

BLACK TIGER SHRIMP VALUE CHAIN ANALYSIS IN BAC LIEU PROVINCE, VIETNAM

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**Master Thesis in Fisheries and Aquaculture
Management and Economics
(30 ECTS)**

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May 2011

ACKNOWLEDGMENTS

I wish to express my sincere gratitude to my supervisors, Prof. Arne Eide, Norwegian College of Fishery Science, University of Tromsø. Dr. John R. Isaksen from the Norwegian Institute of Food, Fisheries and Aquaculture Research, and Prof. Nguyen Thi Kim Anh in Nha Trang University, whose encouragement, guidance and support from the initial to the final level enabled me to develop an understanding of the subject.

I would like to show my gratitude to the financial support from the Norwegian government, and all of the lecturers and coordinators in NOMA-FAME project.

I would like to thank Mr. Kai Wiegler, Technical Advisor of Coastal Forest and Ecomodels Management Project belongs to Gesellschaft fuer Technische Zusammenarbeit (GTZ), who gave me a “green light” to participate and use project data. I am indebted to my colleagues: Mr. Phan Thanh Lam, Dr. Vu Anh Tuan, and Tran Quoc Chuong to support me during study time. Thanks to the staffs of Bac Lieu Experimental Station for Aquaculture (BLESA) Tran Quoc Nghi, Tran Quoc Binh, Nguyen Dinh Ky, and Miss. Nguyen Thuy An. Mr. Phan Thanh Quoc from Bac Lieu Agriculture and Rural Development Department. This thesis would not have been possible unless your hard working on survey.

Last but not least, I offer my regards and blessings to my wife and parents who supported me in any respect during the completion of the study.

Ho Chi Minh city, May 15th 2011

Doan Van Bay

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ABSTRACT

This research applied value chain analysis to represent activities of participants and their linkages in Black tiger shrimp culture industry in Hoa Binh district, Bac Lieu province, Vietnam. Actors involved in shrimp farming practice from farmers, collectors, wholesalers, feed and veterinary medicine enterprises, processors, to hatcheries, and nurseries were interviewed by separate questionnaires. A total sample size of 71 surveyed households were conducted and analyzed for this research. Results presented a map of actors, costs and margins, employment distribution, advantages and disadvantages of each level.

Farmers, collectors, wholesalers and processing companies are four main actors which contributed directly to shrimp production and effected to the commercial value, and shrimp price. Hatcheries, nurseries, feed and veterinary medicines enterprises impacted indirectly to the economic efficiency and the value chain development orientation. Especially, small-scale farmers are the weakest and the most vulnerable actor in the value chain. The processing companies increase added value about 18%-26% and get the opportunities and benefits from trade better other actors.

To upgrade this chain, shrimp farming clubs or farmers' associations should be established in this district. They need to link to other actors with contract systems to meet the market demands and ensure sustainable development of shrimp industry.

Keywords: Value chain analysis, costs and margins analysis, employment distribution, shrimp farming.

ABBREVIATION

ARDD	Agriculture and Rural Development Department
CCA	Commodity Chain Analysis
<i>et al.</i>	et alii
etc.	et cetera
FAO	Food and Agriculture Organization of the United Nations
GCC	Global Commodity Chain
GSO	The General Statistics Office
GTZ	Gesellschaft fuer Technische Zusammenarbeit (German Technical Cooperation)
ILO	International Labour Office of United Nation
M4P	Making Markets Work Better for the Poor
NACA	Network of Aquaculture Centres in Asia-Pacific
PL	Pos-Larvae
ROI	Return On Investment
SI	Semi-intensive
UNEP	United Nations Environmental Programme
USD	United States Dollar
VCA	Value Chain Analysis
VND	Vietnam Dong (1USD=18,932VND in August, 2010)
WB	World Bank Group
WWF	World Wildlife Fund

1. INTRODUCTION

“Every firm is a collection of activities that are performed to design, produce, market, deliver, and support its product. All these activities can be represented using value chain”

(Micheal E. Porter 1998:36).

Production and trade in aquaculture products continues to grow at a fast pace, responding to increased global demand for fish, shrimp, molluscs and other aquatic products. Aquaculture production reached 59 million tons, with a farm gate value of USD 70 billion in 2004. Developing countries dominate aquaculture production and trade, contributing to over 80% of production and 50% to the value of internationally traded aquatic products (FAO, NACA, UNEP, WB, WWF 2006). Production and processing of one aquaculture product are often carried out by different actors, enterprises and countries.

Aquaculture is an important economic sector in Vietnam today. Vietnam has advantages in freshwater and saltwater aquaculture which has grown rapidly in Mekong Delta in recent years. Based on the conversion of low-productivity paddy fields and coastal mangrove areas that became industrial land for aquaculture, this sector has developed widely since 1999. The shrimp farming industry is the economic strength of the coastal provinces in the Mekong Delta where the main product is Black Tiger shrimp (*Penaeus monodon*), and in recent year the White-legged shrimp (*Penaeus vannamei*). These shrimp species are the most important for export articles in Vietnam, both in volume and value terms. Between 2004 and 2008 Black Tiger shrimp and White-legged shrimp production increased from 225,569 tons to 363,200 tons and total value rose from USD 902 million to USD 1,452 million (FAO 2011). It has contributed greatly to local economic development and the improvement of people's livelihood.



