply chain. About 75% of shrimp production is passed to the middlemen, while the rest belongs to the processors. From there, only about 4% of shrimp production is sold on the domestic market and the rest is exported (Van Duijn et al., 2012, p35).

Local government agencies, producer associations and non-governmental organizations (NGOs) are implementing changes aimed at restructuring the value chain and shifting towards more vertical integration between processors and farmers. On the other hand, the fact that shrimp will be handled by many different buyers before moving to the processing factory, may be a potential hazard regarding food safety and traceability. However, selling to middlemen is often preferred by farmers, because they usually pay on time, while exporters often delay payment. Moreover, regarding the actual purchase of shrimps, middlemen will buy 100% of the shrimp, while some parts of the shrimp may be refused by some exporters (Van Duijn et al., 2012, p35, 36).

In contrast, in the case of pangasius, middlemen do not play a significant role in trading. Because there is a higher level of vertical integration almost all fish are sold directly from farmers to processors, with the help of companies in harvesting and transport. Middlemen only buy 10% of the fish production from farmers, while 90% of the product is sold directly to processors. Of this, 98% is exported to international markets while the rest stays in the local market. Although a higher level of vertical integration has been established, the spot market is still the main operating environment for most farmers (Van Duijn et al., 2012, p46, 48, 50).

Compliance with food safety standards is an important factor in accessing the international market. Additionally, farmers must comply with environmental and social requirements in order to meet the demands of certification agencies (McCoy et al., 2010, p98). In the pangasius sector, for example, imposing standards on suppliers, which may then take the

place of contracts, and vertical integration. Imposing standards can influence the pangasius value chain in two ways. *Firstly,* the bargaining power of quality producers in relationship with processors increases, producers may thus find it easier to find other buyers and reduce the monopoly of processors. *Secondly,* increasing competition among processors in their demand for quality producers, means that there has to be a strengthening of vertical coordination and the exclusive linkage with producers, so that the production source can be guaranteed. Currently, the application of standards is still limited in the pangasius sector (Trifković, 2014, p244). In the case of the shrimp value chain, almost all linkages between actors are unofficial, and mainly oral agreements are made between actors. Thus, traceability is difficult, which may lead to breaches of food safety standards (Ho & Burny, 2016, p95).

3.5 Issues in Vietnam's aquaculture

Aquaculture in Vietnam is facing many challenges, including the fact that the area under aquaculture has grown faster than common infrastructure (MARD, 2016), and investment in logistics, fingerling production and farm irrigation is still lacking and weak (Van Duijn et al., 2012, p36). Small scale farming still accounts for a large percentage of production; meaning that the standard of productive organisation within the value chain is not high, which creates difficulties in monitoring quality. At the same time, prices of food, fingerling and energy are high and the agricultural output market is unstable. In addition, producing on a small scale makes it hard to apply new technology as well as connecting to the market (MARD, 2016). Vertical integration is considered to be a solution for value chain development and ensure sustainability in the Vietnamese economy, but only a small percentage of farmers are considering this solution (Ho, 2012, p146).

The export market for fishery products increasingly depends on an adherence to quality standards, while barriers to trade are becoming tighter, and competition among countries with similar commodities is growing (Ngo, 2013). For instance, food safety standards and import tariffs are considered the two main barriers to infiltrating the EU market (Van Duijn et al., 2012, p24). In addition, aquaculture also comes with the risk of disease outbreaks and environmental pollution. Climate change especially poses a real problem for the production environment of aquaculture in Vietnam (Ngo, 2013). Vietnam specifically, is highly vulnerable to natural hazards because of its geography and topography; and typhoons, storms, and floods already have an impact on people, their livelihood and their infrastructure (Nguyen, 2010, p19).

4 Aims and objectives of the research

Global food demand is projected to increase for at least another 50 years (Dobermann & Nelson, 2013, p2). This prediction is explained by population growth, increasing per capita consumption, changing diets and income growth (Alexandratos & Bruinsma, 2012, p3; Valin et al., 2014, p52). In order to meet demand, 60% of the world agricultural production has to increase annually. In this, developing and developed countries need to increase 77% and 24% respectively (Alexandratos & Bruinsma, 2012, p95). In addition, demand for meat and dairy products and other more resource-intensive food items is increasing as well (FAO, 2017, p10).

Therefore, global food availability is a critical issue at the global level, which depends on food production and stocks in any given year. Meanwhile, at national level, together with the country's food production and stocks, food imports have become an important factor as well. The food production capacity of a country is dependent on resources, climate, capitals and policies, while a country's national income, the availability of foreign exchange and the conditions and prices on international markets are elements influencing the ability to import food (Carletto et al., 2013, p30).

Globally, agricultural production has increased threefold between 1960 and 2015 (FAO, 2017) as a result of enhanced technologies and the expanded use of land, water and other natural resources. In parallel, the industrialization and globalization of food and agriculture have taken place, which have led to a lengthening of food supply chains and a sharp rise in the consumption of processed, packaged and prepared foods. At the same time, a rising demand for agricultural products and easily processed food, better transportation and storage, and more efficient distribution are resulting in population growth and urbanization developments. Hence, food processing and distribution can be considered critical elements in the shifting of food systems (FAO, 2017, p20-36). Currently, the scale of food trade is strongly increasing. The value of international flows, indicating global trends in overall trade volume, has grown fivefold during the past five decades. Yet, this increase is unevenly distributed across regions with high-income countries capturing a higher proportion than developing countries. Nevertheless, comparative advantages in food and agricultural production might give some developing countries an advantage over developed countries (Pocketbook, 2018, p34).

Together with the significant changes in agriculture, far-reaching technological and institutional innovations, and new roles for the state, the private sector, and civil society (Mondiale, 2008, p8), changes in developing countries' food value chains have become obvious in the diversity of formats. This includes the establishment of food chains by modern

sector firms, but also interactions between firms and traditional value chain actors such as SSF, traders and street vendors and traditional outlets such as wet markets or corner stores (Gómez & Ricketts, 2013, p3). Unlike 50 years ago, before the effects of urbanization and income growth, nowadays people in developing countries depend on food purchased from commercial food value chains, which consist of a mixture of traditional actors such as street vendors, small-scale traders and farmers, and modern actors such as supermarkets or food manufactures (Gómez et al., 2013, p137).

Agriculture-based livelihoods still exist in most rural households of poor countries (Aksoy & Ng, 2010), and the majority of agricultural systems in developing countries is based on smallholders who contribute a lot to the countries' food security (IFAD, 2016, p8). Yet, smallholders are facing many problems concerning the accessibility to markets, low supplier capabilities, lack of traceability, and issues in financing, transport, quality standards and certification, that are preventing their participation in integrated value chains (Riisgaard et al., 2010, p199; Dobermann & Nelson, 2013, p5; FAO, 2017, p36).

Increasingly, private label standards as well as specific customer requirements are critical obstacles for dealing with global buyers. Thus, in order to respond to changes in trade standards, small producers, especially from developing countries, face challenges because they lack institutional, technological, or infrastructural capabilities to implement necessary changes (Busch & Bain, 2004, p341).

Over 700 million people on the world are faced with extreme poverty (FAO, 2017, p26). In this context, research on agri-food value chains is necessary to improve the four dimensions of food security: food availability, food access, food utilization and food stability, and to promote trade liberalization which is considered as a critical element to improve global food security (Grafton, 2015, p180). Furthermore, some development agencies have promoted the participation of poor people in modern value chains including food value chains (Hawkes & Ruel, 2012, p2). A VCA forms the basis to identify competitive advantages, participatory actors and their roles and benefits, advantages and disadvantages of products, and financial and information flow that contribute to specifying production and business strategies or developing suitable development policies.

Research on value chains will have different aims; it can contribute to the theory system of the value chain concept or explain specific situations through empirical research. The main aim of this research is to analyze the white shrimp value chain in order to determine the situation of white shrimp production and consumption in Central Vietnam, the role, function and power of each actor in the chain, the relationships and governance in the chain, and the

challenges and constraints in white shrimp farming and the operation of the value chain. By providing results of empirical research for issuing policies and planning in aquaculture activities, as well as providing specific evidences on white shrimp production and consumption of SSF for managers, development agencies or other researchers, this research supports the development of white shrimp farming in Vietnam. In line with these points, this research aims to establish strategies for white shrimp farming towards sustainable development, which contributes to ensuring food security in Vietnam and globally. The research process was therefore based on the following main questions:

i) How has white shrimp farming developed in Central Vietnam in recent years?

ii) What are differences between white shrimp marketing channels and how is capacity of white shrimp farmers to respond to the standards of these channels?

iii) How is power distributed and exerted among the main actors in the white shrimp value chain and how does this impact white shrimp farmers?

4.1 Research site

This research was carried out in the case study site of the Thua Thien Hue province in Central Vietnam. The province borders Laos in the West, Da Nang and Quang Nam province in the South, Quang Tri province in the North and the Southeast Sea in the East. Thua Thien Hue province has 120 km of shoreline and the area of the province is over 5,000 km^2; in which, mountain terrain occupies a quarter of the area; midlands half of the area and lowlands about 1,400 km^2. The total area covers 289 thousand ha of forest, 55.4 thousand ha of agricultural land, 22 thousand ha of lagoon and 91 thousand ha of other land categories. In 2017, the population of Thua Thien Hue was 1.1 million people. Of these 51.2% live in rural and 48.8% in urban areas (Thua Thien Hue portal, 2019).

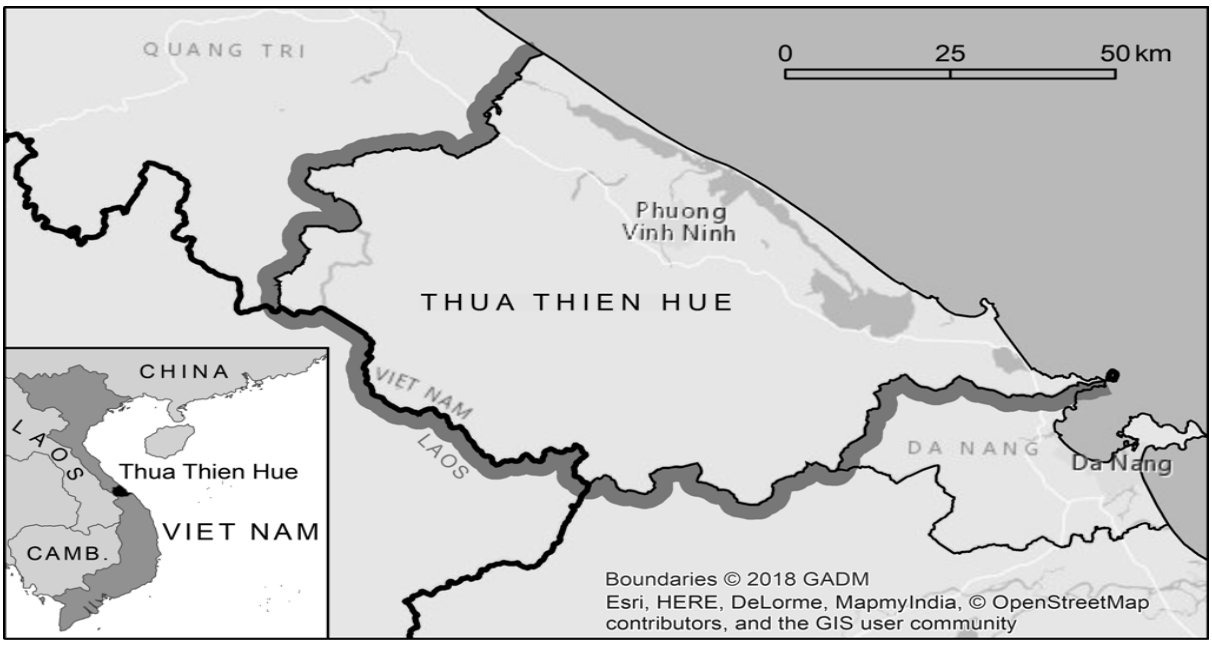

Figure 9: Map of Thua Thien Hue province

Socio-economic indicators of Thua Thien Hue province have improved in current years. Aquaculture is significantly contributing to the socio-economic development of the province in general and of rural areas in particular (Thua Thien Hue statistical office, 2018). The development of aquaculture in the province is shown in the changes of aquaculture area and aquaculture production in figures 10 and 11.

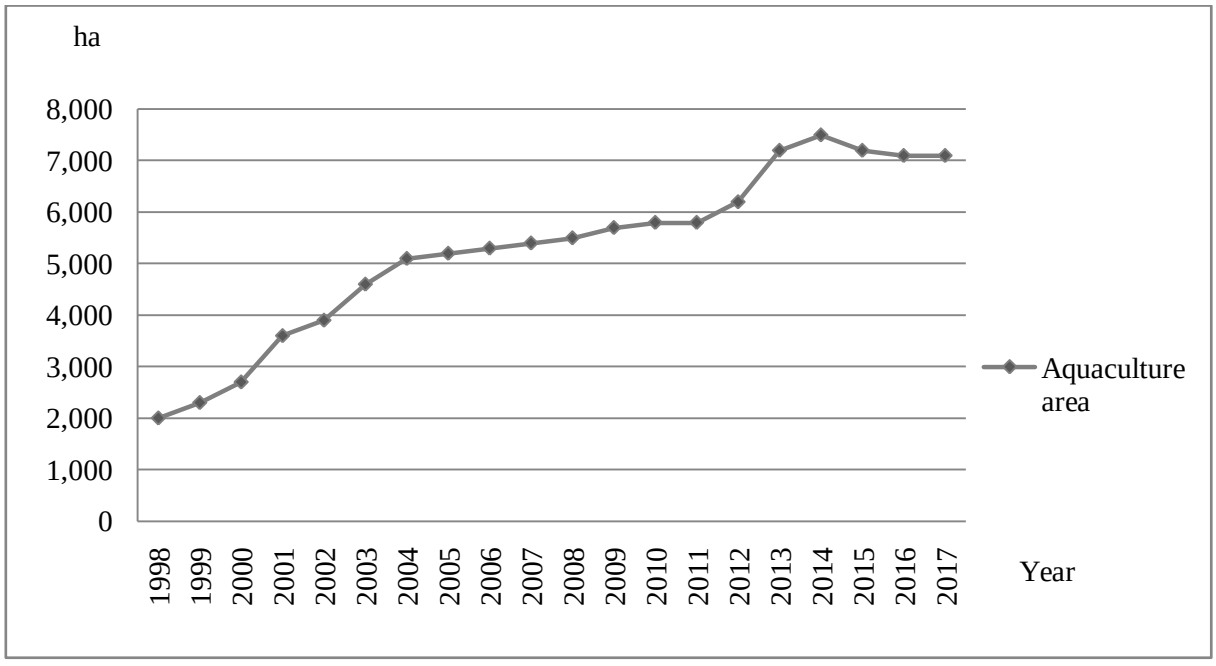

Figure 10: Aquaculture area of Thua Thien Hue province from 1998 to 2017

Source: GSO of Vietnam

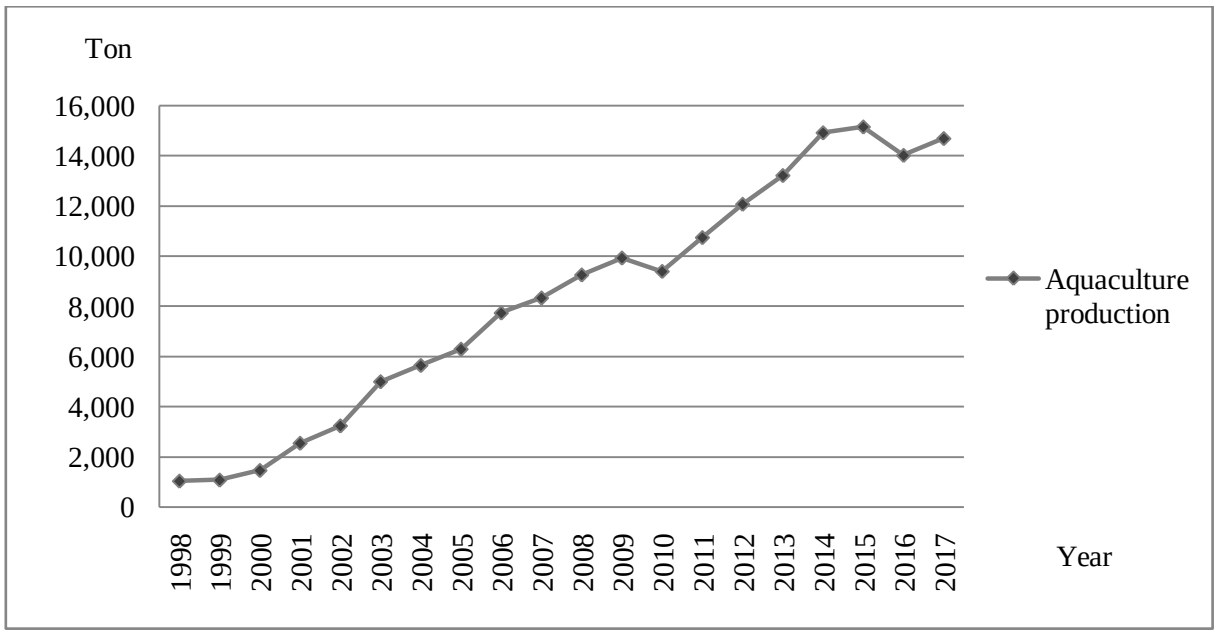

Figure 11: Aquaculture production of Thua Thien Hue province from 1998 to 2017

Source: GSO of Vietnam

Figure 10 shows that aquaculture area in Thua Thien Hue has significantly grown between 1998 and 2017. The aquaculture area was only 2,000 ha in 1998, but it reached over 5,000 ha in 2005. Since then, there has been a further slight increase in the aquaculture area until 2012, before the area peaked at 7,100 ha in 2017. In line with an increased aquaculture area, aquaculture production has grown between 1998 and 2017 (Fig. 11). The production has rapidly increased from 1,000 tons in 1998 to 10,000 tons in 2009. After a decline in 2010, production has continued to increase since 2011 and reached over 14,000 tons in 2017. Therefore, aquaculture has significantly contributed to the fisheries export turnover of the Thua Thien Hue province. Fisheries export was US$ 56.7 million in 2017, which accounted for about 41% of the total export value in the agricultural sector of the province (DARD, 2018).

Of the 7,100 ha of aquaculture area in 2017 brackish water made up nearly 72%; of which, over 1,200 ha were used for fish aquaculture, 2,397 ha for black tiger shrimp and 470 ha for white shrimp farming. In 2017, aquaculture farms produced 8,757 tons of fish and 4,925 tons of shrimp, of which white shrimp accounted for 70.6% (Thua Thien Hue statistical office, 2018; DARD, 2018).

Besides the achievements in agriculture in general and aquaculture in particular, the Vietnamese Government still has many policies in place to support agricultural and rural development. This includes measures to encourage enterprises, cooperatives and farmers to cooperate with each other by giving advantageous conditions. These include, for example, the

provision of finance capital and the availability of land. Since the government, organizations and farmers have focused on technical advances in production; machines, equipment and other input factors have become abundant and modern, while the qualification of farmer is increasing as well. However, the aquaculture sector has been faced with many challenges such as more complex weather due to climate change which increasingly impacts the life of farmers; infrastructure, that still has not met the development demand due to changing agricultural structures and rural economies; limited control and monitoring of product quality and input factors; and difficulties related to output markets and the enhancement of product value (Thua Thien Hue statistical office, 2018).

As a result, Thua Thien Hue province gave aquaculture development a special focus in the next planning term, which includes the following main points: *first*, maintaining the aquaculture area at 7,100 ha, of which, 4,220 ha are poly-cultures in lagoons (brackish water area) and 1,000 ha or 15,000 tons of white shrimp farming on sand and lagoons by 2030; *second,* implementation of white shrimp farming models, which follow the Viet Good Aquaculture Practice (VietGAP) standards at some areas of the Phong Dien district; and coordination and development of to an aquaculture program applying and confirming the VietGAP standards that involves typical characteristics for each region by the Directorate of Fishery. *Third*, promoting aquaculture by value chain links with stable and sustainable markets (MARD, 2015; Thua Thien Hue statistical office, 2018).

4.2 Research methodology

In order to answer the research questions above, a qualitative methodology was applied in this research because of its usefulness. "*Qualitative studies are most likely exploratory, naturalistic, subjective, inductive, ideographic, and descriptive/interpretive*" (Chenail, 2011, p1713); and, focus on the quality or nature of human experiences (Draper, 2004, p642). Specifically, based on qualitative research, exploring problems or issues is possible; a better understanding on the complexity and details of issues becomes apparent when a researcher directly meets and talks to people, and listens and shares their stories; the researcher thereby gains better understanding of the contexts and problem-solving strategies of actors (Creswell & Poth, 2007, p40). Thus, understanding and making sense of phenomena from the participant's perspective are aimed at in qualitative research. Researchers are considered as the primary instrument of data collection and analysis, resulting in an inductive investigative strategy, and a richly descriptive end product (Merriam, 2002, p6). Thus, the capacity and

effort of the researcher affects the credibility of their qualitative research (Golafshani, 2003, p600).

Some methods applied in qualitative research include participant observation, interviews, focus-group discussions and document analyses (Pope & Mays, 2006, p4; Creswell & Poth, 2007, p38). Researchers tend to combine multiple forms of data rather than depending on a single data source. In the entire qualitative research process, the meaning of the issues or problems of participants are the focus of the research, while researchers can make changes to the research plan after going to the field and collecting data. Through qualitative research, an explanation of what researchers hear, see and understand and a complex picture of the issue or problem is established (Creswell & Poth, 2007, p39).

4.2.1 Semi-structured interview

Interviews are one of the main methods of data collection in qualitative research. The interviewer aims to collect information from interviewees, as well as to understand their attitudes, beliefs, behaviors or experiences as citizens, users, consumers or employees. Qualitative interviews allow for greater depth of information or better understanding of opinions, attitudes, experiences, processes, behaviors or predictions, rather than providing only quantitative findings with limited causal relations (Miles & Gilbert, 2005, p66). The semi-structured interview is the most commonly used method in qualitative research. Semi-structured interviews allow for flexibility in the forms and numbers of questions, as well as their adaptation degrees and order to suit the situation of each interviewee (Rowley, 2012, p260). Questions and areas discussed can be changed during the interview, thus, the researcher can focus on those aspects meaningful to the interviewee. As a result, many complex research questions can be explored by using semi-structured interviews (Miles & Gilbert, 2005, p66).