Figure 1. Vietnam and its provinces
 (Source: <http://en.wikipedia.org/wiki/File:VietnameseProvincesMap.png>)

The provinces with the greatest proportion of the shrimp output are Ca Mau, Bac Lieu, Soc Trang, Ben Tre, Kien Giang and Tra Vinh, respectively. In these provinces, water surface area of aquaculture has reached hundreds of thousands hectares, mainly for shrimp farming and other mixture farming models. The provinces with larger areas for aquaculture farming are Ca Mau with 293,000 ha, Kien Giang with 127,000 ha, Bac Lieu with 126,300 ha, Soc Trang 68,300 ha, Ben Tre with 39,300 ha (GSO 2010:324).

Bac Lieu is a coastal province (Figure 1). The aquaculture industry in general, and especially brackish-water culture, in this province has tended to develop quickly in both cultured area and production with many models. Aquaculture has created permanent jobs and incomes for hundreds of rural households. The total aquaculture area of Bac Lieu was the third greatest after Kien Giang and Ca Mau of which 86,313 ha was used for shrimp culture in 2009 and mainly

focused on brackish-water shrimp development. Shrimp species in Bac Lieu are mainly Black tiger shrimp that accounts for more than 90% of the total production. Recently, farming of white-legged shrimp has developed in some localities, but hitherto not in large quantities.

According to Bac Lieu ARDD, the method of shrimp farming in Bac Lieu is mainly extensive shrimp farming, accounting for about 90% of the total shrimp farming area in 2010. Intensive farming area – also known as industrial farming – using artificial breeding and industrial feed, high-density farming, under veterinary control, accounts for approximately 10% of the total shrimp farming area (in a range of 11,174 ha of 126,076 ha in total with production of 28,634 tons).

In recent years, the shrimp farming industry in Bac Lieu has faced many problems. The generic study of Khai *et al.* (2006) pointed to the following problems: First, the quick transition in the last few years is not appropriate for the social resource conditions (economic capacity, capital investment, intellectual, technical level) of the farmers and regional management. Already in 2005, the shrimp farming areas in Bac Lieu reached the level planned for the sector, for the year 2010. The infrastructure model for the aquaculture industry has not met the production requirements, since there is no suitable irrigation model for shrimp farming. Research infrastructure and testing have not met production requirements either. The current level of producer's knowledge and production technologies is unable to achieve the required level of productivity, quality, food safety and economic efficiency. The changes in trade and prices in recent years have been detrimental to the shrimp industry in Bac Lieu. Increased input prices (with rising oil prices in 2008 and 2010) have made production more expensive which has reduced the farmers' profit. Second, the shrimp production model mentioned above is undertaken by small-scale farmers. Their production is also spontaneous in the meaning that their works were carried out without plans of local government. The community relationship and the linkage between the farmers is very poor, shrimp farming clubs or farmers' associations has not been established. Third, the trading model lacks tight vertical integration of actors in the process of production and trade. The weakest point is the lack of direct linkages between farmers and processing and exporting enterprises. Traders control almost the entire market from the collection, purchasing from farmers and selling raw shrimp to the processors (or processing

companies). Thus, the weakest point of the model is the incapability to control material sources, and the high risk in export possibilities, due to high quality standards and the lack of transparency in the production chain. Finally, the unusual weather, long sunny conditions, in combination with infectious diseases which have not been brought under control yet, and the environmental degradation of water and land used for shrimp farming makes the yield very unstable.

In the context described above, updating the economic data of the shrimp farmers and other actors in the value chain, before assessing the active development of relations between relevant institutions of the shrimp industry, are essential. This could enable the adjustment of the management and administration policies of the local government as well as the market relationship to ensure stable development and sustainability of the shrimp farming in Bac Lieu. Therefore, I propose to implement the study: “Black tiger shrimp value chain analysis in Bac Lieu province, Vietnam”. The research problem pursued throughout this thesis is to represent activities of participants and their linkages in Black tiger shrimp culture industry in Hoa Binh district, Bac Lieu province. The main objective is to use value chain analysis (VCA) approach to propose and design interventions in the value chain, in order to increase its efficiency. Through this analysis, I also summarize the employment distribution and financial situation of participants in the value chain.

Objectives of the thesis

To achieve above objectives, this research envisaged three specific objectives as follows:

1. Describe and analyze the organization of Black tiger Shrimp value chain in Hoa Binh district, Bac Lieu Province, Viet Nam.
2. Identify constraints and needs of the value chain, and propose design interventions.
3. Identify advantages and disadvantages, environmental threats and opportunities of actors, in order to upgrade this chain.

Methodology procedure

The methodology applied in this research is mainly to map the Black tiger shrimp value chain in Hoa Binh district, Bac Lieu province, and to analyze costs and margins of actors involved. The final stage is to analyze the employment distribution.