Semi-structured interviews were also used to collect data for this dissertation. Researchers conducting semi-structured interviews commonly use a guide including questions and topics (Harrell & Bradley, 2009, p27), in which open-ended questions are often predetermined and other questions develop during conservation between the interviewer and interviewee. This type of interview is often applied in interviewing an individual or groups (DiCicco-Bloom & Crabtree, 2006, p315). Recording interviews is a suitable option as it allows the researcher to concentrate on the interview content and the conversation will produce a "verbatim transcript" (Jamshed, 2014, p87).

4.2.2 Data collection

In qualitative research, one of the most important steps is sampling, which is purposeful and more concentrated on specific cases than random sampling (Flick, 2009, p126). In other words, the purpose of the research project will determine sampling in qualitative research, which typically results in small sample sizes (Bricki & Green, 2007, p10). Differences in quantitative and qualitative study settings and research questions lead to differences in selecting a sample. For example, if a quantitative sample is to show the differences within a population or study behaviors of a cross-section of a larger population, the sample needs to represent this cross section adequately (Koerber & McMichael, 2008, p462). At the same time, qualitative sampling ensures the collection of data with high complexity, depth, variation, or context of a phenomenon for better understanding (Gentles et al., 2015, p1782). Besides, the number of participants in qualitative research is dependent on how much new data is gathered in the interviews and if a saturation point of information is reached (Bricki & Green, 2007, p10) that is identified when there is little or nothing new from data collection contributing to the research questions (Gentles et al., 2015, p1781).

Therefore, applying snowball sampling is popular in qualitative research, and is sometimes considered as the main approach in accessing new participants and social groups or as an assisting tool for enriching sampling clusters (Noy, 2008, p330). Snowball sampling is also useful when the location of potential participants is difficult to determine; and its suitability is especially illustrated in research researches on subtle issues and secretive matters (Etikan et al., 2015, p2).

Because of this, snowball sampling was used in this research, by starting with first participants and then expanding the sample through recommendations from each participant to verify other potential participants. Specifically, the sample for this research was selected based on the involvement as in the white shrimp value chain as main actors, who directly participated in; and involved actors, who supported the value chain. The starting point for sampling was white shrimp farmers, who exactly knew the next participants in the input-output structure of the white shrimp value chain. After that, other participants were explored step by step through information from previous interviewees. Each actor in the chain was identified through different criteria that are dependent on their location and function in the white shrimp value chain such as participation in white shrimp farming, relation to production and consumption, or expert knowledge on the research issue. The number and functions of interview participants are summarized in table 1.

Table 1: Number of participants in the research

No.	Interviewee	Quantity (person)
1	White shrimp farmer	10
2	Input supplier	1
3	Middlemen	1
4	Wholesaler	1
5	Retailer	1
6	Head of villages	3
7	Officer of local government	7
Total		**24**

Field research was conducted in Thua Thien Hue province, Central Vietnam from October 2017 to March 2018. Starting point of the research was the definition of the research site based on socio-economic reports of the Thua Thien Hue province and information from interviewing aquaculture staff at provincial level. In a second step, the author met with local government officers for an interview and determined which white shrimp farmers would be interviewed in the next step. In a third step, farmers were interviewed and further actors involved in the white shrimp value chain were identified using the snowball approach, which were interviewed in a fourth step. Different catalogues of questions were used depending on the interviewee's actor group and interviews took between 30 and 90 minutes. Lastly, data was aggregated and analyzed and the research results were written up.

Semi-structured interviews were conducted with farmers in coastal communities, who have been implementing white shrimp aquaculture. Interview questions concentrated on general information on shrimp farmers, producing and selling activities, input and output factors, input suppliers, buyers of their products, involved actors in the shrimp value chain, impacts on producing and selling processes, cost, revenues and added value, relationships with other actors in the chain, power in the chain, and problems they are facing and possible solutions.

Semi-structured interviews were also carried out with one middleman, wholesaler, and retailer each. Information collected related to general information on the subject, relationships

between buyers and sellers, cost, revenues and added value, buyers of their products, advantages and disadvantages of collection and distribution processes, power in the chain, relationships with other actors, support for other actors in the chain, and comments and requirements on farmers' products.

Officers of local government were also interviewed including chairmen of communes, agricultural officers of government levels, village heads, and an officer of the provincial department of agriculture and rural development at Thua Thien Hue province. Collected information included as the situation of aquaculture, their role for producing and selling activities of farmers, their evaluation on shrimp farming of farmers, local government's supports in production and consumption, advantages and disadvantages in the aquaculture sector, and the development orientation for aquaculture in the future.

All interviews were saved as audio recordings, which no information will be lost and the author can recheck the data to ensure its reliability and clarity. All audio recordings were transcribed word-by-word and saved as MS Word files, before being aggregated and analyzed. Depending on the list of themes and questions of each interviewee group, the author read all answers belonging to each theme and question and took notes on answers with the same or different meaning. Based on these notes, the story of each theme is synthesized and written down as research results. Depending on the relational level of each theme in all interviewee groups, the author aggregated and explained the data of each group to increase generalization as well as reliability.

Data was also collected from official reports and statistics at local, regional and national scales, which included topics such as the socio-economic and environmental conditions, as well as the development and regulations of aquaculture in Vietnam. Data from websites, statistics and reports of the Food Agricultural Organization and research results of other researchers were also used in the research. Secondary data was carefully checked for suitability to contribute to the research themes. Secondary data was considered as a reference tool, so that the author could check the data during the interview process. As a result, generalization, diversification, reliability and accuracy of the data in the research would be warranted.

4.3 Overview of papers

The first paper, "White shrimp production systems in Central Vietnam: Status and sustainability issues" presents the situation of shrimp farming in Vietnam in general and particularly the development of shrimp farming in Thua Thien Hue province. Furthermore,

the paper contributes to a deeper understanding of challenges in white shrimp farming in Central Vietnam and solutions of white shrimp farmers to respond to these challenges. The paper indicates that white shrimp farming has brought many benefits to the farmers, but challenges such as, disease, climate change, water pollution affect the efficiency of white shrimp farming; and farmers are struggling to find the best solutions.

The second paper, "Value chains and the role of middlemen in white shrimp farming in Central Vietnam" explores the role of middlemen in relation to other actors in the white shrimp value chain. Depending on the status of each actor in the chain, the middlemen fulfill various roles, granting them gradually increasing power until they dominate and control the white shrimp value chain in Central Vietnam. Adding to this, the role and existence of middlemen is highly dependent on informal transactions and trust.

The third paper, "Linking shrimp farmers and food processors: An empirical analysis from the Thua Thien Hue province in Vietnam" discusses the gap between requirements of processing plants and response abilities of white shrimp farmers. The paper shows that barriers originating from processors can be explained by a desire to improve the quality of products to meet the standards of international markets. However, the response ability of white shrimp farmers is still limited and the paper also provides specific reasons to explain why white shrimp farmers cannot yet cross these barriers.

The fourth paper, "The challenge of upgrading white shrimp production in central Vietnam and the potential of farming cooperatives" describes the relationships between shrimp feed suppliers and white shrimp farmers, bargaining position of farmers and potential role of cooperatives in upgrading production processes. The paper illustrates that relationships are based on informal transactions between farmers and feed agents, on whom farmers tend to be dependent on. Cooperative establishment is considered as a solution to upgrade production processes and improve the bargaining power of farmers, but this solution is unsuccessful while cooperatives do not have enough capital to invest in infrastructure and low participation rates by farmers.

5 White shrimp production systems in central Vietnam: Status and sustainability issues

5.1 Abstract

White shrimp has become a major export product for Vietnam in recent years and upgrading structures for white shrimp production is part of the Vietnamese development strategy. However, the sector suffers from various sustainability issues which hinder development and contribute to soil and water pollution. This article aims to explore production systems for white shrimp in the central Vietnamese Thua Thien Hue province and to outline existing sustainability issues as well as possible approaches to address them. This is done with an explorative study in which primary data was collected from semi-structured interviews with 24 respondents including white shrimp farmers, local government representatives and white shrimp buyers. In addition, secondary data such as documents and statistics were used. This study identified inconsistent seed quality, low professional expertise among smallholders, high dependence of smallholders on middlemen and diminishing water quality as major challenges which constrain further development in the sector. The article argues that the underlying reasons for those issues lie in high informality of relationships, low access of smallholders to capital and generally weak implementation of existing regulations and standards. These issues need to be addressed in order to enable further development in the white shrimp sector.

Keywords: aquaculture, central Vietnam, challenge, farmer, white shrimp

5.2 Introduction

Aquaculture has made a significant contribution to national economic growth, food security and income generation in Vietnam, especially in rural areas (Rimmer et al., 2013). In value terms, shrimp and prawns are the main species exported, and the major producing countries are in Latin America and East and Southeast Asia. Wild shrimp still covers a large proportion of the total production, but an increasing share is produced as farmed shrimp (FAO, 2018). International demand for shrimp is predicted to increase in the future and farmed shrimp can be viable solution to respond to this demand (Bush et al., 2010).

Vietnamese aquaculture is a source of foreign exchange and economic development. It is one of the strongest contributors to the national economy and about 50% of fish production is coming from aquaculture. The contribution of aquaculture to Vietnam's economy is estimated to be among the highest in the world (Hishamund et al., 2009b). As a consequence of

declining fish production and increasing revenues from aquaculture, the Vietnamese government regards aquaculture as a high priority sector for development (Hishamund et al., 2009a). Vietnam is the world's third largest exporter of fish and fish products. The value of exports has increased from 3.8 billion USD in 2007 to 8.5 billion USD in 2017. The main revenue from export comes from Pangas catfish and shrimp (FAO, 2009; FAO, 2019).

In Vietnam, shrimp farming concentrates on two main species: black tiger shrimp *(Penaeus monodon)* and white shrimp *(Litopenaeus vannamei)* (Van Duijn et al., 2012). In 2017, the total brackish water shrimp farming area was 721.1 thousand hectares, of which 622.4 thousand hectares were black tiger shrimp farms, and the rest was white shrimp farming area. At this time, shrimp production reached about 700 thousand tons. Shrimp products were exported to 99 markets and generated 3.85 billion USD (VASEP, 2018). Hence, shrimp farming proved its importance in the socio-economic development of Vietnam.

There are constraints to the development of aquaculture in general and shrimp farming in particular, that are caused by the limited capacity of farmers in adopting new technologies and approaches (Rimmer et al., 2013). Such shortcomings led to occasional production losses in shrimp farming due to disease and environmental degradation (Hishamund et al., 2009a). Another major challenge in aquaculture is the impact of climate change, which leads to destruction of facilities, loss of stock, loss of business, increase of harmful algae blooms, and increased virulence of dormant pathogens (De Silva and Soto, 2009). The major share of domestic shrimp production is located in the Mekong Delta (Tran et al., 2013; Lan, 2013). While various studies have focused on interaction patterns between actors of aquaculture value chains in Vietnam (such as Tran et al., 2013; Lan, 2013; Ha et al., 2013), the conditions under which unsustainable production processes evolve in the aquaculture sector in Vietnam have received relatively little attention. Hence, this study aims to outline the production processes and sustainability issues of white shrimp farming in Vietnam and the framework conditions which cause such issues. This study applies an explorative approach, using the central Vietnamese Thua Thien Hue province as a case example.

Empirical material for this article was obtained in a field study in Thua Thien Hue province, which is located in central Vietnam. The province has 120 km of shoreline and an area of 5,000 km^2. The population of Thua Thien Hue province was 1.1 million people in 2017, of which 51.2% live in rural areas. Thua Thien Hue is one of the provinces, which has strong development in aquaculture sector in central Vietnam with diversity in aquaculture types such as freshwater aquaculture, brackish water aquaculture and marine aquaculture (Thua Thien Hue portal, 2019).

White shrimp farming is well developed in this locality, the province started to use white shrimp in aquaculture on sandy land in 2002 and focused on coastal communities. After that, the area of white shrimp farming has increased significantly and achieved 470 hectares in 2017. The provincial government has a plan to reach 1,000 hectares devoted to white shrimp production in 2030 (MARD, 2015). White shrimp farming has significantly contributed to socio-economic development and poverty reduction at coastal communities in particular and the province in general. At the research site, shrimp farmers typically use intensive farming and the participation of smallholder farmers is popular.

5.3 Materials and methods

Qualitative research is applied for this study. Primary data was collected from semi-structured interviews with 24 participants including white shrimp farmers, representative of local government from village to provincial level and white shrimp buyers. The field research was aimed at obtaining a picture of the real situation of white shrimp farming, development processes, marketing channels as well as current challenges and ways to solve them. The research was also based on collecting secondary information from reports from various levels of government, previous researches and statistics of functional units in Vietnam. As such, this study attempts to reconstruct the situation of white shrimp farmers as complete as possible. The study site and locations of interview partners are outlined in figure 12.

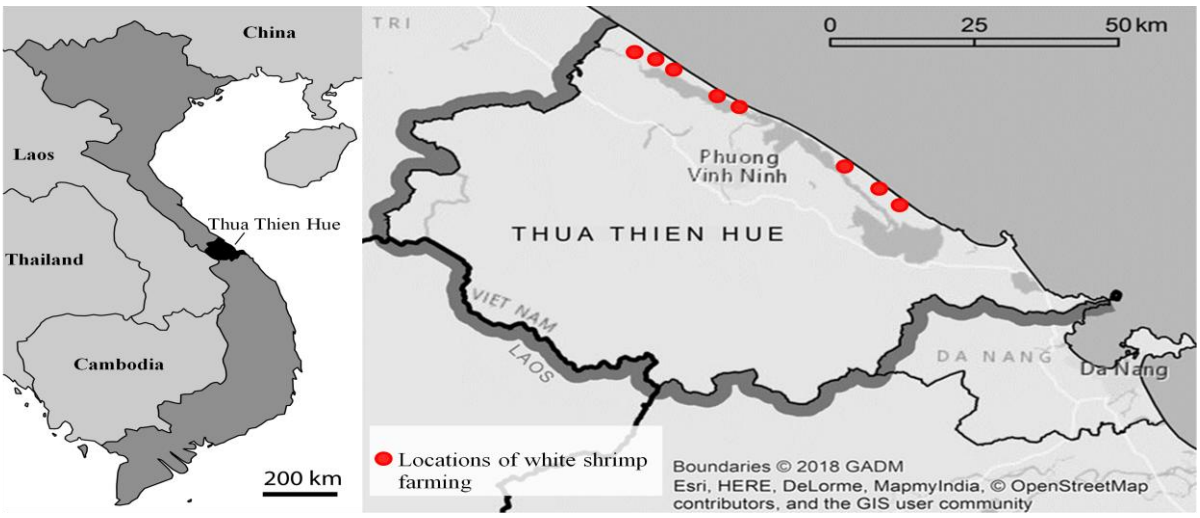

Figure 12: Location of Thua Thien Hue province and white shrimp farming

Source: Own adaption

For the choice of interview partners, the snowball approach was applied so that the next interviewee was verified through the information of the previous one (Noy, 2008; Etikan et

al., 2015). Interview partners were selected based on relevance for the research questions. The interview information was recorded, then transcribed and synthesized. The results of this study are presented in the following sections.

5.4 Results

5.4.1 White shrimp farming in Vietnam

The role of shrimp farming has become increasingly important for the socioeconomic development of Vietnam's coastal areas (Hai et al., 2015). By the start of the 1990s, the Vietnamese government realised that shrimp is a high value export product, which has the potential to increase national export revenues (Ha and Bush, 2010). Shrimp farming exists in the forms of extensive, semi-intensive and intensive farming. The main actors are small-scale household producers, whereas cooperatives and companies are also involved in shrimp farming and seed production (Hai et al., 2015). In Vietnam, two main shrimp species are cultured including black tiger shrimp and white shrimp, with white shrimp production showing a significant increase relative to black tiger shrimp in recent years (Van Duijn et al., 2012).

Vietnam started to culture white shrimp in the 2000s and production quickly developed in the central provinces. Advantages of white shrimp include short culture duration, high production density, low risk of disease and loss; however, it requires high investment in technology and capital (Lan, 2013; Hai et al., 2015). The farmed white shrimp production from 2002 to 2017 is illustrated in Figure 13 below:

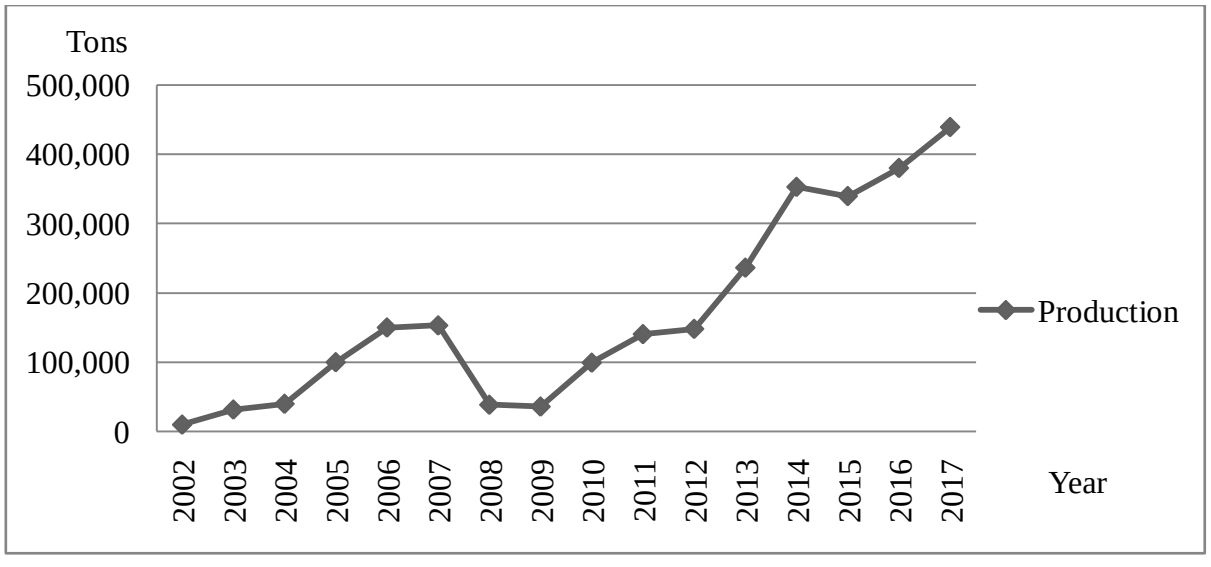

Figure 13: Farmed white shrimp production of Vietnam from 2002 to 2017

Source: FAO statistics

As shown in figure 13, white shrimp production in Vietnam increased multifold during the period of 2002 to 2017. Due to outbreak of diseases, the production dropped sharply between 2007 and 2009 but it has developed dynamically since.

The Vietnamese Government determined that shrimp is a key export product of the aquaculture sector. In the national development planning from 2021-2025, the shrimp industry is encouraged to invest in establishing key farming areas and organic shrimp farming. The aim is to increase production and export revenues from shrimp respectively to 700,000 tons and 5.5 billion USD by 2025. Also, quality of production shall be improved by introducing more efficient production processes and banning chemical antibiotics. The position of smallholders shall be improved by reducing the number of intermediate layers and promoting vertical integration of shrimp value chains (Government of Vietnam, 2018).

5.4.2 Practices and circumstances of white shrimp farming in Thua Thien Hue province

Seasonality of white shrimp farming

In Thua Thien Hue, the main actors in white shrimp farming are the smallholder farmers who are directly managed and supported by local governments. However, each farmer has a different strategy for feeding the white shrimp and has his own decision whether to farm two or three seasons in a year. Farmers are also individually deciding on the specific date for seeding, harvest and renovation of their ponds. Local farmers do not often follow the guidelines provided by the seasonal calendar, because they stock shrimp seed based on traditional spiritual beliefs and advise from fortune-tellers.

In recent years, most white shrimp farmers have chosen to farm two seasons in a year (instead of three seasons per year which was common in the beginning), mainly in winter season (August to December) and summer season (January to April), with winter considered as the main season for white shrimp farming activity. There are numerous differences between the winter and summer season which are outlined in table 2.

Table 2: Difference between winter and summer season in white shrimp farming

No.	Criteria	Winter season	Summer season
1	Stocking density	High	Low
2	Culture period	Long	Short
3	Number of participants	High	Low
4	Rate of losses	Low	High
5	Risk aversion-level	Low	High
6	Selling price	High	Low
7	Size of shrimp	Big	Small
8	Likelihood of disease	Low	High

Source: Stakeholder interviews

In general, farmers can benefit more from farming in the winter season rather than in summer. Stocking density is entirely dependent upon the decisions made by each farmer, based on their experience, production strategy and the investment capacity of each household. Additionally, white shrimp farmers tend to stock 160-350 white shrimps/m^2, which is higher than local government regulations allow (these range from 100 to 150 white shrimps/m^2). Density in the summer is lower than during winter season, because white shrimp grows faster in summer, which combined with high density, high temperature and a large amount of industrial feed, can create the conditions for spreading diseases.

> "*Farmers had high stocking density because they hoped that they can earn high profit, if the survival rate of white shrimp is high. From this perspective, many farmers think of white shrimp farming as a form of gambling; they have the freedom to decide on stocking density and then hope that they will be successful".* Head of Hoa My village, Dien Loc community.

On the other hand, diseases occur less in the winter season because of the lower water and air temperatures, thus they can culture shrimp at a higher density. As a result of the lower risks and better conditions in winter, the number of people involved in farming activities increases.

As mentioned above, the rate of stock loss and level of risk in the winter season is lower than during summer season, but culturing shrimp in winter takes more time because of the lower temperature in winter, which leads to lower growth rate than in summer. On the other hand, farmers are able to sell shrimp at a higher price in the winter season, because the size of shrimp is bigger. Also, demand in winter tends to be higher because white shrimp farming activities are not possible in the Northern provinces of Vietnam at this time, basically eliminating part of the competition.

There is a difference in total area of white shrimp farming of each farmer, but the area of each white shrimp pond is about 2,500-3,000 m^2. The shrimp pond system is developed on sandy area and water is pumped from the sea combining fresh water system from underground. Thus, it takes significant initial investment to set up shrimp ponds but the profits can be relatively high: The average production of white shrimp farming is 14-20 tons/hectare and the profit margin ranges from 4.5% to 10%. From this perspective, white shrimp farming has attracted the participation of stakeholders and concentration of local government.

Quality of white shrimp seed

Most white shrimp farmers selected shrimp seed from companies in different provinces of Vietnam. They chose companies based on their experience, established trust-based relationships and exchange of information with other white shrimp farmers. If a farmer makes a profit during harvesting, they will continue buying shrimp seed from the same company, if they make a loss, they will change the supplier. The amount of capital available to a farmer is also relevant: More affluent farmers buy from professional feed suppliers while farmers with less capital available will buy lower quality feed from other farmers.