Thesis structure

This thesis is organized as follows: Chapter 1 provides the introduction with the problem statement, the objectives and methodology procedure. Chapter 2 contains general information, population, aquaculture labourers, status and value of aquaculture in Bac Lieu province and Hoa Binh district, and Black tiger shrimp value chain in Vietnam. Chapter 3 mentions definition of value chain, VCA concepts, VCA in agriculture aspect, and empirical studies related to VCA in aquaculture in Vietnam are reviewed. Chapter 4 describes the methods used for data collection and calculations, study scoping, sampling method, and sample size. Chapter 5 presents the results of performance analysis. The results are discussed. Chapter 6 presents conclusions and the main points of VCA and recommendations to increase this value chain efficiency.

In the next chapter, information about the study site, the aquaculture industry, and Black tiger shrimp value chain in Vietnam is presented.

2. GENERAL INFORMATION OF STUDY SITE

Where is Bac Lieu? Why is this province importance in aquaculture in Vietnam? In this chapter general information about Bac Lieu province and Hoa Binh district is presented to give an overview of this site before implementing shrimp value chain analysis.

Bac Lieu is a province in Ca Mau peninsula; it was created from the separating of Minh Hai in 1997. The province has a natural area of 259,409.50 ha including 223,789.69 ha of agriculture land; 22,461.13 ha of non-agriculture land; 3,904.17 ha of unused land; and 9,254.51 ha of coastal area, the total length of coastline is about 56 km accounted for 7.2% of Mekong coastline which is 780 km and 1.7% of Vietnam coastline (Bac Lieu Statistical Office 2010a). Bac Lieu province consists of one city and six districts: Bac Lieu city, Dong Hai, Gia Rai, Vinh Loi, Hoa Binh, Phuoc Long, and Hong Dan. The Figure 2 indicates the spatial extent.

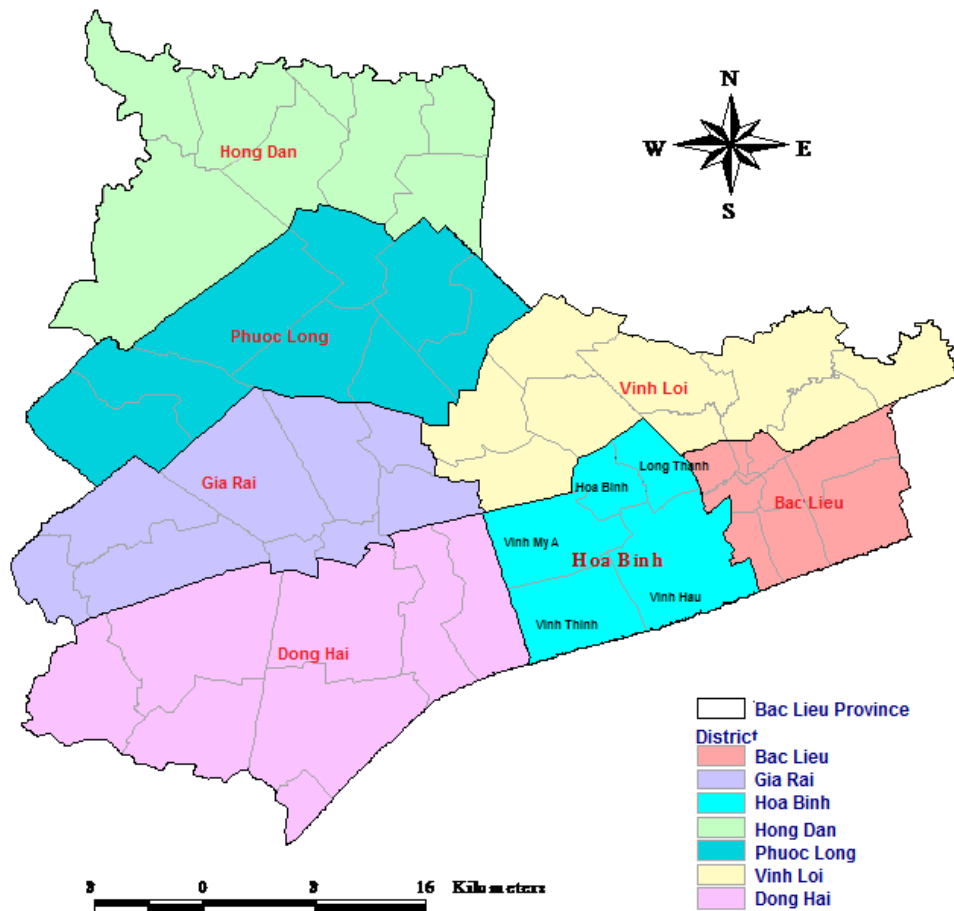


Figure 2. Administrative map of Bac Lieu province
(Source: Chuong *et al.* 2010)

2.1. Population and the employment distribution of aquaculture

According to statistical data of Bac Lieu in 2009, there were 191,567 household with 858,444 persons and the average of household size was 4.48 persons. Average density was 331 persons per km². Highest is Bac Lieu town with 852 people per km². Lowest is Hong Dan district with 250 people per square kilometer.

Total labourers were 460,865 persons with the average of 2.41 persons per household. Labourer employed in the fishery and aquaculture sector is shown in table 1.

Table 1. Labourers employed in the fishery and aquaculture sector in Bac Lieu province
(Unit: person)

Employed population by kinds of economic activities	Year					
	2000	2005	2006	2007	2008	2009
Total	334,329	407,457	412,427	420,172	426,309	460,865
Fishery and aquaculture sector	42,366	192,211	192,851	191,563	195,015	197,458
Proportion (%)	12.67	47.17	46.76	45.59	45.74	42.85

(Source: Bac Lieu Statistical Office 2010a:20)

Table 1 shows that labourers employed in the fishery and aquaculture sector increased quickly between 2000 and 2005. It increased from 42,366 persons. (accounting for 13%) in 2000 to 192,211 persons (accounting for 47%) in 2005, and 197,485 persons (accounted for 43%) of the total population employed in 2009.

According to Chuong *et al.* (2010), the average of household size is 4.18 persons. Family labour force accounted for 62%. Family labours involved in cultured farming occupy 82% of the household labours, being proven that cultured farming is an important activity to the household's economics and contributes jobs for local people.

Table 2 shows that most of the farmers were participating in culturing shrimp when shrimp farming developed in the Mekong Delta with around 6.37 years of experience. It reflects that farming models were established long time ago and farmers have been strongly involved in

farming activities. A comparison of the number of experience years among culture models, fish farming model (mud-skipper and grouper) was established relatively recent years (3.1 years), while the integrated mangrove-shrimp and shrimp-mud crab farming models have been developed for 6 or 8 years ago, especially there is a farmer with more than 15 years of experience.

Table 2. Family labours and years of experience in farming activities

	Mangrove-shrimp (N=24)	Shrimp-mud crab (N=40)	Mud skipper (N=27)	Grand Total (N=91)
Household size (person)	4.38	4.08	4.17	4.18
<i>Labours (% of household size)</i>	<i>61.00</i>	<i>62.60</i>	<i>64.00</i>	<i>62.60</i>
<i>Labours in aquaculture (% of household size)</i>	<i>82.80</i>	<i>84.30</i>	<i>73.80</i>	<i>80.50</i>
Number of experienced years in aquaculture	6.50 (1-15)	8.75 (1-20)	3.10 (1-18)	6.37 (1-20)

(Source: Chuong *et al.* 2010)

The value of aquaculture production at constant prices in Bac Lieu was 6,756,688 million VND in 2009. Only after the Ca Mau had higher product value with 7,925,720 million VND. Per capita income was 16.84 million VND. That was ranking average in the Mekong Delta region.

Per capita income of Bac Lieu increased year by year in the period. In 2005 with 9.576 million VND, 2006 with 10.721 million VND, 2007 with 12.763 million VND, 2008 with 14.557 million VND and by 2009 had reached 16.849 million VND (Bac Lieu Statistical Office 2010a). See Figure 3.

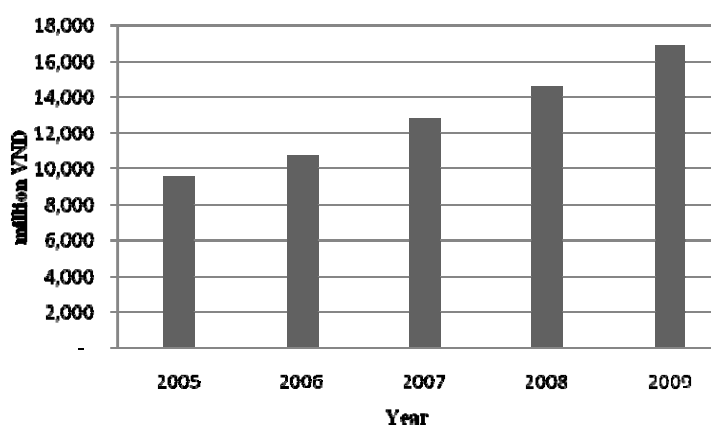


Figure 3. Per capita income of Bac Lieu form 2005 to 2009

2.2. Status of aquaculture and value

In 2000, total area of water surface utilized for aquaculture was 5,017 ha. In 2009 it was 126,338 ha 2.34 times more than in 2000. Area of water surface for aquaculture in each district has also increased regularly. In 2009, Dong Hai district had the largest area with 39,125 ha and accounted for 31% of total area and Vinh Loi district had the smallest area with 2,968 ha account for 2% of total area of water surface for aquaculture in the province (Bac Lieu Statistical Office 2010a) see Table 3.

Table 3. Area of water surface for aquaculture in Bac Lieu province

(Unit: ha)

Administrative units	2000	2005	2006	2007	2008	2009
Bac Lieu town	2,411	6,982	7,089	7,651	8,000	7,366
Hong Dan district	2,072	16,792	17,410	17,820	21,266	22,558
Phuoc Long district	7,122	17,584	18,100	18,150	8,000	18,350
Vinh Loi district	1,295	2,846	2,900	2,968	2,968	2,968
Hoa Binh district	5,383	15,796	15,657	15,698	15,698	15,676
Gia Rai district	9,235	20,295	20,295	20,308	20,295	20,295
Dong Hai district	26,499	38,417	38,763	39,570	39,125	39,125
Total	54,017	118,712	120,214	122,165	125,602	126,338

(Source: Bac Lieu Statistical Office 2010a:146)

In 2009, an area of 126,338 ha was utilised to produce a total quantity of aquaculture of 139,700 tons of which the area for intensive and semi-intensive (SI) shrimp framing was 10,853 ha and accounted for 8.6% of total area. Total quantity of shrimp framing was 27,890 tons. This accounted for 20% of total aquaculture production and 41% of total shrimp production (table 4). Table 4 shows that production of intensive and SI shrimp farming tended to decrease from 2005 to 2008 but increase in 2009.