Buying shrimp seed from a company is supposedly high quality. But it is unreliable insofar as documents and certification of professional suppliers about quality and origin of the seeds have been feigned in the past which creates uncertainty for farmers about the true quality of supply. In some instances, the shrimp seed died shortly after they were purchased.

Notably, white shrimp farmers do not know how to determine the quality of the shrimp seed. They choose shrimp seed based on their experience and judgement. Thua Thien Hue province does not have any local companies producing white shrimp seed, which makes it difficult for farmers to evaluate the quality of the seed before buying. Thua Thien Hue province only has small scale production facilities that produce white shrimp seeds of relatively poor quality.

When buying white shrimp seeds from production facilities in Thua Thien Hue province, farmers can control or test the quality of shrimp seeds with the support of the provincial

Government (using Polymerase Chain Reaction, PCR, which is used to determine latent pathogens). This method is used to check for diseases and assess the health of the shrimp. However, white shrimp farmers are often reluctant to use this technique, because they have to spend time getting the shrimp seeds to Hue city and wait for the results. Also, the accuracy of the test has been questioned because in some instances shrimp seeds died shortly after purchase even through the test showed good results.

> "*Determining the quality of white shrimp seeds is very hard, because farmers have used white shrimp seeds from different companies or production facilities and many have had their seeds die. Therefore, nobody can say that the white shrimp seeds from any particular company are the best. They will choose the white shrimp seeds from one company or another company when those seeds were stable during culturing"* A farmer, Hai Dong village, Phong Hai commune.

These aspects contribute to highly informal relationships among farmers and suppliers which are chosen based on previous experience rather than formal standards and documentation and hinder further development towards implementing general production standards in formalized relationships.

Adopting production technologies

In the early stage of shrimp farming, farmers did not have sufficient knowledge about production techniques. They learnt about shrimp farming and the related technology through training courses provided by functional departments in the government, and workshops from Industrial Feed Companies and the Aquatic Medicine Company. The most important knowledge farmers have is often learnt from other farmers and their technical knowledge regarding shrimp farming that accumulated over time.

Although the white shrimp farmers have developed their experience and knowledge over years, most white shrimp farmers were not yet satisfied with the levels of their technical skills. Their major dissatisfaction is because they have struggled to deal with diseases in their shrimp ponds. However, they usually try to solve their problems using their own experience and do not trust the technical advice provided in books or by experts. They are reluctant to incorporate technical advice because of high costs of capital and time in order to install new production technology and change existing habits, but also because previous attempts of changing production techniques were unsuccessful and therefore pose an incalculable risk.

Therefore, changing and applying technological advances seems to be difficult while traditional production routines are the dominant mode in white shrimp production. Many farmers simply assume that production success depends on luck.

Using aquatic medicine

Aquatic medicines are popularly used in white shrimp farming. They are used to treat pond water and to renovate their ponds. White shrimp farmers also use vitamins, minerals and antibiotics to improve the health of the shrimp during the culturing process. When diseases do occur, or when there are drastic changes in the weather, farmers can buy various aquatic medicines to mitigate the impact of such instances. Buying aquatic medicine is convenient for white shrimp farmers as various agents in Thua Thien Hue province offer it.

There are numerous aquatic medicine companies and types of medicine available. Each white shrimp farmer selects his aquatic medicine based on their experience and his specific circumstances. White shrimp farmers have tried to use a number of different aquatic medicines during their culturing time until they are no longer effective. At that point the farmer would replace that product with another. There is great variance among white shrimp farmers, as to what extent they us aquatic medicines and how they use it, as this is based entirely on the individual farmer's discretion. Thus, a strong prioritization of high production output often makes farmers ignore existing regulatory limits of using medicine, causing antibiotic residues in white shrimp. This is even acknowledged by government officials as the following comment points out:

> "*Using aquatic medicines is now a habit for white shrimp farmers. White shrimp farmers believe that "prevention is better than cure"; so, a large number of white shrimp farmers focus on preventing diseases by using antibiotic aquatic medicines. Farmers will not culture white shrimp without aquatic medicines".* Officer of the Department of Agriculture and Rural Development, Phong Dien district.

Diseases are an ongoing problem in white shrimp farming and very few farmers were able to control diseases that occurred in their ponds. All white shrimp farmers use aquatic medicines, with the aim of preventing rather than curing diseases. In addition, white shrimp farmers are often not able to find the cause or the reason for a particular disease. They may think that the diseases were caused by poor water quality, climate change or poor-quality shrimp seed. Although farmers try to treat diseases, it is not easy to cure them once they are in a shrimp pond. Farmers tend to sell all the shrimp, if they are unable to cure the disease.

It is government policy to support white shrimp farmers when their shrimp are affected by disease. Local governments will check for diseases and give advices on how to treat the diseases. However, very few of the white shrimp farmers actually spoke to the various government officers available to them, when they identified diseases in shrimp ponds, as they thought of involving the government to be too time consuming and without clear benefit, as one interviewed farmer explained:

> *"Diseases have become common in white shrimp farming. We have tried many methods to control water quality and stop the blooming of algae and we have also tried to increase white shrimps' resistance to disease. Though when diseases appear, they can cause white shrimp farmers to lose lots of money. Thus, we face many difficulties in trying to deal with diseases. Even the technical staff from the local government could not help us"* A farmer, Dien Loc commune.

Rather than involving third parties, farmers tend to hide the disease or try to deal with it by themselves. Hence, diseases are easily spread, while there is a lack of management and control by government.

Water pollution

Although white shrimp farmers use water drawn from the ocean using water pipes and pumps, they often struggle with poor water quality. Shrimp ponds run along the coast, and most of them do not meet the required standards for managing water quality. Very few production facilities have a wastewater treatment pond to treat the water before it is pumped back out to sea. Due to insufficient enforcement of regulations for wastewater treatment, the majority of white shrimp farmers have no incentive of treating wastewater after it has been used. Therefore, most of the water is discharged back into the sea untreated, creating a vicious circle of gradually decreasing quality of water which could be reused in other shrimp ponds and then farmers will use that water again. This problem has also been confirmed by an interviewed government representative:

> "*White shrimp farming has been ongoing for many years, while water treatment has not been implemented properly. This has been harmful to the water. White shrimp farming activity does not only happen in Phong Hai commune, but in a number of communities in Thua Thien Hue province in particular and other provinces in Central of Vietnam in general. Therefore, the amount of wastewater discharged into the sea is increasing over time, while the quality of the water is deteriorating'* agricultural officer of Phong Hai community.

White shrimp farmers clearly understand the harmful effect of untreated wastewater, but will not invest in wastewater treatment unless they must. As a result, instead of treating wastewater, farmers try to focus on improving water in the shrimp ponds before stocking.

Monopoly on buying white shrimp

After harvesting, farmers have limited options for selling because almost all of the white shrimp produce is sold to middlemen. The middlemen in Thua Thien Hue province have a tacit agreement in place in which they divide the territories in which each middleman has the exclusive access to purchase produce from smallholders. This effectively eliminates competition among middlemen and weakens the bargaining positions of farmers. This mode also entrenches existing relationships between middlemen and farmers because these are trust-based informal relationship and farmers who sell to a middleman who is not "in charge" of their area will damage the relationship with their previous middleman who then might not buy their produce next time.

Another possibility is for farmers to sell their products to a processing plant in Thua Thien Hue province, which can buy white shrimp at a higher price than the middlemen, but, due to common antibiotic contents and insufficient size of the white shrimp, their produce often does not meet the requirements of the processing plant. An interviewed farmer summarized the dependence on middlemen as follows:

> *"We only hope that the middleman can buy all of our products whenever we want to sell at suitable price, because we do not have capacity in bargaining, finding out other buyers or improving the quality of our product"* A farmers, Hai Dong village, Phong Hai commune.

The de-facto monopolist purchasing structure of white shrimp in Thua Thien Hue province is one of the major constraints for the development of more sophisticated white shrimp production systems in Thua Thien Hue province.

5.5 Discussion

The empirical results outlined above highlight significant deficiencies in the sustainability of white shrimp production in the Thua Thien Hue province which need to be addressed in order to make local shrimp production of smallholders eligible for export, as the Vietnamese government anticipates (Tran et al., 2013). Value and export turnover of white shrimp produce of Thua Thien Hue are constrained by antibiotic residues and purchasing monopolies. Current asymmetries in bargaining power between producers and middlemen are a major

curtailment for poverty reduction and the development of the sector in central Vietnam. Due to low capital, expertise and bargaining power of smallholders, shrimp production is focused almost entirely on high density and low investments because, in the awareness of farmers, these are the only possibilities of increasing profitability. These findings somewhat stand in contrast to Tran et al. (2013), who concluded in a study about governance of shrimp value chains in the Mekong Delta that "*For the most part, shrimp produced by small-scale producers have limited exposure to antibiotics or other prohibited chemicals because the low intensity of their production system does not require such inputs*." (Tran et al., 2013:10).

The production structures described in Thua Thien Hue province lead to inconsistent quality of the produce, occasional production losses, water pollution economic risk for farmers and high dependence of farmers from middlemen. An important measure for farmers to improve their position and practices would be to horizontally organize to share experiences and improve their bargaining position but this requires close geographic proximity and the establishment of mutual trust (Joffre et al., 2018). Trust is currently lacking among farmers in Thua Thien Hue and, compared to the Mekong Delta, it is more difficult to achieve because of their lower geographic proximity.

On the institutional level, lacking trust in formal contracts and standards is the core issue which should be addressed by different government levels. Besides building capacities of tracing the origin of shrimp produce (as outlined by Tran et al., 2013), further measures should be focused on *enabling farmers* to adopt more sustainable production practices. These could include the provision of easily accessible financing for smallholders, the facilitation of building trust among farmers to establish cooperatives and, very significantly, an increase of government capacity to reliably enforce existing regulations. However, even with such measures in place, the existing habits of farmers towards more formalized and standardized production practices will take time to change.

5.6 Conclusion

The farming of white shrimp has developed significantly in the central provinces of Vietnam since 2002 and this article explored in detail the production systems of white shrimp farmers in Thua Thien Hue province. As the case article shows, white shrimp production systems face serious sustainability issues which currently constrain further development, contribute to pollution and lead smallholders into high dependency on middlemen. Although white shrimp farmers have implemented some solutions to adapt or deal with these challenges, these solutions are only temporary and are not very efficient. Quality of seed supply and the

emergence of diseases and the behaviour of middlemen are uncertainties which farmers feel relatively powerless to overcome. Significant government efforts are needed in order to improve these conditions. In general, easier access to capital and training for farmers as well as more reliable implementation of formal regulations and standards are needed. This study focused on the circumstances under which white shrimp are produced in Thua Thien Hue. Thus, it is not representative for Vietnam as a whole. A viable area of further research could be the exploration of white shrimp production systems in other Vietnamese provinces which could contribute to developing more nuanced policy advice that takes into account specific regional circumstances.

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6 Value chains and the role of middlemen in white shrimp farming in Central Vietnam

6.1 Abstract

Vietnam is the world's third largest exporter of shrimp products. Small-scale farmers are the main actors in producing shrimp but they depend on middlemen to market their products. This study aims to explore the role, network relationships and strategies of middlemen in shrimp farming in the central Vietnamese Thua Thien Hue province. This is based on semi-structured interviews with farmers, middlemen, wholesalers, input suppliers and local government representatives as well as complementary statistical data. The research findings illustrate the role of middlemen as buyers and as facilitators of information and capital. The network relationships between middlemen, farmers, wholesalers and input-suppliers are a stable arrangement based on trust and personal interaction. Within the framework of GVC, they can be characterized as "captive" and "relational". The main determinant enabling the structure of these interactions is the informality of transactions which are conditioned by the institutional framework conditions in Vietnam.

Keywords: agri-food networks, global value chains, middlemen, intermediaries, aquaculture, white shrimp.

6.2 Introduction

Shrimp farming in Vietnam has developed significant volumes over the past two decades and evolved as one of the most important export sectors of the country (Suzuki and Nam, 2018). Vietnam has 3,260 km of coastline and over 4,000 islands with 12 bays and lagoons as well as comprehensive river and lake systems. Due to these favourable conditions, Vietnam emerged as the fourth-largest producer of foods from aquaculture after China, India and Indonesia and shrimp products cover 50% of the country's aquacultural exports as of 2017 (VASEP, 2018). It is especially the white shrimp (*Litopenaeus vannamei*) which has been produced with increasing volumes since the 2000s as it generates relatively high revenue. Shrimp production has been driven by growing export markets such as the EU, Japan, USA and especially China (Seafood TIP, 2018; FAO, 2019). Delivery of farmed shrimp for export is typically facilitated by middlemen, who play a critical role in connecting producers and buyers and towards whom farmers have developed significant dependency (Tran et al, 2013; Ho & Burny, 2016).

The Vietnamese shrimp sector has been subject to various studies, including analysis of value chain governance of shrimp production (Tran et al., 2013; Ponte et al., 2014; Ho & Burny,

2016), market distortions created by middlemen (Thanh, 2016), management practices of smallholders (Suzuki and Nam, 2018; Pham-Duc et al., 2019; Joffre et al., 2020) as well as the social and environmental implications of shrimp farming (Lan, 2013; Ha et al., 2013). The importance of middlemen in Vietnamese shrimp farming and distribution is recognized in most studies, however, their role and interaction patterns have thus far rarely been the explicit focus of research. Existing studies examining value chains of the Vietnamese shrimp sector typically outlined the role of middlemen within individual supplier-buyer relationships while the integrative role of middlemen for the value chain as a whole remained somewhat obscure.

Hence, this study aims to examine in detail the interaction patterns and network relationships of middlemen with other parties, their strategies to improve their competitive position and potential counter-strategies from farmers. This is done using the case example of the shrimp sector in the Thua Thien Hue province in central Vietnam. The examination on the provincial level allows us to reconstruct and explain the region-specific configurations of the upstream layers of value chains for shrimp production. This focus is important because the patterns may differ significantly by region, depending on geographic conditions, transport infrastructure and the degree to which farming activities are dispersed (see also Tran et al., 2013). This study is based on field work conducted in the Thua Thien Hue province, where 24 semi-structured interviews with middlemen, farmers, input-suppliers, local government representatives and wholesalers were conducted. The analysis is done using the conceptual framework of GVCs outlined by Gereffi et al. (2005). In the following section, the conceptual frame of this study is introduced. Afterwards the empirical results are presented and discussed.

6.3 The role of middlemen and types of value chain governance

Given the high fragmentation and local embeddedness of smallholders, their connection to international retailers and input suppliers is often facilitated by middlemen, who bridge informational and also cultural gaps (Vieira and Traill, 2008, Tran et al., 2013). Middlemen can be defined as agents who buy a product and sell it at a higher price, thus generating a profit without being involved in production or distribution to the final consumer. The core functions of middlemen are to connect buyers and producers. By establishing relationships to both sides, they accelerate the transaction process between farmer and wholesaler, using information about product demand, supply and prices. They also coordinate the delivery of large volumes to wholesalers, thus making it unnecessary for wholesalers to establish a myriad of relationships to individual farmers whom they don’t have the capacity to manage

(Biglaiser, 1993; Suhaimee et al., 2015). Another core function of middlemen, especially in environments of weak implementation of formal regulations, is to ensure the seamless transaction between producer and wholesaler (or processor) by creating personal trust in an environment where trust in institutions is missing. Trust needs to be established either on *institutional* or on *personal* level in order to enable transactions and reduce the risk of being exposed to opportunistic behaviour by the counterpart (Vieira and Traill, 2008).

Interaction patterns of agri-food networks (including aquaculture) have frequently been analysed within the strongly interrelated concepts of GVCs (Gereffi et al., 2005) and GPNs (Coe and Yeung, 2015). Focusing on the types of interaction between international lead firms and suppliers, Gereffi et al. (2005) identified five types of value chain governance, which are determined by the codifiability of a value added input, the complexity of transaction and the capabilities of the supply base (Gereffi et al., 2005). In this context, the position of smallholders in agri-food networks usually corresponds to a governance type which Gereffi et al. (2005) described as "captive", indicating that small and fragmented producers are facing much larger buyers and entirely depend on them without viable options of diversifying their customer portfolio (Tran et al., 2013; Ha et al., 2013; Ponte et al., 2014). Such a constellation is common when supplier capabilities are low and competition among them is intense (Gereffi et al., 2005; Tran et al., 2013). Another category relevant for this study is the "relational" type of value chain governance. It describes interaction patterns which "*may be managed through reputation, family or ethnic ties*" (Gereffi et al., 2005, 84) and are strongly based on personal trust. While the typology outlined by Gereffi et al. (2005) strongly influenced the discussion, it has been criticized by Coe and Yeung (2015) for its "*dyadic and static conception of industrial governance, [the] relative neglect of territorial organization, and [the] inability to interpret competitive dynamics and evolutionary processes in multi-commodity or multi-industry production networks*" (Coe and Yeung, 2015, 204).

This study agrees with such criticisms insofar as a specific type of value chain governance typically does not apply to all value creation steps of a particular product or even an economic sector as a whole (as originally indicated by Gereffi et al., 2005). Furthermore, interaction patterns are shaped not only by international lead firms but also by factors such as institutional environments, intervention of interest groups or competitive pressures (Coe and Yeung, 2015) and dynamically evolve as such contextual influences change over time. However, the typology by Gereffi et al. (2005) continues to offer a useful analytical framework for characterizing actor relationships on an *individual* level at a *given time* which, in this article, provides the basis for mapping mutual dependencies between middlemen and

other actors along the value chain and also for outlining framework conditions which determine the way how such dependencies evolve. In this context, the underlying assumptions of the typology of value chain governance types is also critically reflected in the discussion part. In the following sections, the roles, power balances and network relationships evolving around shrimp production in the Thua Thien Hue province are outlined and discussed. The findings outlined below are based on stakeholder interviews and complementary data.

6.4 Value chain of white shrimp production in the Thua Thien Hue province

The major capacities of white shrimp production in Vietnam are located in the Mekong Delta (Suzuki and Nam, 2018). But also in central Vietnam, such as the Thua Thien Hue province, white shrimp production emerged as an important product for farmers. Parallel to the countrywide development, white shrimp farming in the Thua Thien Hue province expanded during the last two decades from below 258 tons in 1998 to 4,925 tons in 2017. The introduction of white shrimp production contributed to the increase in overall volumes as the white shrimp produces higher revenue and uses less space compared to the black tiger shrimp (*Penaeus monodon*), the previously dominant type in shrimp production (GSO, 2018).

The relatively high productivity and low resource use of the white shrimp prompted local governments in the Thua Thien Hue province to encourage shrimp production as it could contribute to creating a reliable source of income for farmers and reduce poverty. An interview partner from a local government explained in this context that white shrimp farming was in particular promoted by local governments from 2009 to 2011. As livelihoods of farmers were at risk due to depleted traditional fishing resources, farmers developed white shrimp production within artificial ponds and without specific technical instructions or standards, as the effort to develop white shrimp farming initially did not follow a systematic approach.

White shrimp can be cultivated during three annual seasons, from January to April, May to August (both dry) and August to December (humid). The highest yields in Thua Thien Hue province are during the humid season. Because other provinces in North Vietnam cannot produce during that time, the humid season also brings the highest shrimp prices, giving the Thua Thien Hue province a competitive advantage compared to other locations in North Vietnam. Generally, farmers tend to prefer producing during all three seasons, but limited access to capital forces some to produce only in one or two seasons. In such a case, producing during the humid season and leaving out the dry period is a viable strategy as it allows them

to maximize the selling price. An interviewed farmer from the Phong Hai community explained the production incentives as follows:

> "*The seasonal calendar differs among farmers. Some farmers produce from two to three seasons, some farmers have one season, this depends on how much capital each farmer has, as well as the weather and climate. Each farmer will also consider when they can sell their product at the highest price.*"

Almost all the white shrimp produce of farmers in Thua Thien Hue is sold to middlemen, while only the remaining volumes (which middlemen refuse to purchase) are being sold to local wholesalers. Middlemen sell the produce to wholesalers located in North Vietnam who export it mainly to China, while shrimp produce in the Mekong Delta is predominantly exported to overseas markets such as the EU, USA and Japan. Given the increased importance of export-oriented white shrimp production for farmers in the Thua Thien Hue province, local farmers have developed considerable dependence on middleman.

6.5 The role of middlemen: Network relationships and mutual dependencies

Middlemen in the shrimp production system of the research area act as intermediaries to wholesalers in the Northern provinces (including Hanoi) and, on their behalf, buy white shrimp from farmers. They are typically acting as self-employed agents and informally organized households. The Chinese export market takes large quantities as well as different types of shrimp. Due to their market access, middlemen typically buy shrimp in all conditions (such as living, fresh or frozen), with only minimum quality requirements for the farmers, giving middlemen a competitive advantage over regional wholesalers and processors who are more selective about the type and quality of shrimp they can purchase. Also, the middlemen can buy during all seasons, giving farmers the opportunity to essentially sell any type and quality of shrimp at any time of their choosing.

The middlemen maintain a comprehensive network of wholesalers who provide information about product demand and pricing which is being forwarded to the farmers. The wholesalers are in turn informed by middlemen about existing production volumes by locality. Based on the wholesale prices, middlemen determine the (non-negotiable) product price for farmers and negotiate quantity and time of delivery. They typically collect a commission of 5% to 8%. Hence, from the perspective of the wholesalers, the role of the middlemen is to provide them with the needed products and quantities at the determined price. The middlemen undertake all coordination related with the purchase and guarantee for product quality.

As middlemen depend on their relationships with wholesalers, they permanently seek to maintain a position as trusted vendor of products and information and also to increase the number of wholesalers they work with. In this type of relationship, trust is established based on the personal track record of the middlemen. One interviewed middleman from the Phong Hai community described his relationship with wholesalers as follows:

> *"I am always kind in business. I always talk honestly to wholesalers, for example if a farmer's shrimps are good or bad quality, or if they have a large or small quantities. […] And then, they can make the decision to buy the shrimp or not. Based on my actions, the wholesalers trust me. We believe each other, and we maintain a good relationship. The wholesalers only need to send their trucks to the ponds to collect the white shrimp. I do everything else with the farmers. If needed, I will even pay the farmers upfront and then the wholesalers can pay me later on."*

There are attempts from both, middlemen and farmers, to improve their competitive position in order to influence shrimp prices in their favour. Farmers contact wholesalers directly, attempting to circumvent the middlemen and achieve a higher price, however, wholesalers tend to refuse buying directly from the farmers, as they lack the capacity to manage farmers on an individual level and avoid harming their relation to middlemen. The middlemen in turn have tacitly agreed to divide territories in the Thua Thien Hue province within which only one middlemen operates. This eliminates competition among middlemen and provides them with a de-facto monopoly on shrimp output within their respective region. The way how shrimp farming in the Thua Thien Hue province integrates into domestic and international value creation is indicated in figure 14.