Of a 139,700 tons aquaculture production in Bac Lieu province in 2009, shrimp production was 68,200 tons accounted for 49%; fish production was 54,985 tons accounted for 39% of total products. The rest was crabs, molluscs, etc. with 16,515 tons accounted for 12%.

Table 4. Area, yield, and production of intensive and SI shrimp farming.

	Year				
	2005	2006	2007	2008	2009
Total area of water surface for aquaculture (ha)	118,712	120,214	122,165	125,602	126,338
Of which intensive and SI shrimp framing (ha)	10,929	9,115	10,853	10,804	11,174
Yield (tons/ha)	3.12	2.65	2.68	2.51	2.56
Production (tons)	34,098	24,155	29,040	27,090	28,634

(Source: Bac Lieu ARDD 2010)

Production of aquaculture in Bac Lieu province has increased every year from 22,366 tons in 2000 to 139,700 tons in 2009. The district with the largest aquaculture area was Dong Hai which also had the highest production with 49,837 tons (36%); the smallest aquaculture area was Vinh Loi district that also the lowest of production with 2,241 tons. (1.6% of total aquaculture production in province) (Bac Lieu ARDD 2010). In the next figure, the value and quantity of aquaculture is presented.

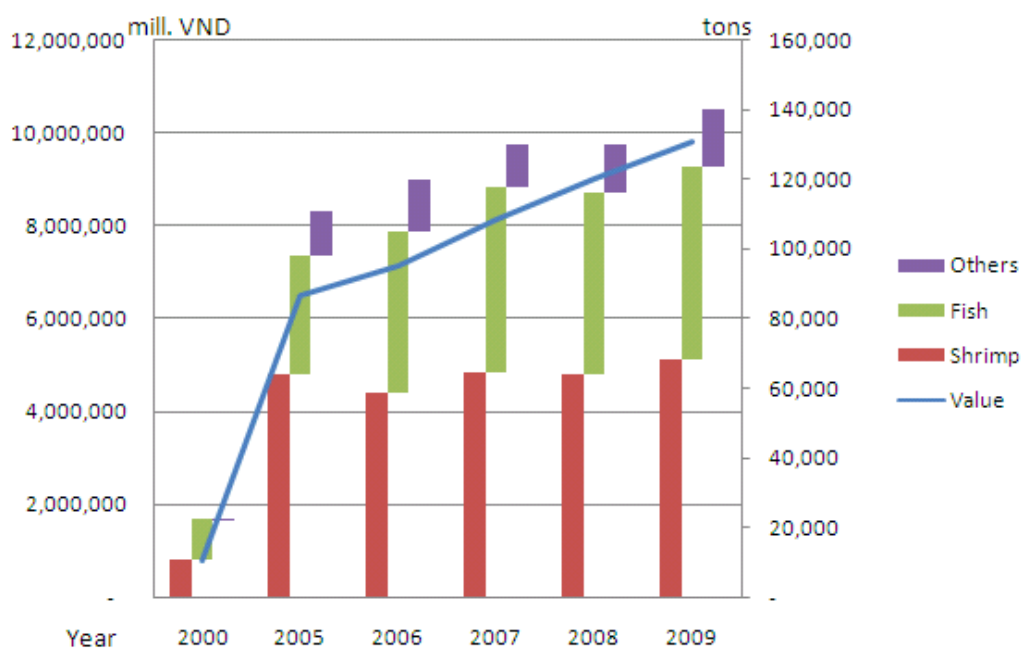


Figure 4. Aquaculture production and total value in Bac Lieu Province

In 2009, the total value of aquaculture was 9,798,641 million VND. Shrimp production was the main contributor to the total production of 139,700 tons. In 2005 it was 6,474,498 million VND and the total production was 110,466 tons (Figure 4).

2.3. General information about aquaculture in the Hoa Binh District

Hoa Binh has an area of 412 km² with a population of 107,075 persons in 2009. Aquaculture covered an area of 15,676 ha including different model (Bac Lieu Statistical Office 2010a:146). There were 3,642 ha used for intensive and SI shrimp farms, 11,441 ha for extensive shrimp farms, 593 ha of brackish water fish and other models. Volume sold was 21,126 tons, (where shrimp accounts for 13,600 tons and other aquatic products for 7,526 tons).

Table 5. Aquaculture area and output of Hoa Binh district in 2009

Year	2000	2005	2006	2007	2008	2009
Brackish quaculture area (ha) of Bac lieu province	52,517	117,424	118,742	120,559	124,023	124,649
Aquaculture area (ha) of Hoa Binh district	5,383	15,796	15,657	15,698	15,698	15,676
Percent (%)	10.25	13.45	13.19	13.02	12.66	12.58
Volume sold (ton)	4,652	26,858	19,052	22,000	20,800	21,126
Percent (%)	20.80	24.31	15.90	16.97	16.03	15.12

(Source: Bac Lieu Statistical Office 2010a:146,152)

According to data from the Hoa Binh Agriculture and Rural Development Office (2010:2), the shrimp production of intensive and SI shrimp farms was 2.5 to 3.0 ton per ha in 2010. Gross revenue was 300 – 400 million VND, total costs was 200 – 250 million VND, and net revenue was 100 – 120 million VND, cost price per 1 kg of shrimp was 80,000 - 85,000 VND. 60 percentage were profitable farms, 20% were break-even farms, and 20% of the farms incurred losses.