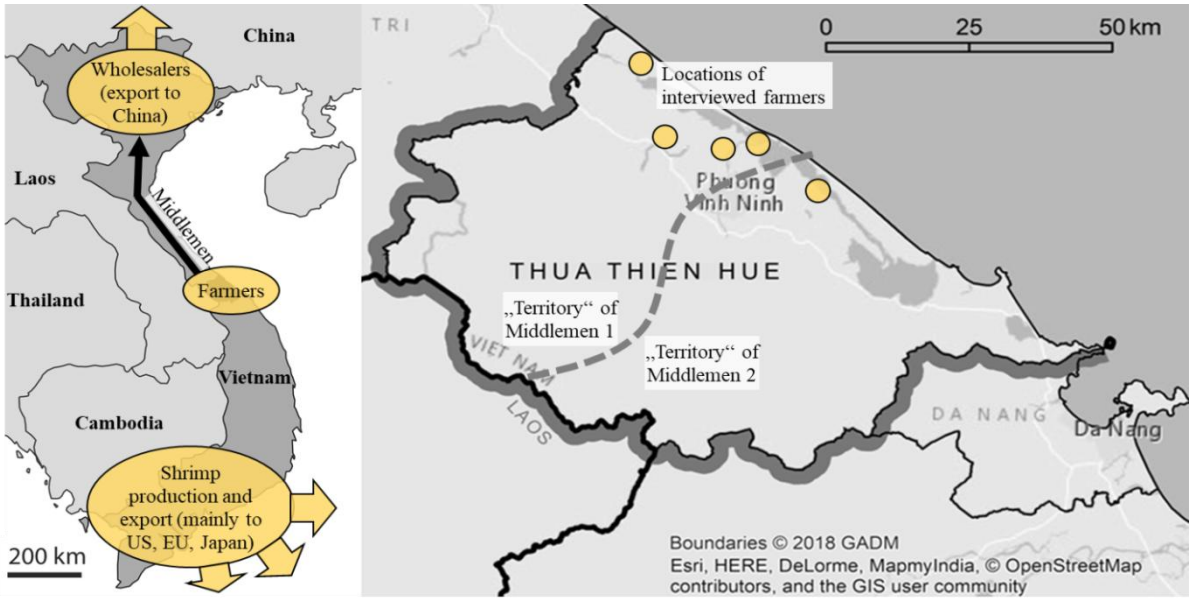

Figure 14: Territorial arrangement: Integration of white shrimp production in Thua Thien Hue province in global value chains

Source: Own adaption based on stakeholder interviews

Besides the role of providing a link between supply and demand between farmer and consumer market, another important role of middlemen is to lend interest-free capital to farmers which they need for production (such as buying fingerlings, feed or medicine). Such loans can also be provided by input suppliers (such as industrial feed providers) and they can generally be paid back flexibly (typically after harvest). In this context, input suppliers and middlemen exchange information about farmers for example about production success, reliability and amount of unpaid loans in order to evaluate, an individual farmer's creditworthiness. The interrelationship between middlemen, input suppliers and farmers is strongly based on personal trust (instead of contracts) and designed to ensure a reliable supply which caters to the requirements of the wholesalers. Middlemen and input suppliers coordinate their provision of capital to farmers, as an interviewed owner of an industrial feed provider explained:

> "*I have had a relationship with the middleman for a long time. Because I provided input supplies and the middleman deals with the output market, we are able to support farmers from the beginning of a season until the end when they harvest. Buying feed on credit and borrowing money happens very often in our community, so the middleman and I, we have to connect with each other to share information and control our debtors."*

The mutual dependencies described above are summarized in figure 14. Given the almost monopolistic position of the middlemen as buyers of white shrimp produce on a local level and the dependency of farmers on input suppliers and middlemen for capital, farmers tend to be in an unfavourable position of high dependence. The de-facto purchasing monopoly of the middlemen in their locality is not only the result of tacit agreements between middlemen in the Thua Thien Hue province, but also because they tend to offer higher prices than regional wholesalers. As competition among buyers on the local level is basically eliminated and farmers' creditworthiness depends on reliability of output and payback, the farmers tend to pursue maximization of output at minimal costs, which at times prompts them to ignore existing regulations regarding prohibitions of antibiotics or wastewater treatment. On the other hand, the role of the middlemen provides security to the farmers as they usually purchase the complete white shrimp produce, thus guaranteeing a relatively stable income and in most cases access to low-interest capital. An interviewed representative of the local government of Phong Hai summed up the dependencies of the farmers from the middlemen:

> *"Farmers are also able to borrow money from the middleman, without interest, to pay for industrial feed, aquatic medicines or white shrimp fingerlings, as well as cover their daily expenses. Farmers can derive numerous benefits from linking with the middleman. At the very least, they don't have to worry about selling their shrimp. However, farmers are not able to negotiate the price and they are totally dependent on the middleman."*

Nevertheless, as market demand for white shrimp is currently stable, most interviewed farmers expressed satisfaction about the current arrangements. While the dependence from middlemen is a matter of concern, the farmers earn a reasonable profit margin from white shrimp production, ranging from 4.5% to 10%.

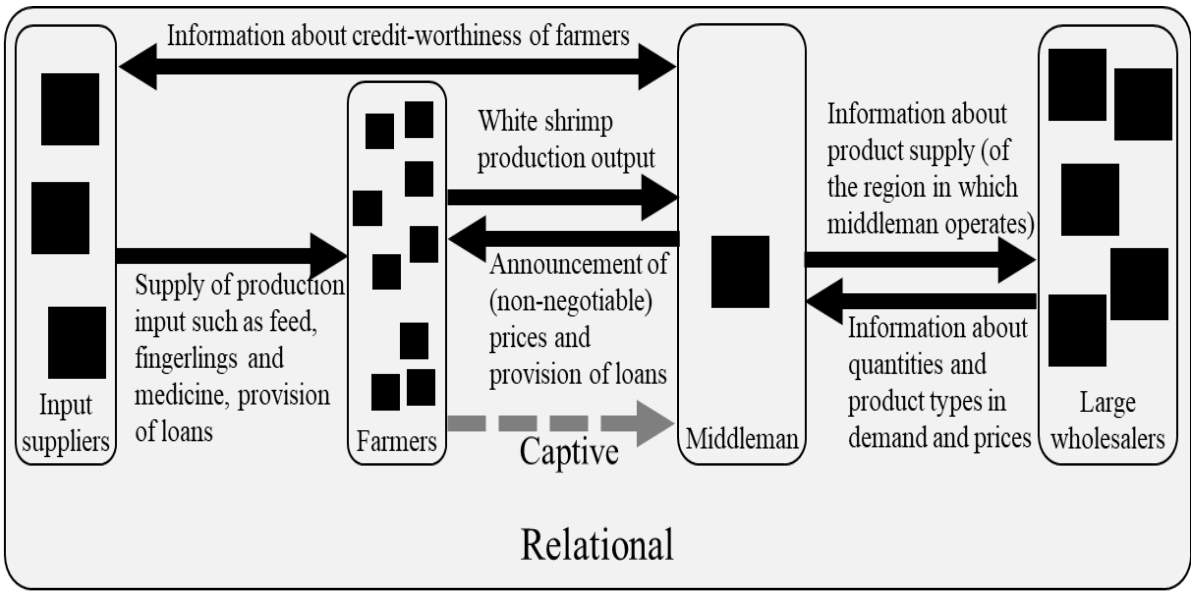

Figure 15: Organizational arrangements: Interaction patterns within the value chain of white shrimp production in Thua Thien Hue province

Source: Own adaption based on stakeholder interviews

6.6 Discussion and conclusion: Trust and informality as determinants for interaction patterns

Using the terms of Gereffi et al. (2005), this study confirms that farmers find themselves in a "captive" relationship with the middlemen, highlighting a largely one-sided dependency of several farmers to sell their products to only one buyer (namely the middlemen of their locality). At the same time, all relationships involving farmers, middlemen and wholesalers may be characterized as "relational", due to their strong reliance on personal trust, regular face-to-face interaction and the exchange of tacit information (figure 15). These relational patterns are fundamentally structured by a high degree of informality, which is the result of weakly implemented rule of law, weakly institutionalized coordination of interest groups and a culture in which personal relationships have traditionally had a more binding character than written contracts (see also Schwabe, 2020). Absence of trust in formal institutions requires the establishment of trust on an individual personal level (Vieira and Traill, 2008) and this necessity fundamentally defines the role of middlemen to facilitate product distribution domestically in Vietnam. As highly mobile agents who are not bound to physical capital for production, processing or storage, they are in a unique position to personally inspect quality and quantity of shrimp production and evaluate a farmer's individual creditworthiness.

Hence, the economic resources valorized by middlemen are trust and information. They use their resources not only to connect buyer and seller, but also to operate a shadow banking

system in collaboration with input suppliers in order to influence production activity of farmers based on the requirements of wholesalers (effectively circumventing banks in the process). Therefore, in contrast to the determinants for governance types of value chains outlined by Gereffi et al. (2005), namely input codifiability, complexity of the transaction and supplier capabilities, are not necessarily the main factors for explaining interaction patterns in a value chain. Rather, the high informality in which those transactions take place are a major reason for the existence of middlemen for domestic trade in the first place. In contrast to the outline by Gereffi et al. (2005), the "captive" and "relational" types of value chain governance should therefore not be viewed as mutually exclusive, but can help characterizing different dimensions within the same relationship, namely power asymmetries ("captive") and degree of informality ("relational") in which the transaction takes place. In such an understanding, the "relational" type of value chain governance indicates low institutional trust and a resulting high importance of personal trust to ensure seamless transactions.

Compared to regions in the Mekong Delta, which feature small and large scale shrimp farms and, due to difficult transport conditions, in some cases require five layers of middlemen in order to reach processing plants or large-scale wholesalers (Tran et al., 2013), the organization of production in Thua Thien Hue province is less diverse as almost all of the shrimp produce is sold to the middlemen of their locality and then to wholesalers located in North Vietnam who mostly export the shrimp to China. Due to the intense competition among farmers, their geographical dispersion and their lack of independent access to information, they have little incentive to self-organize, even though case examples in Ca Mau province show that horizontal organization of farmers can improve their bargaining position and also contribute to adopting better management practices (Joffre et al., 2020, Ha et al., 2013). Establishing trust among peers has been found by Joffre et al. (2020) as a critical element for farmers to self-organize but this requires close geographical and social proximity. Compared to regions in the Mekong Delta, aquaculture farmers in Thua Thien Hue province are more geographically dispersed which in turn is a significant barrier for horizontal organization. Instead, there are (unsuccessful) attempts to circumvent the middlemen and sell directly to the wholesaler. However, current arrangements in the Thua Thien Hue province are relatively stable and not resisted significantly against by farmers, while external dynamics, such as a decline of white shrimp demand, formalization of production and climate risks could potentially disrupt and transition the production patterns identified in this study.

This study contributes empirically to the understanding of network relationships of middlemen and aquacultural production patterns in central Vietnam. Conceptually, the article

discussed how the aspect of trust can be situated in the typology of value chain governance by Gereffi et al. (2005). The high informality of transactions is an institutional feature which applies for Vietnam as a whole, however, regional specific patterns of organizing upstream value chains of white shrimp production may differ due to local geographical and socioeconomic conditions. Viable areas of further research therefore include the organization of white shrimp farming in other Vietnamese provinces (especially outside of the Mekong Delta). Regarding disruptive potential for aquacultural value chains, the aspect of climate change would certainly be deserving of further investigation: Vietnamese fisheries and aquaculture are highly vulnerable to climate change while adaptive capacity is limited. Especially the increased frequency of droughts and floods are a significant risk to the existences of smallholders which is only likely to increase in the foreseeable future (Son and Kingsbury, 2020; Tran et al., 2018). Further research is therefore needed to improve estimation of local-level exposure to climate risks and the adaptive potential of smallholders.

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7 Linking shrimp farmers and food processors: An empirical analysis from the Thua Thien Hue province in Vietnam

7.1 Abstract

This study explores the barriers of white shrimp farmers in Vietnam to directly link with food processing companies and produce according to international quality standards. Shrimp production in Vietnam has evolved as an important economic sector and source of income for farmers. A major share of 55% of shrimp produced for export. While the quantity of shrimp production in Vietnam has grown multi-fold over the past two decades, the shrimp sector is still characterized by highly informal structures, weak implementation of food safety regulations and lacking expertise among farmers to comply with international standards. The Vietnamese government anticipates to modernize shrimp production and enable farmers to produce based on quality standards of international retailers. While food processing companies have established locations in Vietnam to serve international markets, farmers often lack the resources and expertise to produce according to their requirements. The main challenges are related to infrastructure for transport and payment transfers, risk management and overcoming established production routines which are mostly based on tacit knowledge and experience (rather than verifiable standards). Hence, it is not enough for the government to attract international food processing companies to establish locations in Vietnam, but also simultaneous efforts are needed to improve infrastructures, establish risk management tools for farmers and promote success cases which can act as guiding examples for adapting white shrimp production.

Keywords: agri-food networks, global value chains, middlemen, intermediaries, aquaculture, white shrimp

7.2 Introduction

Shrimp production and export in Vietnam have evolved as an important economic sector and source of foreign exchange for the country. Shrimp production has grown multi-fold during the past two decades, from 93,503 tons in 2000 to 747,333 tons in 2017 (General statistics office of Vietnam, 2018). The export share of shrimp produce is at 55%, with the EU, the USA, Japan and China being the largest export markets (Lan et al., 2013). In the context of depleting fish resources in the seas, it is in particular for small farmers that aquaculture and the production of white shrimp for export has evolved as a significant source of household incomes and in turn contributed to poverty reduction. Due to its relatively high profitability,

local governments in Vietnam strongly promoted the production of white shrimp, in particular during the years of 2009 to 2014. As a result, Vietnam emerged as the world's third largest exporter of fish and fish products, with the export value increasing from 3.8 billion USD in 2007 to 8.5 billion USD in 2017. The main revenue from export comes from Pangas catfish and shrimp (FAO, 2019). In Vietnam, shrimp farming concentrates on two main species: Black tiger shrimp (*Penaeus monodon*) and white shrimp (*Litopenaeus vannamei*). In 2017, the total brackish water shrimp farming area was 721.1 thousand hectares, of which 622.4 thousand hectares were devoted to black tiger shrimp, and 98.7 thousand hectares to white shrimp (VASEP, 2018).

Currently, value chains of shrimp production and marketing are relatively inefficient due to high dispersion of farmers among land areas which are difficult to reach via transport, low education and technical expertise among the farmers and the need for several layers of intermediaries in order to connect farmers with wholesalers, processors or exporters. These attributes make it difficult for food processors and government agencies to reliably monitor the quality of shrimp produce. Thus, dispersed farmers are in a difficult position to comply with international quality standards and are excluded from high-value markets (Ho and Burny, 2016; van Tilburg et al., 2012; Osmani and Hossain, 2015).

Eliminating intermediate layers and directly linking farmers with buyers (such as processors or wholesalers) can decrease transaction costs, improve food quality and enable farmers to achieve higher income by producing according to international quality standards. Hence, the way how value chains of shrimp farming can be organized in a more efficient manner is an important question for regional development in Vietnam. The actors within Vietnamese aquaculture, including farmers, government institutions and processors see the importance and benefits of producing based on international quality standards (Washington and Ababouch, 2011). However empirical evidence is lacking as to *how* the linking between farmers and food processors is done and which barriers exist in this context and under the conditions present in Vietnam.

Amidst this background, this study examines the capacities and barriers of farmers to directly link with food processors for high value production according to international quality standards, using the central Vietnamese Thua Thien Hue province as a case example. This is a qualitative study using the method of semi-guided interviews in order to examine in depth the possibilities of transitioning upstream value chains in shrimp farming in Vietnam towards higher integration and higher value production. A total of 24 interviews was conducted with actors along the value chain, including white shrimp farmers with different pond sizes and

years of experience, officers of communes, and at district and provincial level, heads of villages, input suppliers and middlemen. In addition, secondary statistical data has been used. In the following section, the role of quality standards in agri-food networks is outlined. Afterwards, the government plans for developing the shrimp sector as well as the capacities and barriers of farmers to directly link with food processors are outlined and discussed.

7.3 Governance of Agri-food networks and the role of standards

International trade in agricultural products intensified over the past decades due to liberalization of trade regimes and development of transport and communication infrastructures (Dicken, 2015; Bellmann et al., 2016). Quality standards are a well-recognized element in shaping global trade and investment patterns in agri- and aquaculture. In the major import markets of Europe and North America, government-imposed standards for import can be instrumentalized for protectionist measures. This has, for example, been the case of food imports from developing countries to the EU (Henson et al., 2000; Unnevehr, 2000). Besides government standards, private quality standards for food production, processing, labour and sustainability have significantly gained traction (Ouma, 2010; Swinnen and Vandemoortele, 2009). This is because consumer concern was raised over the past decades by numerous food scandals, exploitative labour conditions in developing countries and environmental problems which accompany the globally integrated production and trade in food products (Washington and Ababouch, 2011; Schuster and Maertens, 2013). Large retailers react to this increasing consumer sensibility in developed countries (as well as urban areas in developing countries) with the implementation of product-specific standards along their international value chains (Bellmann et al., 2016).

The definition of those standards and their implementation are intended to establish consumer trust in the safety and quality of the food. Given the intense competition among international retailers, the neglection of food safety can have disruptive effects on their brand reputation and sales (Washington and Ababouch, 2011). Besides food safety, standards on labour conditions, fair trade and ecological production have also been introduced. Such standards are primarily driven by consumer sentiments, pressures from NGOs and also by a perceived weak implementation of government regulations (such as on protection of natural resources) on the food sector in weakly developed food exporting countries (Anderson et al., 2010; Washington and Ababouch, 2011). The wide-spread implementation of quality standards by international retailers coincides with the "supermarket revolution" in developing countries, where food is

increasingly sold through professional (international and domestic) retailers rather than traditional informal markets (Beghin et al., 2015).

The implementation of private quality standards in food production has profound implications for the structure of value chains and for the economic prospects of food producers in developing countries (Beghin et al., 2015). They may contribute to excluding small farmers from higher value food markets as they often lack the capacities to upgrade their production in a way that enables them to comply with stringent quality standards of international retailers. Barriers of compliance for small farmers include financial constraints, lack of information about how to comply, lacking expertise about finding the right investment strategy but also insufficient capacity to produce the quantities which exporters require. Hence, production for international export may be consolidated, and exclude small farmers who lack the capital and expertise to produce according to quality standards (Beghin et al., 2015; Osmani and Hossain, 2015). Also, trade of quality food through middlemen who collect larger quantities of the produce to re-sell it to wholesalers or processors (a common mode in shrimp farming in Vietnam) is unsuitable in this case because intermediate layers of trade, such as middlemen, can make it virtually impossible for exporters to consistently monitor the compliance with quality requirements (Lan, 2013). Direct trading between food exporters with larger producers is a more efficient, but not always feasible mode of marketing quality products. In the case of high value food exports which comply with quality standards of international wholesalers and retailers, these attributes typically lead to more vertically integrated value chains with more comprehensive and direct interaction between (larger) producers and food exporters in developing countries (Washington and Ababouch, 2011; Beghin et al., 2015).

The establishment of direct links between producers and exporters increases the fixed production costs of farmers (thus, generally favouring the consolidation of production) but it decreases transaction costs between farmers and exporters (or processors) once high value production and monitoring are established and once formalized relationships with downstream actors of the value chain are possible (Beghin et al., 2015; De Abreu et al., 2011). While the risks of exclusion of smallholders from high value product markets do exist (this has been the case for agri-food value chains in African and Latin American countries, where market shares of smallholders were at least partly replaced by larger production units (Abebe et al., 2016; Subervie and Vagneron, 2013; Berdegué et al., 2005), empirical evidence also points to positive welfare effects of high-value food production for farmers who, depending on the product and locality, have significantly higher incomes and better access to technology (Beghin et al., 2015; Jaudy and Kukenovaz, 2011). Hatanaka et al. (2006) point out, that while

farmers are highly dependent "takers" of private quality standards with no influence in defining them, they nevertheless have possibilities to adopt standards strategically for their benefit. For instance, the certified compliance with private quality standards improves their reputation and enables them to link with higher value markets in the first place. Empirical evidence from Indonesia shows that farmers in some cases organize collectively and collaborate with NGOs to establish production methods which comply with international standards for safety and sustainability (Hatanaka et al., 2006).

Hence, the upgrade of production methods and integration of farmers in vertically integrated value chains for high quality food products *can* contribute to poverty reduction and modernization of agricultural production in developing countries. As Maertens and Swinnen (2006) pointed out: *"Instead of acting as barriers, emerging food safety and quality standards might provide incentives for developing countries for upgrading their export capacity and for gaining access to high value food markets"* (Maertens and Swinnen, 2006). The degree to which smallholders are included in high value food production differs by product and locality. Vandermoortele et al. (2012) argue that a relatively homogeneous farming sector (depending, for example, mostly of smallholder farmers) tends to be slower in the adoption of high value production, but also more inclusive, pointing to a development path in which all smallholders gradually link to vertically integrated value chains for high quality food production.

Given that the coupling of small farmers with GVCs for high quality food can significantly improve livelihoods and infrastructure, the pursuit of high value production becomes a viable development strategy of low- and medium-income countries. The central strategic question is how this integration can be successfully achieved in regional contexts. The regional conditions of shrimp farming in the Thua Thien Hue province in central Vietnam, as well as the strategies and barriers of establishing linkages between farmers and international food processors are outlined in the following section. The sections below are mainly based on stakeholder interviews which were conducted for this study.

7.4 Government strategies of upgrading food produce in Central Vietnam

The following sections are based on semi-structured stakeholder interviews which were conducted in the Thua Thien Hue province as well as complementary government document. The study area is shown in figure 16.

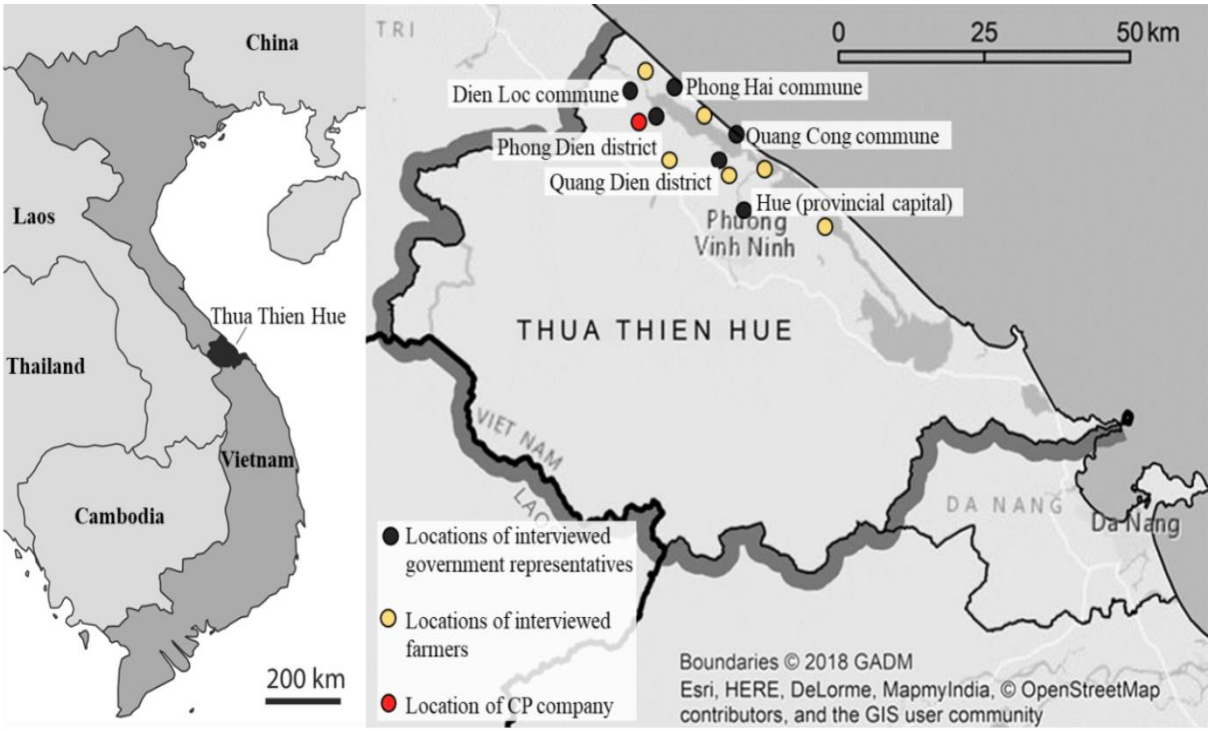

Figure 16: Location of interview partners in the Thua Thien Hue province

Source: Own adaption

In congruence with the agri-food sector as a whole, shrimp farming in Vietnam is strongly export oriented and markets are dominated by international retail companies who are in a position to demand quality certification for produced and processed shrimp based on their specified food safety standards. Also the domestic government regulations on food safety are mainly driven by the regulations of importing nations (Tran et al., 2013). The upstream layers of shrimp value chains in Vietnam are, however, highly fragmented. Shrimp production is organized by a large number of about 330,000 small farmers and farm households who are highly dispersed among areas which often feature no access to road infrastructure (Hai, 2015). Most shrimp produce is sold through several layers of middlemen to wholesalers for export and also the domestic market. The high fragmentation of shrimp production and numerous layers of (up to five) intermediaries make it virtually impossible for wholesalers and processors to trace the shrimp produce and observe compliance of producers with certified quality standards (Tran et al., 2013). Due to intense competition among farmers and low institutional capacity to monitor compliance with government regulations, compliance with government regulations (such as the ban of antibiotics or wastewater treatment) is, at times, neglected by farmers as it causes additional costs. As a result, high value shrimp production based on certified international quality standards, which features strong coordination between farmers and processing companies is limited to a low number of pilot projects while the major share of shrimp produce is sold to middlemen. Tran et al. (2013) summarize the situation as

follows: *"With the exception of a few pilot projects limited in participation and scale, shrimp certification programs or even public health standards are not significant factors in determining farm management practices. This is so because governance of the shrimp GVC [global value chain] is weak and fragmented."*

These patterns also apply to the Thua Thien Hue province in central Vietnam. The production of shrimp grew significantly over the past two decades and was strongly promoted by local governments during the years 2009 to 2011. White shrimp farming is dispersed among small producers who sell almost all their produce to two middlemen who have divided their "territories" within the province to avoid price competition. The produce of Thua Thien Hue province is mostly sold to wholesalers located in North Vietnam who sell the shrimp either domestically or for export to China. There have been efforts in the Thua Thien Hue province to establish higher value white shrimp production and link food processors directly with farmers.

Given the potential benefits of integrating value chains for high value production, these aspects are part of the central government development strategy in the aquaculture sector, which also incorporates the Thua Thien Hue province. In this context, large scale aquacultural farming which complies with global agricultural praxis (GAP) standards shall be developed, international investment be attracted and linkages between farmers and food processors be encouraged (Government of Vietnam 2010). Until 2030, the proportion of export value in seafood shall increase to 60%. Besides giant tiger prawns, white shrimp are a major product for which industrial scale farming shall be developed (60,000 ha, out of a total aquacultural area of 190,000 ha that is dedicated for industrialization). Mechanisms for tracing product origin shall be strengthened and strong domestic brands be developed. To improve traceability of products and export efficiency, the establishment of large trade centers shall replace intermediaries (Government of Vietnam, 2013). The explicit objective for developing aquaculture in brackish areas is to "*form large-scale industrial farms meeting GAP standards and each market's demand, producing large commodity quantities for export and domestic consumption in the Red river delta, central coast region [of which Thua Thien Hue is a part] and Mekong river delta, associated with enabling traceability of origin and building prestigious and quality fishery trademarks"* (Government of Vietnam, 2010).

Accordingly, the government of Thua Thien Hue province seeks to develop the regional aquaculture sector towards higher value chain integration and a stronger focus on high value products. White shrimp farming is to be developed among consolidated production areas near the cost for export according to GAP standards (customized for Vietnam) and overall

production is to increase to 15,000 tons by 2030 (compared to 4,925 tons in 2017; General statistics office of Vietnam 2018; Ministry of Agriculture and Rural Development of Vietnam, 2015). In 2011, the province managed to attract the investment of the Charoen Pokhand Company (CP), which is a seafood processing company based in Thailand. The company has been active in Vietnam since 1990 in several sectors including aquaculture. They produce industrial feed, shrimp fingerlings and aquatic medicine, operate large scale shrimp farms and engage in food processing. Hence, they have the capacity to integrate the upstream value chain for shrimp production and processing. In Thua Thien Hue, CP operates a food processing plant with a capacity of 9,000 tons shrimp per year. They source most of their input from their own industrial scale production which consists of 216 hectare ponds for white shrimp farming. The facilities are located in the Phong Dien district. According to an interviewed local government official, the company can produce based on international certified safety standards and the local government encourages to expand the linkages between CP and small scale farmers. In general, the company offers a higher price for shrimp produce than middlemen, but requires more stringent quality standards. CP can provide farmers with production inputs such as fingerlings and offer technical advice about complying with the required quality standards. However, while a small share of an estimated 10% of produce from small farmers was sold to the CP processing facility, most farmers find it difficult to consistently produce high quality shrimp according to requirements. An interviewed local government representative described the challenge as follows:

> *"Government officers at all levels, from provincial to local government, realize that there is a monopoly in the purchase of white shrimp [among middlemen]. The installation of a processing plant in Phong Dien district was a strategy to mitigate this monopoly. The processing plant increases demand for white shrimp from producers. However, white shrimp sold to the CP Company has to satisfy higher standards than that sold to local middlemen. This is because the CP Company exports to America, Japan, and Europe. These countries have high safety and technical standards for the production of white shrimp, which the producers in Phong Dien district do not often meet. Producers said that adhering to the technical standards of the CP Company is a risk, so the majority have chosen to follow their own processes, which make their shrimp unsuitable for the CP Company"* (Agriculture officer of Dien Loc commune).

7.5 Barriers to establishing linkages between farmers and the food processing company

The barriers which farmers face to link with the processing plant of the CP company illustrate the challenges which a sector faces when traditional production methods are under pressure to modernize. Shrimp farmers in Thua Thien Hue province typically feature low education, follow highly individual habits of production which are strongly based on personal experience and trade with middlemen based on trust and without formalized contracts. In order to meet the requirements of CP, farmers would need to fundamentally change their habits to comply with standardized production techniques and enter formalized contracts in order to link to the corporate culture of the CP company. The main challenges for farmers include the following:

One of the most important aspects is that farmers feed shrimp based on their experience without following formalized technical processes. If farmers want to sell their shrimp to the CP Company, company staff will take about one week to test the quality of the shrimp produce. Only after testing, the company will decide whether or not they can buy the shrimp. This creates significant uncertainty for farmers, who will only consider selling to CP if they have strong confidence in the quality of their shrimp. An additional complication is that while farmers can control the size of the shrimp, they are unable to control antimicrobial residues in it, adding further uncertainty about compliance with quality standards. Even if farmers successfully sell one branch of shrimp produce, there is no guarantee of a long-term sales relationship, as quality inspections need to be passed each time when a farmer intends to sell a branch of shrimp produce to CP and every time, a new sales contract needs to be signed. Long-term contracts do not exist and demand of the processing plant may differ from season to season.

These requirements strongly contrast the prevailing habits among farmers. Most use antibiotics, which conflicts with the requirements of CP, however, the farmers have little experience in cultivating shrimp without antibiotics and fear that their fingerlings may die out without it. Also, the farmers are used to informal transactions and up-front payments in cash by the middlemen, which contradicts the formalized corporate culture of CP, where the payment agreed in the contract is processed via bank transfer which takes longer time. Since many farmers do not have bank accounts, this practice seems strange and unusual to them. Also for practical reasons, payment via bank transfer is inconvenient, since farmers operate from remote places which oftentimes requires significant travelling time to the next town to withdraw the money. An interviewed farmer from the Dien Loc commune described the relationship to CP like this:

> "*Before selling our white shrimp, if we strongly believe that our white shrimp meets the requirements of the CP Company, we will call the company and compare the prices between company and middleman and then we will decide to sell to whoever is offering the higher price. The price offered by the CP Company is often higher than the price offered by the middleman. CP Company employees will come to our shrimp ponds to collect a sample and test the quality of white shrimp. If our white shrimp meets their standards, we will decide on when to sell them. We have to wait for feedback from the company, which takes time. However, the slowest part of the process is getting paid by the CP Company, which is quite complex. We culture white shrimp by our experience, so we don't intend to sell them to the CP Company, our systems and processes are not sufficient to meet the technical standards of the CP Company."*

An interviewed middleman from the Phong Dien district confirmed this pattern, explaining that *"the CP Company has high standards in buying white shrimp while I will buy all kinds of white shrimp. Furthermore, the CP Company can buy at a higher price than me in summer, but they cannot buy at a higher price than me in winter."*

The strong relationships between the middlemen and farmers, as well as the ease with which they can conduct transactions, offers the middlemen competitive advantages compared to the CP Company, even though farmers have entered a position of high dependency from middlemen. Often middlemen are given priority by farmers, and are able to buy their product first: "*After comparing the price between the CP company and me, if the price of the company is higher than my price, farmers will inform me about it and ask me if I can buy their white shrimp at that price. If I cannot buy at that price then they will sell to the company"* (Middleman, Phong Dien district).

A farmer located in the Quang Cong commune confirmed the prioritization of middlemen from his perspective: "*When the price of white shrimp was similar between the middleman and the CP Company, I decided to sell my white shrimp to the middleman. After that, the company increased the price, but I could not change from the middleman back to the company.(…) I do not want to break the commitment with the middleman. If he is unhappy about my actions, he might not buy shrimp from me the next time."*

The CP Company is willing to buy shrimp and provide technical support to help farmers meet their requirements. Another important aspect, however, is that farmers are required to use the industrial feed, aquatic medicine and shrimp fingerlings which the CP company provides. This has prevented farmers from selling to the CP company, because they select their shrimp

fingerlings, industrial feed and technical processes based on their own experience. Each one has found a suitable, individual practice and changing these habits has proved a barrier for the CP company. Furthermore, farmers cannot buy industrial feed and aquatic medicine from the CP company on credit even though paying for the feed and aquatic medicine only after harvesting is completed has become standard business practice for most farmers. The ability to pay after harvest (and not up-front) is an important criterion to them when they select input suppliers.

Interviewed government officers support establishing stable business relationships between the CP company and local producers and shared their view of how this can be achieved. A local government representative of the Hoa My village (in Dien Loc commune) explained that the transition towards linking farmers with the CP company can only be achieved in a gradual process which takes time:

> "*Linking the CP Company to farmers is a good development goal for the government. In order to improve these business interactions, first of all, we need to change the ways in which shrimp farmers culture their shrimp. Their production methods need to adhere to the regulations of government and the CP company's standard. Secondly, government and producers need to overhaul their infrastructure in order to meet the technical standard of the CP company. Thirdly, government need to increase their management and oversight role, helping producers from input to output to ensure a higher quality product. However, these changes are not easy to implement and they take time. Either farmers do not want to change, or they do not have capacity to change their farming styles or their production facilities."*

7.6 Discussion and conclusion

Compared to currently predominant patterns, linking farmers directly with the food processing plant requires different production routines, infrastructure and interrelationships with the actors along the value chain. The contrast of those value chain characteristics is shown in figure 17. "Traditional" patterns of the upstream value chain for shrimp production are characterized by highly informal interactions and multiple actors for low and medium value shrimp produce. As outlined in existing literature (such as Beghin et al., 2015, Vandemoortele et al., 2012 and Dries and Swinnen, 2004), the linking of farmers and food processors results in a much more vertically integrated upstream value chain of shrimp production. Hence, shrimp production for the CP company shows a higher degree of integration in which formalized procedures replace the informal relationships present in lower

value production. Instead of the middleman, it is the CP company which exercises high control over the production procedures of farmers.

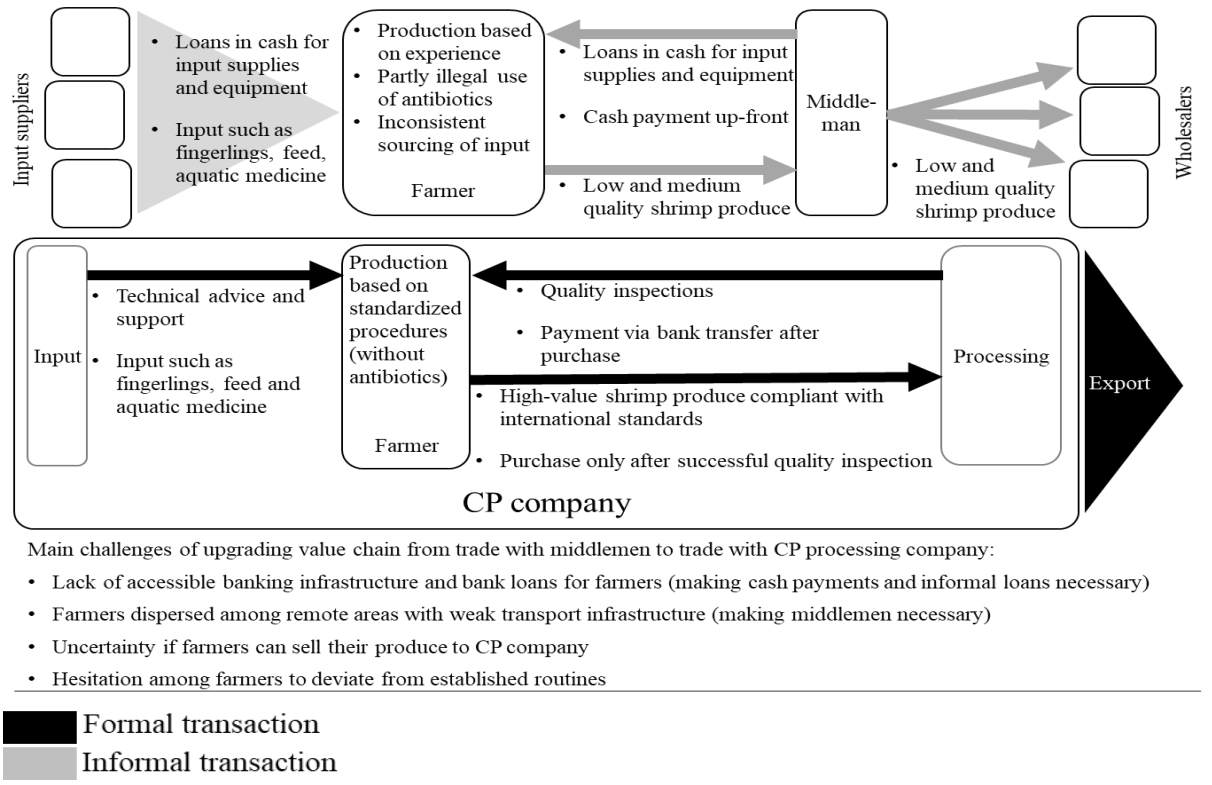

Figure 17: Interaction patterns of "traditional" value chain of white shrimp production (top) versus high value production for the CP company (bottom)

Source: Own adaption based on stakeholder interviews

While it is generally anticipated by the government that farmers link directly with food processors in order to initiate the modernization of white shrimp production and enable farmers to increase their incomes by producing higher value products, the attempts of upgrading thus far have had limited success. Apart from low sales volumes of farmers to the CP company and the shrimp production which is directly integrated in the corporate structure of CP, farmers by and large continue to sell medium and low value shrimp to middlemen within highly informal structures of interaction. In contrast to the example of Indonesian farmers outlined by Hatanaka et al. (2006), who organized collectively to upgrade production processes, there are no attempts to collaborate among farmers in Thua Thien Hue province, which may be the result of low professionalism, high competition and weak social linkages between farmers.

Lack of capital, expertise and information are important barriers of farmers to produce according to international standards which are recognized in literature (Beghin et al., 2015).

In a more abstract notion, the main barriers which impede a successful integration with the CP company relate to several dimensions including infrastructure (for transport, pond system and payment transfers), economics (risk management) and established routines. Changing production patterns for the requirements of the CP company currently poses a significant economic risk for farmers as they cannot be sure whether they meet the necessary quality standards and, in some cases, it may be physically infeasible for them due to lacking access to transport and payment infrastructure as well as inadequate production infrastructure.

Hence, each of these challenges needs to be addressed individually. For instance, the establishment of online payment systems may make it easier to facilitate payment in a formalized setup. Investments in improved road transportation should be prioritized in order to improve access of farmers in remote locations to the processing plant and the CP company should coordinate transportation of produced shrimp from the farmers. Along with improved road transportation, improvements of the white shrimp pond system of small-farmers should be supported (for example with low interest loans or subsidies) to enable high value shrimp production and limit the outbreak of diseases. One very significant area of action is to reduce risk for famers as they invest in upgrading production capacities. Possible instruments for this could be purchasing guarantees from the CP company, government guarantee of reimbursing farmers who demonstrably produced according to instructions by the CP company but could not sell, easily accessible low interest loans for production or up-front payment by the CP company. At the same time, in order to incentivise changes in production routines among farmers, successful linkages between the CP company and a farm may be promoted as demonstration project. Measures for improved infrastructure and convenience, reduced risk and a clear guideline of implementation are needed simultaneously in order to gradually enable high value shrimp production, integrate upstream value chains, reduce the number of intermediaries and hence contribute to higher income for farmers and economic development in the Thua Thien Hue province. Once there is a track record of "guiding" success cases, the regional aquacultural sector may gradually modernize based on international quality standards and enter a development path as outlined by Vandemoortele et al. 2012, namely the gradual modernization of a relatively homogenous "traditional" food producing sector.

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8 The challenge of upgrading white shrimp production in central Vietnam and the potential of farming cooperatives

8.1 Abstract

Aquaculture in Vietnam expanded significantly over the past two decades and contributed to poverty alleviation among smallholders. Upstream value chains of shrimp farming in Vietnam are characterized by a high degree of informality, high number of intermediate layers in trade and power asymmetries between farmers, suppliers and buyers. Input supply such as feed and fingerlings for shrimps account for 60% to 80% of overall cost in white shrimp production. Reducing the cost of input supply would therefore significantly improve income and welfare of farmers. Hence, this study focuses on the characteristics of business relationships between farmers and input suppliers and explores the possibilities of farmers to improve their bargaining position. In particular, the potential of horizontal coordination in the form of cooperatives is evaluated. Characteristics of business relationships and possibilities to (individually and collectively) improve their bargaining positions of farmers are evaluated within the conceptual frame of *global value chains* and *upgrading*. The paper argues that despite previous unsuccessful attempts to establish cooperatives, horizontal coordination is an important measure in order to counter high dependencies from supply agents. However, in order to be successful, attempts to coordinate need a clear value proposition for farmers, engagement and communication among farmers and government support in funding the necessary infrastructure.

Keywords: agri-food networks, cooperatives, global value chains, upgrading, aquaculture

8.2 Introduction

Shrimp farming in Vietnam has developed significant volumes over the past two decades. The rapid development of aquaculture is the result of increased international and domestic demand and also depleted fish resources (Van Duijn et al., 2012: 10ff). It is in particular the black tiger shrimp and the white shrimp which are cultured in aquacultural ponds. White shrimp farming is particularly common in the Mekong Delta, where production for international markets is located, but it has also developed dynamically in central Vietnam, where shrimp farmers produce for the domestic and predominantly the Chinese market and SSF are the main producers. Development of white shrimp production has also been supported by political initiatives in order to provide alternative income sources for farmers and thus contribute to

poverty reduction (Tran et al., 2013; Lan, 2013; Suzuki and Nam, 2018: 472; Quyen et al., 2020: 2).

Value chains of white shrimp production in Vietnam are characterized by a high degree of informality of interrelationships and transactions as well as a prominent role of middlemen who act as purchasing agents, brokers of information and also as loan providers. Transactions are typically not conducted through formal contracts and rely strongly on personal relationships and trust. The informality of transactions has enabled smallholders to establish shrimp production in an uncomplicated manner as capital could be acquired simply from informal loans of middlemen. Higher value production by quality standards for international markets however is difficult to achieve with the current level of informality because quality of shrimp produce cannot be reliably tracked by international wholesalers (Tran et al., 2013: 7ff). Such patterns are, in fact, typical also for other regions in the global south, for example in the case of shrimp production in Bangladesh (Dannenberg et al., 2016: 180). Furthermore, farmers have developed high dependency from middlemen as well as input agents regarding market price, feed and aquaculture techniques (Joffre et al., 2020: 7); as a result, farmers have no room to bargain and depend on their capital and information.