The shrimp production of mixed extensive farms was 0.36 ton per ha and fish production in this model was 0.42 ton per ha. Gross revenue was 45 – 100 million VND, total costs was 30 – 35

million VND, and net revenue was 15 – 30 million VND. The share of profitable farms were 80% and break-even farms were 20%. Specially, some farms got a profit of 40 – 50 million VND. The aquaculture sector of Hoa Binh depends heavily on shrimp production with 13.6 thousand tons, accounting for 64.2% of the production total. There were 10.153 ha of all models unsuccess (shrimp died before harvest day) in 2009. The diversification of cultured species should be examined as an alternative option for livelihood improvement.

Although, the contribution of total shrimp production from the extensive model is less than that from the intensive and SI models, they occupy the largest areas in the Hoa Binh district. Most of the extensive model farmers are small-scale farmers. They have lack knowledge of techniques on shrimp culture, in particular sustainable shrimp farming and Better Management Practices (BMPs). Moreover, small-scale farmers face difficulties purchasing good quality shrimp seeds, feed, and other inputs in small quantities.



Figure 5. Shrimp extensive farming model in Bac Lieu
(Source: Own photo)

Additionally, the small-scale farmers (with their extensive farming) are likely to purchase inputs with high prices and face the vulnerability to sell their outputs to low prices. Firstly, the input prices increase up to 10-30% annually. Secondly, most shrimp farmers buy inputs from retailers at high prices compared to wholesalers. Thirdly, it seems that farmers sell their shrimp to wholesalers at a lower price than to processors. As a result the, farmer's income is reduced. Thus, this shrimp VCA is meant to identify these problems and propose suitable ways to address them for improving small-scale farmers livelihood.

2.4. Black tiger shrimp value chain in Vietnam

The Black tiger shrimp value chain in Vietnam is a buyer-driven chain. Producers, particularly small-scale producers, have little ability to influence the price and market, if any. They sell their products and are frequently locked into contracts that limit the price they receive.

Figure 6 provides a complete flow diagram of the shrimp industry that traces how inputs are transformed into outputs and how shrimp is farmed, processed and exported. At beginning, blood stocks are caught in the sea or imported by blood stock suppliers, and then sold on to hatcheries. Hatcheries produce PL and sell to nurseries or directly to farmers. Hatcheries selling disease-free PL will help reduce the use of antibiotics which are forbidden by importing countries.

Individual, contracted, and company's farms are three types of shrimp farms in Vietnam also called grow-out farms. In Bac Lieu province, grow-out farms have several models of shrimp farming such as intensive, extensive, integrated mangrove- shrimp, integrated rice- shrimp. More detailed, the *intensive shrimp farming model* is conducted in areas from 0.01 to 5 ha with high stocking densities (more than 200,000 PL per ha). This model is strictly management, heavy feeding, waste remove, and addition of air or oxygen to the water. *Extensive shrimp farming model* is conducted in size from 1 to 100 ha. The stocking density is about 25,000 PL per ha. *The integrated rice-shrimp model* is the joint use of the land for both rice and shrimp farming practice. Farmers dig out a trench about 1 m deep and 1.5 wide around the boundary of the rice field. The trench reduces the available area for rice production, but provides a refuge for shrimp away from the more extreme environmental conditions of the flooded rice field.