Hence, the question arises how farmers can improve their position with regards to other actors along the value chain and enable themselves to enter higher value development paths by consistently complying to international standards. The relationship of famers and input suppliers is particularly important in this regard, because commercial feed input for shrimp production accounts for 60% to 80% of aquacultural production cost (Hasan, 2017: 48). The manner how farmers can access feed input not only determines their economic position but also the quality of shrimp they are able to produce.

Hence, this study explores the relationship of input agents and farmers and its role in attempts to upgrade. While various studies have explored the governance of value chains in aquaculture in Vietnam (such as Tran et al., 2013; Ha et al., 2013; Lan, 2013; Ponte et al., 2014 and Quyen et al., 2020), thus far, the relationships of input suppliers and farmers in aquaculture in Vietnam have rarely been explicit focus of investigation. Given the high cost of input supply in relation to total production cost of farmers, the reduction of input cost could significantly contribute to higher incomes for farmers. Also, since the establishment of cooperatives has been attempted at multiple locations with mixed success, this study puts a particular focus on the manner in which cooperatives could successfully contribute to improving farmer's bargaining positions vis-à-vis input suppliers. This study focuses on shrimp production in central Vietnam which has developed dynamically over the past years

but received relatively little attention thus far. The concept of GVCs is used as a theoretical framework. The study is structured as follows: First, the development of Vietnamese shrimp farming in the context of agri-food networks is briefly outlined. In these sections, a particular focus is put on the theoretical framework and the role of feed supply. Second, empirical material based on stakeholder interviews and complementary data and documents is presented and discussed. The article concludes with a summary of the main points and a brief outline for further research potential.

8.3 Conceptual frame: Agri-food networks, power disparities and upgrading

GPNs in agri- and aquacultural products are characterized by high fragmentation, internationalization and a high disparity of power and value capture among the various actors (including input suppliers, producers, agents, wholesalers and retailers) involved (Dicken, 2015: 424ff; Ponte et al., 2014: 54f). Agri-food networks tend to be dominated by a relatively small number of globally active retail firms originating from North America and Europe who shape food value chains with disproportionately high purchasing power and the formulation of quality standards to which producers need to comply in order to be considered as a vendor (Dicken, 2015: 440f; Rodrik, 2018: 9f). While there has been a strong emphasis in related research on the disparities between producers of the global south who produce for export to developed markets mainly in North America and Europe (and the whole range of socioeconomic implications this dichotomy encompasses), the north south-dichotomy has become increasingly blurred with the convergence of lifestyles and consumer behaviour in urban centers in developing as well as developed countries (Maertens and Swinnen, 2006; Dicken, 2015: 424ff; Beghin et al., 2015: 3).

An important barrier of smallholders in low-income countries to deliver to international markets has been the implementation of private quality standards by large wholesalers who have put increasingly stringent processes in place to monitor compliance (Martens and Swinnen, 2006). Due to the large purchasing power of wholesalers and intense competition among smallholders, international wholesalers are in disproportionately strong positions of power and can almost unilaterally determine the conditions of the business relationships between producer and wholesaler (Maertens and Swinnen, 2006: 11ff; Dicken, 2015: 440f). The pressure of smallholders to adhere to international quality requirements also influences their relationship with input suppliers (such as for seeds, fertilizers or, in the case of aquaculture, feed). The input side of the relationship mirrors the characteristics of farmer-

wholesaler relations: As smallholders rely on high quality supply in order to produce according to international standards, the relatively low number of internationally active input suppliers have high bargaining power over prices and business conditions (Dicken, 2015: 440f). Nevertheless, smallholders in the global south are generally incentivized to produce for international markets. Despite the high power disparities in international agri-food networks, the formalized production processes and business relationships in the context of export-oriented production tends to generate higher incomes for smallholders in the global south compared to the highly informal nature of relationships which frequently occur in production for domestic demand (Maertens and Swinnen, 2006: 2, 24f; Beghin et al., 2015: 16).

The interaction patterns and disparities among different actors along the value chain have been conceptually described within the literature stream of GVCs, which has evolved to be a major stream of discussion in economic geography (De Marchi et al., 2020, 3ff). This relational perspective on sequences of value creation generally seeks to describe and explain disparities in power and value capture among actors which participate in specific value chains (Gereffi et al., 1994; Henderson et al. 2002; Gereffi et al., 2005; Coe and Yeung 2015; De Marchi et al., 2020). The literature stream on GVCs has put a strong emphasis on the influence of lead firms (such as brand assemblers of retail brands) on the organizational configuration of subsequent layers of the value chain (Gereffi et al., 2005; Coe and Yeung, 2015). Disparities of power and value capture among actors along the value chain have been described in conceptual contributions as determinants for organizational and regional development outcomes. In a much acclaimed typology outlined Gereffi et al. (2005), five types of actor relationships were distinguished which featured different degrees of hierarchy, integration and power asymmetry among actors. These types of relationships are determined by the codifiability of a specific input, the capabilities of the supply base and the complexity of the transaction. Actors compete vertically and horizontally for value (such as in the form of profit, knowledge, access to technology etc.) which they seek to capture. Within the concept outlined by Gereffi et al. (2005), the governance types “captive” and “market” are particularly relevant for this article: A captive supplier-buyer relationship describes high power asymmetries in which a large number of lowly-skilled suppliers compete for sales shares among a relatively small number of buyers with high purchasing power. In such patterns, buyers are typically in a position to basically dictate the conditions of transaction and they consequently result in high dependence and low profit margins for suppliers. In contrast, a market-based relationship is characterized by a relatively level number of suppliers and buyers and more equal power-relationships. Transactions in such an environment are determined mainly by prices, which are constant matter of negotiation (Gereffi et al., 2005:

86; Ponte and Sturgeon, 2014: 203). Hence, from the perspective of smallholders, engaging in the market-type of transaction is more desirable then a captive relationship with buyers (this aspect will be elaborated in section 8.8, discussion and conclusion).

This leads to the question of how an actor can improve their position vis-à-vis others for maximizing value capture. Conceptually, such a question can be framed within the context of different kinds of economic *upgrading*, originally outlined by Humphrey and Schmitz (2002: 6), who distinguished between four kinds though which actors and regions can improve their competitive position. These include:

- *Process upgrading:* transforming inputs into outputs more efficiently by re-organizing the production system or introducing superior technology.
- *Product upgrading:* moving into more sophisticated product lines (which can be defined in terms of increased unit values).
- *Functional upgrading:* acquiring new functions (or abandoning existing functions) to increase the overall skill content of activities.
- *Inter-sectoral upgrading:* firms of clusters move into new productive activities.

While these types of upgrading refer to strategies with regards to product offering and production, it is important to point out that actor-specific contexts such as institutional environments, the types of relationships with other actors along the value chain (especially with regards to mutual dependencies and informality) as well as resources available to the actor (such as capital or skillset) are critical determinants of the type of upgrading which an actor *can* engage in (Pickles et al., 2006: 2319f; Dannenberg et al., 2016: 183f). Further perspectives of upgrading, relating to the environmental and social dimensions of offshored value creation activities are provided (among others) by Poulsen, Ponte and Lister, (2016), Lund-Thomsen and Lindgreen, (2014) and Barrientos, Gereffi and Rossi, (2011), however, given this article's perspective of smallholders, this study focuses on the economic dimension of upgrading as outlined above.

In the context of the aquaculture sectors in Asian countries, Ponte et al. explored upgrading trajectories of farmers and food processors in four Asian countries (Bangladesh, China, Thailand and Vietnam). In their study, the relationships of Vietnamese farmers with input suppliers and food processors was described as "relational", pointing to the informality and personal nature of relationships as well as "captive", meaning that they are in a weak bargaining position for business conditions as they face a relatively narrow choice of sales channels on the downstream and input suppliers on the upstream side, while being easily replaceable themselves (Ponte et al., 2014: 56). From the perspective of actors who find

themselves in a captive relationship, the most viable forms of upgrading are process- and product upgrading while a change towards higher value functions within the value chain is typically discouraged by lead firms and oftentimes not possible due to lack of available resources (Ponte et al., 2014: 53f; De Marchi et al., 2020: 7). Using the case example of shrimp farming in Bangladesh, Dannenberg et al. (2016) pointed out that the high degree of informality among actor relationships in the global south hinders their opportunities of upgrading (Dannenberg et al., 2016: 183f). The development of cooperatives among smallholders has been discussed in various contributions as a measure to organize input-supply, increase access of farmers to high-value markets, reduce external transaction cost and thereby improve their bargaining position (Fischer and Qaim, 2012: 1256f; Herrmann et al., 2018: 827f). Cooperatives take various forms in attempting to support smallholders, including a top-down approach of local governments to establish market niches and protect smallholder markets and prices (Kurakin and Visser, 2017: 166ff), or a bottom-up approach of self-organization of members, democratic control and voluntary participation (Kalogiannidis, 2020: 459). Often, agricultural cooperatives fail due to various factors including lack of trust and managerial capacity among potential members, lack of adequate funding mechanisms, lack of government support and lack of cooperative culture (Kalogiannidis, 2020; Francesconi and Wouterse, 2018).

From this conceptual backdrop, this article examines the research questions of 1) how shrimp farmers in central Vietnam access feed input, 2) how current interrelationships between farmers and input suppliers in Thua Thien Hue can be characterized, 3) how farmers attempt to improve their bargaining positions and, 4) with particular focus on the potential of cooperatives, which factors determine the success or failure of horizontal organization among farmers.

Applying the concept of upgrading as a potential to improve the position of Vietnamese smallholders in shrimp production by moving beyond their status as “captive” suppliers, this article adopts a bottom-up-perspective as outlined by De Marchi et al. (2020: 7). The methodology of this study is outlined in the following section.

8.4 Methodology

This study follows a qualitative approach. The research question is addressed using the methodology of the semi-structured interview. For this study, 24 interviews were conducted with a variety of actors including farmers, middlemen, input suppliers and local policy makers in the central Vietnamese Thua Thien Hue province, which was complemented by secondary

information from reports and statistical data. The expert interview is the method of choice in this case as this research seeks to characterize the power relationships among actors and their implications on existing disparities and path dependencies as well as strategic possibilities to change the power asymmetries in given relationships. As such, this study is explorative in character and aims to develop an in-depth understanding of a subject matter rather than a large, highly representative sample of cases which could be examined quantitively. The interview partners were chosen based on their relevance for the research question through direct contacting and through the snowball method in which interview partners introduced further potential interviewees with whom they have either business relationships or who were deemed qualified in addressing the subject. Thua Thien Hue province was selected as the place of study, because (as will be shown in the next chapter) in recent years the white shrimp industry there has developed rapidly and has led to increases in income, but also to new dependencies. Thus far, to the knowledge of the authors, white shrimp farming in Thua Thien Hue province has not yet been focus of geographical research. The fieldwork was conducted in 2018. The interviews were conducted in Vietnamese language by Chung Van Nguyen, who approached interview partners directly and also using the snowball-method of finding interview partners through existing contacts. The interviews were conducted as a field study on-site and took about one hour in average. The interviews were recorded and scripted according to the guidelines outlined by Dresing and Peel (2011) meaning that they were polished for language and readability (such as removal of colloquial language) without altering the contents (see also Azevedo et al., 2017). Based on the research question outlined in the conceptual framework, the interviews were designed to address the following broad questions:

- How is the interaction between farmers and their business partners characterized?
- How can farmers improve their bargaining positions?
- What is the potential of cooperatives to support farmers in their transactions with suppliers?

The interview scripts were broadly structured according to the main questions. These structured scripts then formed the basis for the content analysis and the outline and discussion of the empirical results. In addition to the interviews, complementary documents, statistics and media reports were used for this study to provide context and additional information.

8.5 Vietnamese shrimp farming and the role of input suppliers

Aquaculture is among the most dynamic growth sectors within meat production systems globally (Aklakur, 2018: 385) and in Vietnam, the sector has also developed dynamically over the past decades. Countrywide, shrimp production grew from 93,503 tons in 2000 to 747,333 tons in 2017 (General statistics office of Vietnam, 2018). With over 330,000 smallholders producing shrimp, the sector is highly fragmented as farming households are dispersed among areas which are often difficult to access (Tran et al., 2013: 330). Shrimp produce is mostly sold through several (up to five) layers of middlemen who deliver to food processors and wholesalers (Tran et al., 2013: 330). An estimated 55% of Vietnamese shrimp produce is for export, with the EU, Japan, the USA and (more recently) China being the main export destinations (Lan, 2013: 2). The organization of upstream production systems for white shrimp in Vietnam are largely conditioned by the institutional environment, the quality requirements of wholesalers and also the local geographic conditions. Transactions between farmers and middlemen are largely informal which contributes to making them more flexible and less complex, however due to the high informality of transactions in general, quality standards (which higher value production for international markets usually requires) are almost impossible to implement consistently and at scale (Van Duijn et al., 2012: 35ff).

An important layer of shrimp value chains in Vietnam is the sourcing of input supply which farmers need for production. The supply of commercial feeds allows farmers to control growth and produce predictable quality. While traditionally, inconsistent inputs like trash fish or rice bran have been used as feeds, the use of customized industrial feed has been increasingly common among smallholders in aquaculture globally and in Vietnam. As a result, the average annual growth rate of global aquafeed production was 5.9% between 2006 and 2015 and it has been predicted to be at 3.3% in the period from 2016 to 2025 (Salin et al., 2018: 129). Overall revenues of the aquafeeds sector reached 107.82 bil. USD in 2017 (Giri, 2017: 8).

Vietnam has 130 aquafeed factories with production at 3.77 million tons that respond 85.6% of domestic aquafeed demand. Of these, 96 manufacturers produce pangasius feed, and 68 and 38 manufacturers produce black tiger shrimp feed and white shrimp feed respectively. Thus, the rate of import for aquafeed has been decreasing in recent years, but, the market for aquafeed is dominated by international companies. This applies in particular to the shrimp sector, where 100% of the feed market is covered by international enterprises (VASEP, 2018). The demand of aquafeeds in Vietnam is increasing and manufacturers are mainly focusing their production on the main aquafeeds for shrimp and pangasius. Aquafeed production in

Vietnam could be described as an oligopolistic structure, in which five multinational companies occupy the market of shrimp feed production, each one with a capacity of 20,000 to 40,000 tons per year (Hung and Huy, 2007: 343). The locations of input supply factories as well as the locations of interviewed farmers and input agents are shown in figure 18.

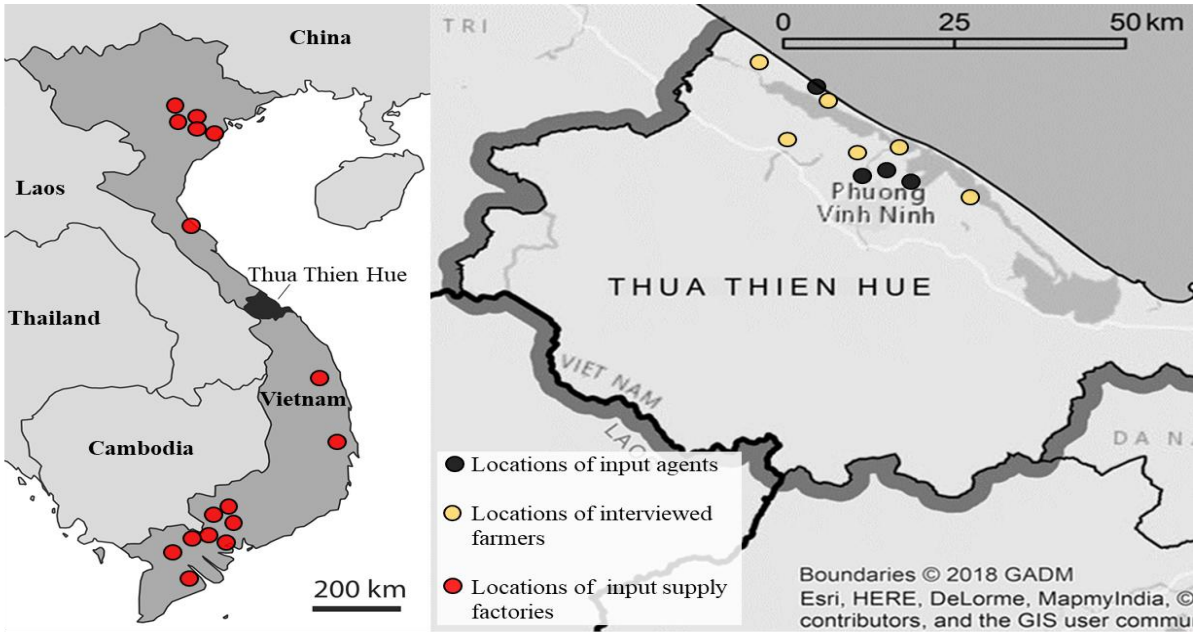

Figure 18: Location of interviewed farmers, input agents and input suppliers factories

Source: Own adaption

Using industrial feed is a high cost burden for shrimp farmers as it accounts for 60% to 80% of production cost. The trading between aquafeed manufactures and farmers is facilitated by intermediate agents. Each manufacturer operates their own networks of sub-dealers and agents who link manufacturers with farmers. The relationship of agents and farmers tends to be informal, based on personal trust and payments in cash, as well as frequent informal loan provision by dealers to farmers (Hung and Huy, 2007: 344). As farmers typically produce small scale and lack capital, they do not directly link with the input suppliers for feed and medicine. Accessibility of farmers to such inputs depends on the network of dealers. Usually, farmers have only one source for their inputs and therefore almost no room to negotiate prices and ensure consistent quality of the supply (Sang and Thao, 2015: 34). In order to improve their position, farmers typically attempt to increase quality and volume of their output by improving management practices, using higher quality supply and maintaining higher water quality. These practices can be broadly described as process- and product upgrading, while functional upgrading among farmers (besides isolated efforts to self-produce fingerlings) remains almost non-existent. Typical barriers of upgrading for famers are lack of capital, lack

of appropriate skills and limited economic incentives to invest in upgrading (Ponte et al., 2014: 57, 59f).

Another important (government supported) measure of farmers to improve their bargaining position and profitability is the foundation of cooperatives. Horizontal coordination of cooperatives can contribute to the diffusion of expertise regarding production processes, ensure higher quality production and quality monitoring by adhering to common standards and improve bargaining power towards suppliers and wholesalers by aggregating volumes of input purchase and produce (Ha et al., 2013: 89). Ha et al. (2013) however have shown that the establishment of aquacultural cooperatives in Vietnam has met with mixed success. Intensive farming cooperatives have generally been more effective in improving farmer's positions as they more clearly contribute to reducing risk, are spatially less dispersed, engage in more advanced and more standardized production techniques and have a higher chance of successfully closing contracts with input suppliers and wholesalers (leading to a stronger vertical integration of value chains). Extensive farming cooperatives however have thus far not shown to be successful in closing contracts with commercial partners and feature little proactive support from the farmers. Government involvement has shown to be important in supporting cooperatives with infrastructure funding (Ha et al., 2013: 95f).

Based on stakeholder interviews, the interrelationships and strategies of farmers and dealers of input supplies as well as efforts to establish cooperatives in Thua Thien Hue province are outlined in the following sections.

8.6 Relationship between shrimp feed suppliers and white shrimp farmers in Thua Thien Hue province

White shrimp farming in the Thua Thien Hue province expanded during the last two decades from 258 tons in 1998 to 4,925 tons in 2017. The introduction of white shrimp production contributed to the increase in overall volumes as the white shrimp produces higher revenue and uses less space compared to the black tiger shrimp (*Penaeus Monodon*), the previously dominant type in shrimp production (General statistics office of Vietnam, 2018). The Thua Thien Hue province however features several disadvantages compared to locations in southern Vietnam, where shrimp production is concentrated as it has a smaller domestic market, relatively small farming area, a higher frequency of extreme weather events (which can destroy shrimp produce) and high distance to input suppliers and wholesalers (who are mostly located in the southern and northern part of the country).

The quantity of feed used in white shrimp farming depends on the culture season, the stocking density, the growth of white shrimp and the investment capacity of each farmer. In winter season, farmers will use approximately 10 to 15 tons for a pond area of 2,500 m^2 to 3,000 m^2. In the summer season, white shrimp farmers will reduce the quantity of feed. Generally, farmers are inclined to buy as much feed as their economic situation allows because shrimps grow larger the more commercial feed they receive, which will in turn increase revenues of farmers.

Shrimp feed is provided by agencies that are located throughout Thua Thien Hue province. However, almost all farmers buy their feed from the agency which is located closest to them which is not only due to higher convenience of spatial proximity but also due to the established relationships between the agency and the local community. Agents of input suppliers sell their feed usually by providing a capital loan which the farmers typically pay back after harvest and in some cases (if the harvest was not profitable) even later. The possibility to obtain capital from agents and pay back flexibly is essential for most farmers in order to operate. A farmer who can pay for the input up-front will get a significant discount in this context. An interviewed agent commented on the trust-based relationship with farmers as follows:

> "*My industrial feed agency was established 7 years ago. Before that farmers bought feed from agencies in Hue city. After my business was established, almost all farmers in my community came to my agency to buy feed. This is because we live in the same community, so it is more convenient for them to transport the feed from my agency to their ponds, than if they had bought from agencies in Hue city. Farmers can immediately get feed whenever they order and they can pay me the money when they have it. We are neighbours, or we have known each other and lived together in the same community for a long time. The price of feed is usually the same across agencies and my agency provides a lot of support to producers during the culturing process. As a result, 90% of the producers in my community are buying feed from my agency. The rest are buying feed from agencies in Hue City.*" (Industrial feed agent in Phong Hai commune, Thua Thien Hue province)

Farmers who take loans from an agent are bound to use the same agent until they paid back the loan even if their prices exceed those of other agents. This can result in farmers taking loans elsewhere (such as middlemen) in order to pay back the agent, resulting in strong one-sided dependencies. Also, using different feed from another agent may be incompatible with

the production methods and technology which a farmer uses at a given time. An interviewed farmer explained the conditions as follows:

> "*The price of shrimp feed is listed by each agency. Farmers cannot negotiate on the price. The price only varies if the farmer pays back the money when they buy the feed or after they harvest and sell the shrimp. Agencies will give generous discounts if farmers pay money when they buy. For instance, if I buy one 10kg bag of shrimp feed, the price will be 14,08 USD per bag if I pay immediately, and the price will increase by 0,22 USD per bag if I pay after harvesting.*" (Farmer from Phong Hai community, Thua Thien Hue province)

Risk management strategies of agents towards insolvent farmers include flexible repayment times, requirements for deposits and also the liquidation of farmer's ponds in case they cannot pay back. As an agent described the conditions of payment:

> "*Only 2% or 3% of farmers can pay cash when they buy the feed. The rest always pay after harvesting. I allow farmers to buy on credit. If I did not do it this way I would not sell my feed. The farmers in my community are very kind and we have good relationships. I keep a record book and have their signatures in the book. Thus, I can get them to pay money. If they are not able to pay me back long-term, then they can sell their shrimp ponds to me to settle their debts.*" (Industrial feed agent, Phong Hai commune, Thua Thien Hue province)

Summing up these statements, trust between agents for feed input and shrimp farmers is based on the implicit commitment of farmers to pay their depts and the willingness of agents to provide loans based on flexible conditions. These relationships are based on previous track record and personal connections (rather than formalized processes) and tend to be stable in the long term. However, the characteristics of these relationships result in high asymmetry of risk as well as high dependence of farmers on agents: Because most farmers pay their input only after harvest, they are bound to be in a long-term relationship with one single agent as farmers can change agents only after paying back all loans (not paying back at all will result in farmers not obtaining loans in the future). This also applies if the quality of feed input is insufficient (which may result in low-profit yields). Hence, farmers with low capital at their disposal are entrenched in a position as permanent deptors, facing disproportionate risk and dependence. At the same time, farmers with enough capital to purchase relatively large amounts of feed and pay up-front are in a self-reinforcing competitive advantage. In general however, dependence of farmers on agents is high, while agents outsource economic risk to farmers.

Besides lacking capital, another important reason of current dependencies of farmers lies in the current setup of infrastructure for delivery and transport. Farmers usually require the delivery of input in small quantities (one ton for about ten days for a pond area of about 3.000 m^2) and keep on purchasing input several times per season rather than purchasing input once for the whole season. This is because farmers usually have insufficient storage capacity. Hence, they can only transact with agents in close proximity to farmers, who are able to permanently deliver feed input, otherwise transport costs would be too high for small quantities. This in particular disconnects farmers in central Vietnam (such as the Thua Thien Hue province) from input manufacturers because feed supply is produced in south and north Vietnam. Hence, delivery to central Vietnam is thus far exclusively handled through a network of agents. The one-sided dependency of farmers from agents and the lacking leverage to bargain for lower input costs has detrimental effects on the sustainability of production techniques and quality of produce because in order to reduce production costs, farmers have only the option of increasing the stocking density beyond the government regulation of 100 to 150 white shrimp seeds per m^2 to densities of up to 350 seeds per m^2. At such high density farmers may be prompted to illegally use aquatic medicines in order to ensure the health of the shrimps during the production period.

Since their individual capacity of improving their bargaining position is limited, the seemingly obvious option of farmers is to collectively organize. As described above, cooperatives have been founded elsewhere in the country already with mixed success and the question remains if and under which circumstances cooperatives can help improve the position of farmers in the central Vietnamese Thua Thien Hue province under the local conditions.

8.7 The potential of cooperatives in improving farmer's bargaining position

The main issue from the perspective of farmers is that in terms of sourcing input for shrimp produce, they are in a position of "rule takers" as they only have the choice of accepting the conditions which are determined unilaterally by input suppliers and agents. Given the high proportion of input supply among the total production cost, it is especially the possibility of bargaining for lower prices which would improve the conditions for farmers. Manufacturers prefer to sell input supplies through agents and are generally unwilling to directly sell to individual farmers because they lack the capacity to manage such relationships on an individual level. Most importantly, it is difficult for input suppliers to assess the solvency of farmers. Regarding the Thua Thien Hue province, this problem is exacerbated by high

geographical distance between farmers in central Vietnam and input factories which are located in south and north Vietnam (see also figure 18).

In an attempt to improve bargaining positions of farmers, the Vietnamese government promoted the foundation of cooperatives since 2012, when the cooperative law was reformed to determine that cooperative decisions are being made by independent members (National Assembly of the Socialist Republic of Vietnam, 2012). Cooperatives have been established in 61 out of 63 provinces and cities of Vietnam as a measure to centralize resources and bargaining processes (Hoai, 2019). Also in the Phong Hai commune in the Thua Thien Hue province, two cooperatives were founded with 56 ha of white shrimp farming area in 2013 (Doanhnghiepvn.vn, 2020). These efforts have been part of the "New Rurality" (Nông Thôn Mới) programme of the Vietnamese central government. However, participation in cooperatives has thus far been relatively unsuccessful. In the Phong Hai commune of Thua Thien Hue province, only 13 white shrimp farmers have joined a cooperative thus far and the cooperative structure has failed to negotiate better supply prices for the farmers. Several reasons deter aquacultural cooperatives in Thua Thien Hue province from operating effectively:

First, their establishment is conducted in a "top-down" fashion in which the requirements and actual demand of farmers are insufficiently taken into account. The main driver of establishing cooperatives in Thua Thien Hue province was not the initiative of farmers but the performance indicators of the "New Rurality" programme, in which the establishment of cooperatives was one of 19 binding indicators based on which local governments were evaluated in their efforts to achieve "New Rurality" (Deputy Prime Minister of Vietnam, 2009). The financial and infrastructural resources of cooperatives, such as transportation capacity and storage space, are insufficient to effectively support farmers. The government would determine a pond area of the cooperative but the farmers would need to invest in canvases water pumps and wastewater systems by themselves up-front, which (due to their lacking access to capital) ended up in a mostly idle effort.

Second, and this is connected to the first point, the farmers themselves engage in highly individual production techniques which are based not on (formal) sector standards but based on their own experience, capital and labour available. This results in highly individual needs for farmers regarding volumes and types of feed input. High geographical dispersion of farmers also contributes to a relatively low willingness and capacity of farmers to coordinate their purchasing processes of inputs. The head of Hai Dong village explained the difficulty of newly establishing a local cooperative due to high initial investments:

"*White shrimp farming cooperatives were planned by the local government. Based on the concept, the farmers will prepare white shrimp ponds by themselves and all members of the cooperative have to contribute money for building a common infrastructure such as wastewater treatment ponds, electricity systems and also for providing basic capital of the cooperative. These investments are high while white shrimp farming is not always successful. Therefore, the farmers were not willing to participate in the cooperative*."

An interviewed representative of the Phong Hai commune also pointed out the stability of existing relationships as reason for the difficulties of newly organized cooperatives:

"*Cooperative establishment is intended to help white shrimp farmers to improve input and output conditions. However, the farmers have had long-term relationships with local input agents and middlemen and these persons are quite reputable*."

Contrasting the efforts in Thua Thien Hue province, one relatively successful cooperative is located in the southern Vietnamese Ca Mau province. They managed to negotiate formal agreements directly with input suppliers and wholesalers, circumventing the intermediate layer of agents. As a result, the farmers can buy shrimp seed, shrimp feed, aquatic medicine at lower prices compared with farmers who are not members of the cooperative. In this scheme, input suppliers also support the farmers in capacity building for more effective production and use of their supplies (Tepbac.com, 2020). The cooperative model in Ca Mau province divides the capital payments for input supplies into sequences of 25% which farmers pay up-front from their own capital, 35% which farmers receive as an interest-free loan and 40% which farmers borrow from a bank (Tepbac.com, 2020). This payment scheme, in combination with collective purchasing and circumventing intermediate layers allows for prices which are 10% to 20% lower compared the currently predominant modes of interaction between farmers and agents of input supply. A representative of the Cai Bat cooperative in Ca Mau province commented the success of the cooperative as follows:

"*Initially, local shrimp farming was organized individually at everyone's own preference which resulted in low productivity, inconsistent quality and unstable prices. After establishing the cooperative in 2012, members of the cooperative were supported by the local government in installing technical infrastructure. Successfully closing agreements directly with input suppliers and wholesalers were critical in the cooperatives success and allowed farmers to source at relatively lower prices while allowing them to sell at prices above market average."*

One important differentiator of success and failure of cooperatives is the initiative of farmers, but also the engagement of local governments in terms of reaching out to farmers and convincing them of the benefits to join the cooperative. Also, the capital expenditure for the necessary infrastructure and brokering an agreement with suppliers and wholesalers are critical areas in which local government engagement can decisively contribute to the successful establishment of a cooperative. The empirical findings are discussed within the concept of "upgrading" in the following section.

8.8 Discussion and Conclusion

As other studies (such as Pickles et al., 2006 and Dannenberg et al., 2016) have pointed out, the options of entering upgrading trajectories are limited when an actor is situated in a "captive" relationship with suppliers and buyers and this holds true for this study as well. The main option of white shrimp farmers in order to increase profitability is to improve the efficiency of overall production processes, thus, achieve *process* upgrading. Whether farmers can individually succeed in improving processes depends significantly on the capital which they have available (which determines whether they can install their own storage capacities, invest in intensive farming or purchase supplies at a discount). Thus, on an individual level, differences in available capital are also strong determinants whether farmers are positioned to achieve process upgrading, improve their profitability, reduce their economic risks and establish long-term competitive advantage over less affluent farmers in the process (while their relationship with suppliers remains largely unchanged). One focus area in which local and provincial policy makers could more strongly engage in are efforts to reduce the self-reinforcing effects which result from disparities in available capital.

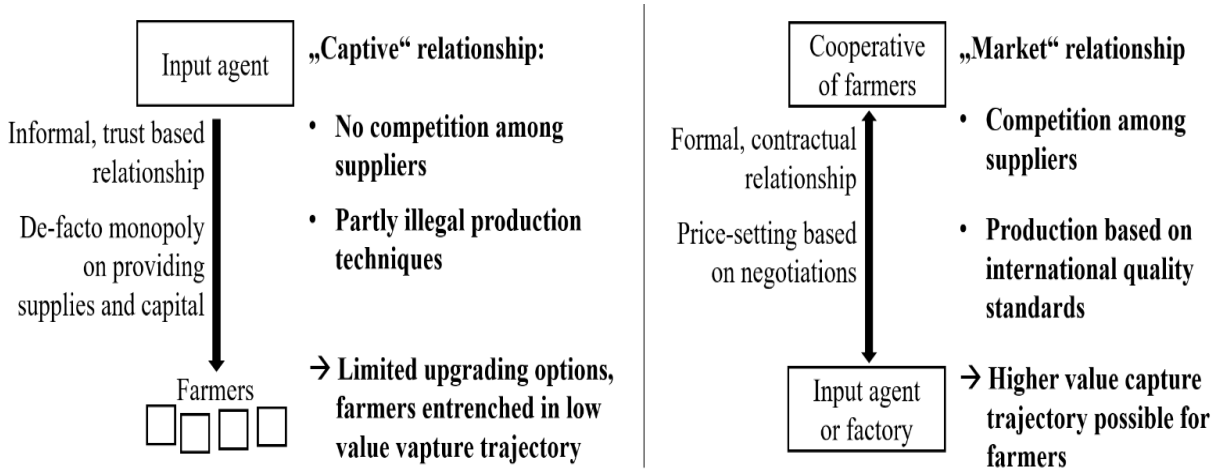

Figure 19: Upgrading options for farmers and the potential of cooperative farming

Source: Own adaption

On the collective level, the findings of the empirical material for this study confirm some of the difficulties which have been identified also by Ha et al. (2013) for the Mekong Delta. The individual production practices, geographical dispersion of farmers, low access to capital for infrastructure investments and low capacities of farmers to effectively coordinate demand and align production practices are among the most important barriers of successfully operating a cooperative in Thua Thien Hue province. Capacity building among farmers is needed in order to familiarize them with organizational management, finances and strategic development. One other important point is that relationships between farmers and supply agents are trust based and personal. These routines of transaction and choice of business partner are difficult to replace by a formalized contracting structure with which farmers are generally unfamiliar.

On the supply side, the main use of a collective organization could be to align input demand, provide storage space to allow for high-volume purchases and negotiate contracts directly with supply manufacturers. Achieving these process improvements may require significant and perhaps more proactive moderation and investment by local and provincial governments. This type of government moderation has also been outlined by Kalogiannidis (2020) as an important pre-requisite for the successful organization of agricultural cooperatives (Kalogiannidis, 2020: 461). Initiatives to self-organize should ideally come from proactive farmers themselves and can be supported by the government which can help facilitate contacts and contract negotiations, provide a platform for horizontal coordination and (perhaps most importantly) provide capital in the form of subsidies for infrastructure investments like storage space as well as zero-interest loans which can allow farmers to pay for their input supplies up-front. Such initiatives could (but are not guaranteed to) improve the bargaining power of farmers compared to input suppliers and middlemen and help farmers move towards more “market”-types of supplier-buyer relationships, the benefits of which are summarized in figure 19. Efforts to establish a central fund to finance the up-front investments of cooperative farming are, in fact, currently underway in the Thua Thien Hue province. Also, efforts for stronger vertical integration are underway as the cooperative in the Phong Hai commune attempts to establish linkages with a local food processing company.

Conceptually, the empirical results of this study indicate that the manner of existing relationships constrain the upgrading options available, as farmers do not feature the expertise nor the capital to meaningfully engage in functional upgrading. While collective organization may seem as an obvious step forward for farmers to improve their position, they typically cannot achieve this without the significant aid of external resources which would typically need to come from state actors and requires willingness of farmers to engage in horizontal

coordination. Hence, the successful establishment of horizontal coordination may need to be preceded by a comprehensive communication process in which the benefits of coordination for the individual farmer are made clear. Also, the provision of capital for infrastructure investments is critical for success. If farmers collectively organize their purchasing process based on competitive bidding, it could initiate competition among suppliers which would potentially improve the farmer's bargaining position. In such a manner, their relationship with suppliers might no longer be "captive" but it could transition towards a mode described as by Gereffi et al. (2005) as "market". Such a mode features lower power asymmetries and it would be typical for a relatively even number of buyers and suppliers who negotiate prices based on level competition in a context of low complexity-transactions (Gereffi et al., 2005: 90; figure 19).

This study focused on the relationships of input suppliers and farmers in shrimp production in central Vietnam with the aim to identify the characteristics of those relationships and their role in attempts to improve the competitive situation of farmers. Existing initiatives to upgrade the production processes of farmers by forming cooperatives have thus far not been successful in the Thua Thien Hue province, which is mainly due to lacking capital investments in infrastructure and low willingness of farmers to coordinate more comprehensively. These deficiencies point to a need to engage in a communication process to identify and align production processes and input demand. This is a prerequisite in order to successfully close contracts with input manufacturers, achieve process upgrading and higher vertical integration of the value chain. Formalizing relationships between farmers and input suppliers in stronger vertical integration of value chains will contribute to standardization, higher transparency and quality increase of production processes which in turn could open new (higher value) export markets to farmers, contributing to the overall development of Thua Thien Hue province.

Regarding the upgrading discussion within the GVC-framework, this paper confirms the constraints faced by "captive" suppliers in engaging in functional upgrading already identified in previous contributions. The article argues that for the successful horizontal organization of smallholders, which would *empower* them to move towards a more "market"-like type of value chain governance, the simultaneous interplay of socioeconomic and geographic factors as well as institutional framework conditions can be decisive. This refers in particular to social and geographic proximity among smallholders as well as functional government support mechanisms for financing and communication as key requirements for successful horizontal organization. These factors have been absent among smallholders in Thua Thien

Hue province, which can partly explain their failure to self-organize. However, since this article is based on an empirical study conducted in one location, the findings cannot be generalized as they are and would benefit from further empirical validation in future studies.

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9 Discussion and conclusion

This section will outline the answers to the research questions, which were illustrated in the papers in section 5-8. The main findings can be summarized as follows.

i) How has white shrimp farming developed in Central Vietnam in recent years?

Undoubtedly, aquaculture in general and shrimp farming in particular has contributed to a socio-economic development in Vietnam in general and in Central Vietnam in particular. Vietnam is one of the countries that has significantly contributed to the world's fisheries production in terms of production and export aspects. Specifically, shrimp farming has become popular in many provinces to support socio-economic development, hunger eradication and poverty reduction. The area for shrimp farming has increased in recent years, with black tiger shrimp and white shrimp being the main species. Although the area for white shrimp farming is lower than for the black tiger shrimp, white shrimp production volumes are still higher.

In addition, white shrimp farming is considered as a new livelihood in coastal communities. This activity not only attracts the participation of smallholder farmers, but also enterprises and companies. White shrimp farming has two seasons, including summer season and winter season, each season of which is fourth months. The winter season is the main season while it combines many advantageous conditions such as high price, low likelihood of disease, low rate of losses. Normally, white shrimp is sold after three months of farming and it is consumed trade in both domestic market and international market as well.

Governments at different scales offer support for farmers in management, monitoring and consultancy, but the acceptance and uptake by farmers are insignificant and almost all farmers continue to make decision in production and consumption by themselves. The decision making in production completely depends on the farmer's production conditions such as stocking density, stocking time, white shrimp farming area in each season and the use of inputs. While selling time is different between farmers, depending on the size, health and prices of the shrimp as well as, the weather conditions. Moreover, decision-making in distribution not only depends on the farmers, but also on other actors in the chain. Farmers only decide on selling time and selling quantity of white shrimp when they believe that their shrimp are healthy or strong enough. Yet, they cannot influence the selling price, with their bargaining power being limited in this situation as most the white shrimp price is decided by buyers.

As a result, cooperatives were established to support white shrimp farmers in providing inputs and connecting them to output markets. Cooperatives are considered as a means of production process upgrading, which can improve bargaining power of farmers, reduce input cost and add value to white shrimp. However, the emergence of cooperatives has not been embraced by local governments and farmers because they could not create positive changes in white shrimp production due to a lack of capital and willingness to participate by farmers.

Besides the benefits from white shrimp farming, the farmers are faced with many challenges in production, such as quality of white shrimp fingerling, changing technical knowledge, use of aquatic medicine, water pollution, treating diseases, monopoly in buying, and impact of climate change, which can cause white shrimp farming to fail and may result in the loss of livelihoods for farmers. As a result of growing challenges, more farmers will fail. And while different government levels and farmers have tried different solutions to cope with these challenges, they are not efficient enough or only temporary, so that farmers even believe that success or failure in shrimp farming is a matter of good or bad luck. It can thus be concluded that the disadvantages of farmers not only originate from their position in the shrimp value chain, but also from their own production activity.

ii) What are differences between white shrimp marketing channels and how is capacity of white shrimp farmers to respond to the standards of these channels?

The research results also indicated that white shrimp flow includes three marketing channels; *first*, farmers sell their white shrimp to middlemen, who sell it on to wholesalers in the Northern provinces of Vietnam, before it is sold to domestic consumers or exported to China; *second*, farmers sell their white shrimp to local wholesalers in Thua Thien Hue province, after that white shrimp is sold to retailers for consumption within the province; *third*, white shrimp of farmers are bought by processors for are exporting to international markets. The first scenario is the main marketing channel of white shrimp by quantity of white shrimp, which makes farmers dependent on middlemen.

Although white shrimp farmers can sell their product via three channels, on two of them there are still access barriers remaining. Specifically, wholesalers and retailers in Thua Thien Hue province cannot buy a lot of the produced white shrimp from farmers as they do not have the capacity to sell all of them in local markets. Meanwhile, processors can buy high quantities of white shrimp at high prices but the white shrimp also has to meet their requirements on quality standards. Responding to these requirements is a real challenge for the shrimp farmers, which includes infrastructure for transport and payment transfers, risk management and overcoming established production routines. White shrimp farmers cannot or do not want to

change their traditional production habits such as using antibiotics and cash payment in transactions, while transport and pond systems are not suitable for modern production to meet the requirements of the processors.

Additionally, middlemen do in some aspects have more competitive advantages than other buyers: *first,* they can buy almost any quantity of white shrimp at higher prices than other competitors, except processors in the summer season; *second,* they do not have any requirements for the product, all types of white shrimp will be bought at different prices; *third,* they can buy white shrimp whenever the farmers want to sell them and the payment will be done immediately after harvesting; *fourth,* middlemen are often willing to lend money to farmers and wholesalers in the Northern provinces which contributed to establishing strong links between them. All of these advantages contribute to a reduced motivation of farmers in responding to standard requirements of processors.

iii) How is power distributed and exerted among the main actors in the white shrimp value chain and how does this impact white shrimp farmers?

Input suppliers, white shrimp farmers, middlemen and wholesalers in the Northern provinces of Vietnam are the main actors in the white shrimp value chain in Central Vietnam. White shrimp famers play an important role in the white shrimp value chain by producing and providing high quantities of white shrimp to consumers. However, their contribution is not reflected in gaining benefits compared with other main actors in the chain. Middlemen are main actors in the governance of the value chain and have a lot of power to affect other actors in the chain.

The research findings contributed to showing that middlemen are not only experts, connectors or guarantors, but do also function as representatives of wholesalers in white shrimp trading. Besides, middlemen not only support farmers by lending them money or dealing with their products, but they also lend money to wholesalers, as well as providing information of the farmers to input suppliers. The crucial role of middlemen has developed over time, while farmers have always belonged to a disadvantaged group.

Although the middlemen always had more advantages than the producers, their contribution in white shrimp trading cannot be negated when almost all white shrimp production of farmers is bought by the middlemen and output markets for white shrimp farmers become more difficult to access without the participation of middlemen. However, their participation also causes a growing gap between farmers and wholesalers, and between farmers and the

processing plant. Yet, middlemen continue to exist while there are enough determinants, such as power, territorial embeddedness, reputation and financial capacity.

Middlemen and wholesalers have strong relationships as both of them can benefit from doing business with each other. As one actor cannot operate without the other it is even fair to argue that these to actor groups are co-dependent. This relationship improved competitive advantages of middlemen in controlling white shrimp farming in Central Vietnam, which led to the dependency of farmers in selling their products and in being limited in exercising their right to choose whom to sell to. On the other hand, white shrimp farmers also have binding relationships with input suppliers, especially shrimp feed suppliers, while shrimp feed suppliers are always willing to sell feed to farmers on credit. This way, farmers become dependent, as they are debtors of the suppliers who become to dominate and control the relationship. Analysing these relationships it becomes clear that informal relationships and trust are determinants in transactions among actors, in which farmers always have lower power than other actors in the value chain. This causes low bargaining power, high dependence and high vulnerability of farmers in white shrimp farming in Central Vietnam.