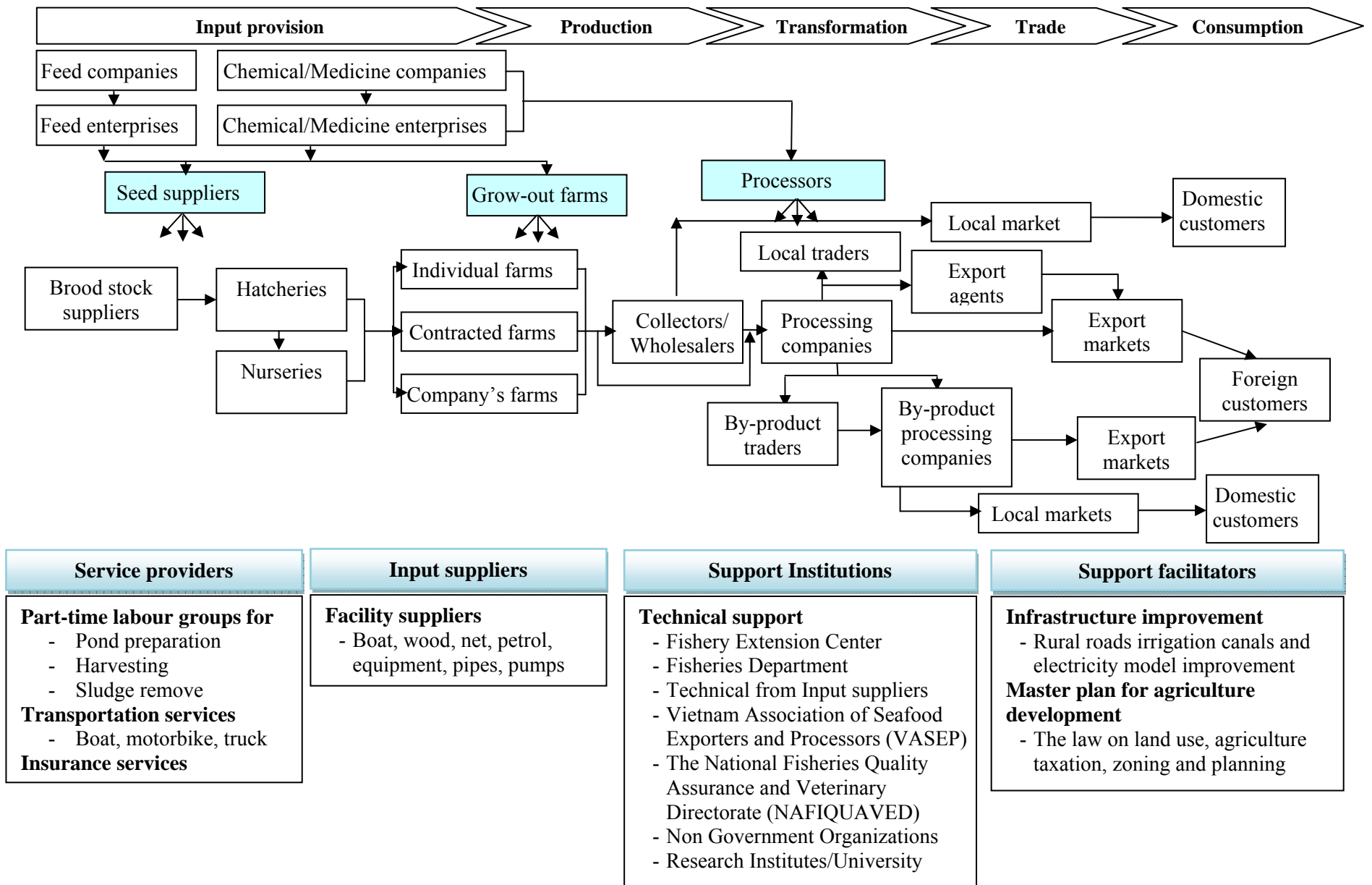


Figure 6. Black tiger shrimp value chain in Vietnam (Source: Phan, L.T. et al. 2011)



Figure 7. Integrated mangrove-shrimp model in Bac Lieu (*Source: Chuong et al. 2010*)

The integrated mangrove-shrimp model has mangrove area of 60% and trench area of 40%, which is the typical model of protective forests in the coastal province.

Shrimp farms sell their product to shrimp collectors or wholesalers after harvesting. Shrimp farmers contribute to the product quality control directly by using natural food sources, processing feed themselves and using chemicals and antibiotics. Collectors or wholesalers are providing the fresh shrimp to processing factories or exchange shrimp products in different size between each other. They also sell to local markets for domestic consumption. The measures to increase their profits may either affect the quality of fresh shrimp wilfully or unintentionally.

Service providers supply input materials for hatcheries, nurseries, and grow-out farms. They supply chemicals or medicine mainly for processors, and impact directly or indirectly to shrimp quality. While, other service providers supply part-time labour groups for pond preparation, harvesting, sludge remove, transportation services (boat, motorbike, truck), and insurance

services. Facility suppliers mainly supply boat, wood, net, petrol, equipment, pipers, pumps. etc. for grow-out farms.

Most processing companies clean, preserve, and pack shrimp. A number of processing companies are also beginning to cook or semi-cook the shrimp to increase the value added of the products. Their production supplies a mount of by-products which are bought by by-product traders and by-product processing companies. For the processing companies, increased knowledge on food quality and safety and the application of quality management standards such as International Model Organization, Hazard Analysis, Critical Control Point, Global Good Agriculture Practice, etc. will ensure product quality which protects consumers' health, and increases exports and revenues.

Institutions that supply the whole the shrimp value chain they are the Fishery Extension Center, Fisheries Department, Technical from Input suppliers, Vietnam Association of Seafood Exporters and Processors, The National Fisheries Quality Assurance and Veterinary Directorate, Non Government Organizations, Research Institutes/University.

Government support infrastructure improvements, rural roads irrigation canals, electricity model improvement, and master plans for agriculture development such as the law on land use, agriculture taxation, zoning and planning. They play a crucial role in supervising the process by setting up the dissemination, supervision and monitoring of the implementation of regulations on environmental protection, trade, use of chemicals and aquatic medicine.

Shrimp VCA belongs to aquaculture economic aspects. In Vietnam, it was carried out on Tra catfish in many provinces of Mekong Delta. I will apply theories and methods of this field to work on this study. Theories and empirical works can be found in the next chapter.

3. LITERATURE

In this chapter, a short introduction into history and concepts of VCA will be showed. It provides a brief overview of the development of the value chain concept and different analytical approaches during the last decades. At the end of the chapter, the concept of the economic agents and research on aquaculture value chains, which conducted in Vietnam, are presented.