9.1 Contribution to theory

Through empirical research on the white shrimp value chain in Central Vietnam, the important role of middlemen for the flow of products, financial support for farmers and information exchange became clear. This result shows is similar to other research results, which concluded that middlemen took over different functions, such as experts, guarantors and financial capital lenders of producers (Russell, 1987; Biglaiser, 1993; Biglaiser & Friedman, 1994; Crona et al., 2010; Zamroni & Yamao, 2012). However, these studies focus on the relationship between middlemen and producers, while the relationships with their buyers and input suppliers of white shrimp farmers are still explored. Therefore, this empirical research can add new roles of middlemen for the theory system, specifically, as information providers to wholesalers and input suppliers and representatives and financial capital lenders of wholesalers. Consequently, “captive” and “relational” are considered to best describe the linkages between middlemen and white shrimp farmers while “relational” is useful to describe the linkages between middlemen and wholesalers. Therefore, middlemen in white shrimp farming in Vietnam have more nuanced relationships with different actors in the chain.

The diversity in the roles and functions of middlemen contributes to increasing their power in value chain governance. The more power they have, the more they benefit; thus, they became dominators and controllers of the chain, and decision-making and benefits of farmers will be

affected by the middlemen. The results also indicated that in the context of developing vertical coordination, the functions of the middlemen can be limited in the governance dimensions of the value chain (Vik & Kvam, 2018). However, the status of the middlemen is remaining the same and is even improving through elements, such as power, territorial embeddedness, reputation, financial capacity, and, most importantly, highly informal transactions requiring the use of middlemen for domestic trade.

On the other hand, the development orientation of the Vietnamese Government supports the vertical coordination in shrimp farming, which led to the emergence of new processing plants. This is a good solution to enhance the value of products and ensure output market for farmers. The accessibility of farmers to processing plants depends on quality requirements of processing plants and response abilities of farmers. However, the study also showed that the more standards a processing plant has, the less ability farmers have to respond. Thus, vertical coordination in the white shrimp value chain is influenced by the gap between processing plants and farmers, which is a result of limited infrastructure, production routines and the existence of middlemen. As a consequence, the empirical findings can support that limited infrastructure, production routines and the existence of the middlemen are three elements to prevent the establishment of vertical coordination in white shrimp farming in Central Vietnam.

The relationship between actors in the value chain is very important to guarantee the operation of the chain. Many researches illustrated that satisfaction, trust and commitment are key elements of these relationships (Friman et al., 2002; Hennig-Thurau et al, 2002; Kwon & Suh, 2004; Ulaga & Eggert, 2006; Fritz & Fischer, 2007). Thus, levels of satisfaction, trust and commitment will have significant impact on stable and sustainable relationships between actors in the value chain. In line with satisfaction, trust and commitment, the empirical findings suggest that “binding” is another factor in building stable relationships. Binding between actors in the chain is a result of buying on credit or lending money without interest. As observed between white shrimp farmers and input suppliers offering feed on credit or middlemen, respectively. Binding creates dependency of farmers on both actors. Importantly, this financial binding has led to reduced power of white shrimp farmers in relationships with input suppliers, even though as buyers of supplies they would normally be in a position of more power.

9.2 Limitation of the research and further research

The research analysed many aspects of the white shrimp value chain and provided substantial findings. Yet, some limitations remain. *First*, the study could not analyse all actors of the value chain such as wholesalers in Northern provinces and processors in Vietnam. They are also important actors in the chain, but, it was not possible to access them due to their large distance from the research site and other actors being reluctant to share information about wholesalers in the Northern provinces, as this relates to their competitive advantages. Representatives of processing plants rejected to be interviewed. Therefore, information from these actors could not be presented in the research. *Second*, although white shrimp in Central Vietnam was exported to international markets, the research did not consider the impact of international trade such as standards, regulations and barriers on the value chain. Since the research focused mainly on shrimp farmers and some involved actors, it has not yet drawn the whole picture of white shrimp value chain. Hence, further research should concentrate on other actors in the chain, as well as looking for solutions to upgrade the white shrimp value chain and improve power of farmers in the chain.

Zusammenfassung

Weiße Garnelen haben sich sich zu einer wichtigen Handelsware in der vietnamesischen Aquakultur entwickelt. Die Zucht und der Handel weißer Garnelen erschließt nicht nur eine Einkommensquelle für Kleinbauern, sondern zieht auch Unternehmen und andere Akteure entlang der Wertschöpfungskette an. Die wertschöpfenden Aktivitäten in der Zucht weißer Garnelen haben zu einer Veränderung der wirtschaftlichen Situation der Beteiligten und zum sozioökonomischen Wachstum der Küstengemeinden im Allgemeinen beigetragen. Geringe Zugänglichkeit zu Märkten des Hochpreissegments, geringe Verhandlungsmacht und eine hohe Abhängigkeit von Zulieferern und Zwischenhändlern sind jedoch bestehende Probleme der Landwirte, die die wirtschaftliche Effizienz der weißen Garnelenzucht sowie die Entwicklung der Wertschöpfungskette im Allgemeinen beeinträchtigen.

Die vorgestellte Forschungsarbeit untersucht verschiedene Aspekte der Zucht weißer Garnelen wie die aktuelle Situation der Produktion und des Konsumssowie Vorteile, Nachteile und Entwicklungsstrategien in der Zucht. Die Arbeit basiert auf einer qualitativen Analyse der Wertschöpfungskette weißer Garnelen in Vietnam. Die Ansätze der Wertschöpfungskettenanalyse gründen theoretisch auf den Konzepten globaler Produktionsnetzwerke und globaler Wertschöpfungsketten (z. B. Gerreffi et al., 1994, 2005, 2016; Humphrey und Schmitz, 2001; Dicken, 2015; Coe und Yeung, 2015). Gereffi et al.‘s (2005) Ansatz zur Unterscheidung von fünf Arten der Governance und Humphrey und Schmitz‘ (2002) Typisierung von vier Arten des Upgrading in Wertschöpfungsketten bilden den theoretischen Hintergrund dieser Studie.

Ziel der Arbeit wares, Informationen über den aktuellen Status und die Nachhaltigkeitsprobleme in der Garnelenzucht, die Unterschiede zwischen den Vermarktungskanälen und die Reaktionsmöglichkeiten der Bauern auf die Anforderungen der einzelnen Kanäle zu liefern. Zusätzlich werden die Machtverhältnisse zwischen den Akteuren innerhalb der Wertschöpfungskette, sowie die Auswirkungen der Beziehungen auf die Landwirte skizziert. Qualitative Forschungsmethoden wurden angewandt, indem 24 halbstrukturierte Interviews durchgeführt wurden. Zu den befragten Stakeholdern gehören Landwirte, Lieferanten, Zwischenhändler, Großhändler, Einzelhändler und relevante Vertreter lokaler Regierungen. Außerdem wurden Sekundärdaten aus sozioökonomischen Berichten der verschiedenen Regierungsebenen und verwandten Forschungen gesammelt. Die Provinz Thua Thien Hue in Zentralvietnam wurde als Fallstudie ausgewählt.

Diese Arbeit beginnt mit einer Einführung in das Thema der Welternährung, derglobalen Bedeutung der Aquakultur und der Darstellung der Relevanz von

Wertschöpfungskettenanalysen. Darauf folgend, werden der Rahmen der Wertschöpfungskettenanalyse, die Dimensionen der Governance und des Upgradings sowie die Wertschöpfungskette der Agrar- und Ernährungswirtschaft, die vietnamesische Aquakultur in Bezug auf Entwicklungsprozesse und Verteilungsproblematiken sowie die Forschungsmethodik vorgestellt, bevor die empirischen Ergebnisse, die Diskussion und die Schlussfolgerung dargestellt werden. Die Forschungsergebnisse werden in vier eigenständigen Papern (Kapitel 5-8) dargestellt, die folgende gemeinsame Merkmale aufweisen: Die Forschung konzentriert sich auf Kleinbauern in der Branche der Aufzucht weißer Garnelen; der theoretische Ansatz globaler Produktionsnetzwerke und globaler Wertschöpfungsketten wird für die Analyse verwendet; Governance-Dimensionen sind ebenfalls eine theoretische Betrachtungsweise, die während der gesamten Forschung verwendet wird; außerdem prägen informelle Transaktionen und informelle Beziehungen häufig die Wertschöpfungskette von weißen Garnelen und sind somit integraler Bestandteil der empirischen Arbeit.

Die Ergebnisse zeigen, dass das Export- und Produktionsvolumen von weißen Garnelen in Zentralvietnam seit 2002 deutlich gestiegen ist. Die Zucht von weißen Garnelen erfordert hohe Investitionen und gleichermaßen kann sie den Landwirten vergleichsweise hohe Einnahmen bescheren; normalerweise können die Landwirte Gewinnmargen von 4,5 bis 10% erzielen. Allerdings beeinträchtigen mangelndes Fachwissen auf Seiten der Landwirte, geringe Verfügbarkeit relevanter Infrastruktur, fehlender Zugang zu Kapital und traditionelle Produktionsroutinen der Landwirte die Nachhaltigkeit der Aquakultur sowie die Grundsicherung der Kleinbauern. Das betrifft zum einen die Qualität der Garneleneier, sich schnell veränderndes technisches Wissen, Einsatz von Wassermedizin, Wasserverschmutzung und die Heilung von Krankheiten. Darüber hinaus besteht eine Abhängigkeit der Landwirte von Input-Lieferanten, insbesondere von industriellen Futtermittellieferanten, da die Landwirte oft deren Schuldner sind. Gleichzeitig kontrollieren Zwischenhändler den Markt für weiße Garnelen und der größte Teil der vietnamesischen weißen Garnelenproduktion wird über sie gehandelt, bevor er an die Verbraucher oder Verarbeiter gelangt. Obwohl die Bauern theoretisch Zugang zu den Verarbeitungsbetriebenhaben, um ihre eigene Wertschöpfung innerhalb der Garnelenzucht zu verbessern, erschweren internationale Standards diese Art von direkten Geschäftsbeziehungen. Der Wechsel von informellen Beziehungen zu formellen Beziehungen wird durch die Kluft zwischen den Qualitätsanforderungen der Verarbeitungsbetriebe und der Fähigkeit der Bauern, sich an diese Anforderungen anzupassen, eingeschränkt. Daher ist die Auswahl von Zwischenhändlern für die Landwirte derzeit die beste Lösung für den Zugang zu den Absatzmärkten. Diese Entwicklung führte

dazu, dass die Landwirte die Vorschriften zum Einsatz von Antibiotika in der Garnelenproduktion und zur Abwasserbehandlung ignorieren; stattdessen konzentrieren sie sich ausschließlich auf die Steigerung der Produktion und die Maximierung der Einnahmen, was als Versuch der Landwirte angesehen werden kann, ihre Nachteile zu kompensieren. Im Vergleich zu anderen Akteuren in der Wertschöpfungskette haben die Landwirte eine geringere Verhandlungsmacht und wenig bis gar keine Möglichkeiten auf die vertraglichen Beziehungen einzuwirken, so dass sie innerhalb ihrer Geschäftsbeziehungen nur reagieren statt agieren können. Die Beziehungen zwischen den Akteuren in der Kette werden üblicherweise auf der Grundlage von persönlichem Vertrauen, regelmäßiger persönlicher Interaktion und dem Austausch von schwer kodifizierbaren Informationen aufgebaut. Typisch für die Beziehungen zwischen den Akteuren ist ein hoher Grad an Informalität und dass diese informelle Zusammenarbeit häufig stärker ist, als die Bindung durch formelle Verträge. Lokale Regierungen und Landwirte haben verschiedene Strategien implementiert, um die Wertschöpfungskette in der Garnelen-Aufzucht zu verbessern. Dazu gehören beispielsweise der Erlass von Vorschriften für die Weiße-Garnelen-Zucht und die Gründung von Genossenschaften. Die Wirkung dieser Aktivitäten ist jedoch immer noch begrenzt und die Mehrheit der Bauern steht immer noch vor großen Problemen beim Zugang zu Vertriebskanälen und der Abhängigkeit von Zwischenhändlern und Lieferanten. Daher ist das Fazit der Arbeit, dass die Züchter von weißen Garnelen, um wettbewerbsfähig und ökologisch nachhaltig zu sein, ihre Produktionsverfahren ändern und die Produktqualität verbessern müssen, um den Anforderungen der nationalen und internationalen Märkte gerecht zu werden. Die lokale Regierung ihrerseits muss die Bauern stärker mit Infrastruktur, Kapital und Technologie unterstützen.

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Appendix

Appendix 1: Guidelines for semi-structured interview

A) QUESTIONS FOR FARMERS/PRODUCERS

I. General information

Sex, age, qualification of respondent, level of household.

Address, number of family member, number of labor in family

When/why did you start white shrimp farming?

What size of the shrimp farm did you start with?

What is the total farm size?

Do you own or rent your farmland?

Is it easy to get the farmland?

Other sources of income in addition to white shrimp farming

II. Mapping / describing the value-chain

+) Input factors.

What types of input factors do you use for producing? Where do you buy them? And their information (Capital, shrimp feed, fingerling, water, labour, land, power, equipment, other). Is all these easy to acquire?

How do you choose suppliers? Do you push the price at suppliers? Who will decide on the price?

What are linkages between you and other suppliers in production? Do you want to change your input suppliers or input factors? Why?

What are problems or risks in terms of costs, availability, reliability, climate change, government policy, etc affecting the inputs? Describe problem? What do you think could be done to solve the problem and/or what are you doing to solve the problem?

+) Production activities

How is stocking densities? Stocking time?

How long typically is the period from stocking to harvest (in months)?

What is the typical size of white shrimp when you sell them (kg)?

When are the main harvest/sales periods?

Who did control your production activities (quantity, quality and health)?

What is linkage between you and other producers in production and consumption?

Do you have any changes in production process (fingerling, feed, technique…)? Do you use any certification?

What are problems or risks in terms of skills, techniques and methods, information, government policy, climate change etc, influencing on your production activity? Describe problem? What do you think could be done to solve the problem and/or what are you doing to solve the problem?

+) Consumption and relationship

Who are your buyers?

How many percentage of the total volume did you sell to each buyer?

Are you always selling to the same buyer?

How many buyers are you selling to?

Have you changed the buyer?

How did you sell your white shrimp?

How much shrimp did you sell this year/season in terms of volume and sales revenues, and for what average price? And the changes compared to previous years?

Which linkage in the value chain is most important in setting prices for white shrimp? Who decided the price and volume? How do you/they decide on the price?

How many percentage of the total amount of white shrimp (that you harvest) are you typically unable to sell? Why?

How is the relationship between you and buyers? (Trust, stable/unstable, personal/impersonal, formal/informal, contracts/loose ties, negotiation, duration, etc.)? What potentials for improvements do you see in these relationships?

Where and how do you get information, regarding prices, demand, supply etc.

What did buyer comment on your products?

+) Cost-benefit

Could you tell about your main operating costs in this year? How is cost changing over for last year/season?

How much profit/value added do you have on average from selling farmed shrimp (per kg, per season or per year)?

What are your investments per year/season?

What did you do to reach highest profit?

What are problems or risks in terms of methods, information, logistics/transport, climate change, negotiating in selling white shrimp? Describe problem? What do you think could be done to solve the problem and/or what are you doing to solve the problem?

+) Policy

Have you ever gotten any supports from Government or NGOs to promote your activities? If yes provide details (when, what and from whom). If not, what sort of supports do you think would be most useful?

Is there any policies, which hinders you in growing your business, making more profit?

How do you think your livelihood and profits could be improved?

B) QUESTIONS FOR TRADERS, WHOLESALERS OR RETAILERS

I. General information

Sex, age, qualification of respondent, level of household

Address, number of family member, number of labor in family

Are you trader, wholesaler or retailer? When and why?

Other sources of income in addition to shrimp sales

II. Mapping / describing the value chain

Where did you buy white shrimp? Why do you know your suppliers? How do you choose your supplier?

How are these products processed?

How much farmed white shrimp did you sell and buy this year/season in terms of volume, and for what average price?

How have your sales volumes, sales revenues and price changed over recent years? And what are the main reasons for any fluctuations?

How do you estimate on farmed white shrimp?

Who are you selling to?

How many buyers are you selling to? What is final market?

Have you changed the buyer? How do you decide about the buyer? Who decides on price?

How many percentage of the total amount of white shrimp (that you buy) are you typically unable to sell? Why?

Why did your customers choose you?

How do your customers estimate on the following issues such as prices, quantity of supply, size, reliability of supply etc?

How is price of farmed white shrimp determined?

Which linkage in the value chain is most important in setting price for farmed white shrimp?

What inputs are you adding on the value of the products (processing, transport, fees, bribes, cost of lobar etc?

How is the relationship between you and suppliers or buyers (stable/unstable, personal/impersonal, formal/informal, contracts/loose ties, duration, etc.)?

What difficulties do you see in these relationships?

What potentials for improvements do you see in these relationships?

How do you maintain these relationships?

+) Cost-benefit

Could you tell about your main operating costs this year? How is cost changing over for last year/season?

How much profit do you have on average from selling farmed white shrimp (per kg, per season or per year)?

What are your investments per year/season?

Where and how do you get information, regarding prices, demand, supply etc.

Have you been any changes in your business recently? What are kinds of changes, and why did they occur?

What are problems or risks in terms of the list of issues such as Government policy or regulations, infrastructure, availability of white shrimp supply, quality of white shrimp, transport, white shrimp price and demand, climate change in your activities? Describe problem? What do you think could be done to solve the problem and/or what are you doing to solve the problem?

What are the main problems occurring in trade?

+) Policy

Have you received external help from NGOs, governmental, or other institutions?

Do you have any other comments to improve your activities, or how do you think your livelihood and profits could be improved?

Do you have any requirements for producers and their products?

C) QUESTIONS TO STAFFS OF VILLAGE/COMMUNE/DISTRICT/PROVINCIAL GOVERNMENT.

I. General information

Sex, age, position in organization, address

Function and task in organization

What are main livelihood activities in your locality?

What is the role of aquaculture?

II. Aquaculture activity

+) Production activity

What are characteristics of aquaculture production at locality?

How is development of aquaculture at locality?

What are advantages and disadvantages in aquaculture production at locality?

Which factors are impacting on aquaculture production? What do/did farmers do? What does/did government do? How is efficiency?

How is your evaluation on efficiency of aquaculture production?

What is the role of government in controlling and monitoring input factors and production process?

What did government support for farmers in aquaculture production?

Which policies have been influencing on aquaculture production? How important is aquaculture for your level of policy making? Do you have own decision possibilities or is it national policy?

Do farmers have any subsidies from government?

What is development strategy of government for aquaculture production? Do you have any platform, where can farmers get help?

+) Consumption activity

Do you know any channels for selling aquaculture products at locality?

How is your opinion about consumption situation of aquaculture products at locality?

Which factors are affecting on consumption of aquaculture products at locality? What did/do producers/buyers do? What does/did government do? How is efficiency?

What have producers changed in production and consumption in recent years?

What have buyers changed in consumption in recent years?

What did government support for producers and buyers in consumption activity?

What is the role of government in controlling and monitoring consumption activity?

What are solutions of government in consumption issue?

What should producers/buyers do to improve value added/profit?

What is development planning of locality in aquaculture sector?

Appendix 2: Complete list of interviewees

Code	Organization/ Interviewees	Duration of the interview	Date	Place
Farmer 1	Young farmers, rich experience, starting white shrimp farming in 2006	01:29:55	23/10/2017	Hai Phu village
Farmer 2	Rich experience, success in white shrimp farming	00:54:00	25/10/2017	Hoa My Village
Farmer 3	Old farmer, starting white shrimp farming in 2009	00:38:00	25/10/2017	Hai Phu village
Farmer 4	Rich experience in white shrimp farming, large white shrimp area	00:57:15	2/11/2017	Village 8
Farmer 5	Smallholder farmer, starting white shrimp farming in 2013	00:51:50	08/11/2017	Hai Thanh village
Farmer 6	Smallholders farmer, spontaneous farming, starting white shrimp in 2009	00:56:51	13/11/2017	Hai Dong village
Farmer 7	Poor farmer, starting white shrimp in 2007	00:30:53	15/11/2017	Hai Dong village
Farmer 8	Rich farmer, large farming are, starting white shrimp in 2009	01:06:18	19/11/2017	Hai The village
Farmer 9	Young farmer, starting white shrimp farming in 2008	01:05:14	07/12/2017	Dien loc village

Farmer 10	Old farmer, starting white shrimp farming in 2004	00:46:00	07/12/2017	Dien loc village
Head of village 1	Key informant, rich experience in white shrimp farming and fuller understanding on community	01:13:04	02/12/2017	Hoa My village
Head of village 2	Key informant, fuller understanding on community	00:49:19	02/12/2017	Hai Dong village
Head of village 3	Aquaculture management at commune level, rich experience in aquaculture sector	01:10:00	07/12/2017	Hai The village
Officer of aquaculture management at commune 1	Aquaculture management at commune level, rich experience in aquaculture sector	01:51:49	28/10/2017	Quang Cong commune
Officer of aquaculture management at commune 2	Aquaculture management at commune level, rich experience in aquaculture sector	01:36:39	02/12/2017	Phong Hai commune
Officer of Agricultural department of district	Manager and controller all activities in agriculture at district level	01:10:28	28/10/2017	Sia town
Officer of Provincial	Fisheries and aquaculture management at whole	01:56:11	14/01/2018	Hue city

Aquaculture Department	province, monitor and controller of aquaculture			
Officer of Provincial Fisheries Association	Manager of fisheries associations, rich experience in aquaculture	00:57:00	22/01/2018	Hue city
Officer of Extension center	Transferring technical knowledge and solving issues in aquaculture	01:23:00	04/02/2018	Hue city
Agricultural officer of provincial level	Manager and controller all activities in agriculture, issuing regulations, polices at provincial level	00:36:30	12/03/2018	Hue city
Middlemen	Big buyer, main actor in consumption activity	01:27:18	23/01/2018	Hai Nhuan Village
Retailer	Buying small quantity of white shrimp	01:23:00	23/01/2018	Hai Dong Village
Wholesaler	Buying small quantity of white shrimp	00:57:00	25/01/2018	Hai Dong Village
Input supplier	Providing white shrimp feed and medicine, starting selling in 2009	00:53:59	25/01/2018	Phong Hai commune

Declaration

I hereby affirm that I have prepared my present dissertation

Shrimp farming in Central Vietnam: A value chain analysis

Independently, without the unauthorized assistance of third parties and have not used any aids other than those specified in the dissertation.

I have marked as such all passages that are taken literally or in spirit from published or unpublished writings. Third parties were not involved in the content-material preparation of my dissertation; in particular, I did not use the support of a doctoral advisor for this purpose.

No part of my dissertation has been and will not be used in any other doctoral or postdoctoral procedures and has not yet served any other examination purposes.

I agree to the use of software for plagiarism detection.

Vorname Nachname
First name Family name Chung Van Nguyen

Datum, Unterschrift
Date, Signature _____