3.1. Definition

According to Porter (1998), the value chain is a chain of activities where products pass through all activities of the chain in order, and at each activity the product gains some certain value. The chain of activities adds more value to the product than the sum of the independent value of activities. Depending on the level of detail for each process, the value chain is divided into two types, the simple value chain or expandable value chain.

The idea of value chain is quite intuitive; *“it describes the full range of activities that are required to bring a product (or service) from conception, through the different phases of production (involving a mixture of physical transformation and the input of various producer services), delivery to final consumers and disposal after use”* (Kaplinsky and Morris 2001:4). Otherwise, a value chain exists and develops when all of its actors operate in a way that the generation of value along the chain is maximized.

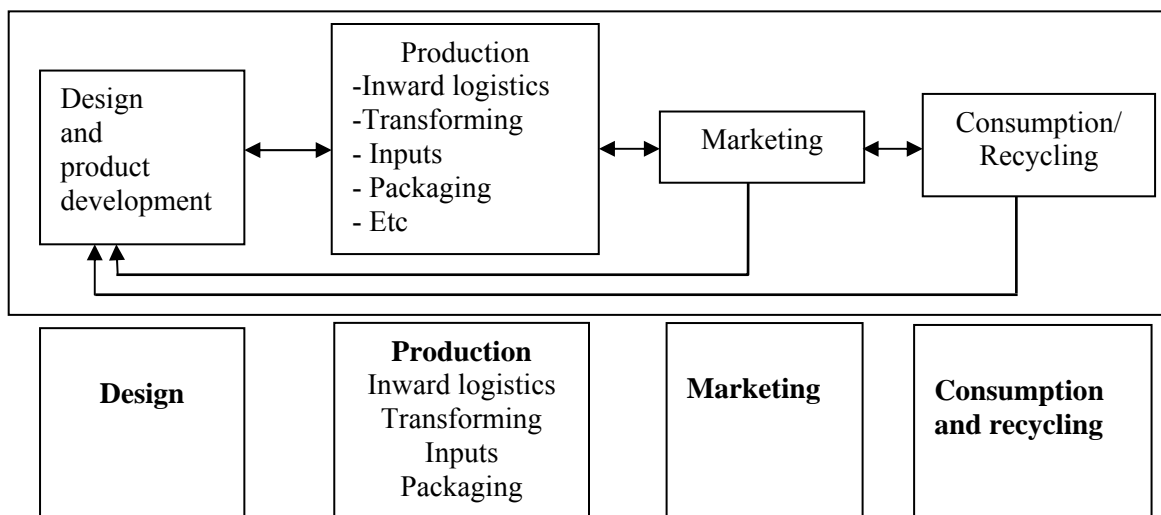


Figure 8. Four links in a simple value chain (Source: Kaplinsky and Morris 2001:4)

Based on this definition, a value chain can be separated in simple or extended value chain. In the **simple value chain**, there are ranges of activities within each link of the chain. A simple value chain implies the range of activities performed within a business organization to produce a certain output. This might include the conception, design and product development stage, the process of acquisition of input, the production, the marketing and distribution activities, consumption and recycling. All of these activities form the value chain which links producers to consumers and each activity adds “value” to the final product (Figure 8).

For example, material recycling is used in exploiting residual matter in the paper industry. It is an important resource and a possibility for using additional products to achieve a significantly higher added value from existing raw materials.

The **extended value chain** is the complex range of activities in a “chain” implemented by various factors. It includes primary producers, processors, traders, service providers, etc to bring a raw material pass through the chain to the sale of the final product to customers. This chain begins from raw materials production and tends to be more links with other factors involve in assembling, trading, processing, exporting, recycling and so on. It does not look at the activities implemented by a business organization. But it includes all its backward and forward linkages, until the level that the raw material production will be linked to the final consumers.

The concept of value chain implies the issues of organization and coordination, the strategies and the power relationships of the different actors in the chain. Hence, the scale of a value chain might be local, regional, national or global. Conducting a value chain analysis therefore requires an investigation of developing trend and relative on the value chain, what information is shared, and how the relationships between actors are established and evolving.

According to a functional view, a value chain is a sequence of related business activities or functions from the provision of specific inputs for a particular product to primary production, transformation, marketing, and up to the final sale of the particular product to consumers.

By the sequence of functions and operators, value chains include of a series of chain links be “stages”. The implementation of enterprises or operators performing these functions is producers, processors, traders and distributors of a particular product. Enterprises are linked by a series of business transactions in which the product is passed on from primary producers to end consumers (GTZ 2007).

Besides, the idea of a value chain is close in relationship with the concept of governance. According to Gereffi *et al.* (2005), there were five types of global value chain governance such as hierarchy, captive, relational, modular, and market which range from high to low levels of explicit coordination and power asymmetry. Humphrey and Schmitz (2000) examined the interaction of global value chain governance and cluster governance for researchers and policies makers. They distinguished between different kind of chains and elaborated the way they arise.

3.2. Value chain analysis (VCA) concepts

VCA is the methodology to analysis economic activities by dividing these activities into parts for evaluating based on value chain concepts. There are many methods of value chain analysis:

- General analysis for all methods.
- Cost analysis based on activities.
- Activities analysis of actors.
- Marketing chain analysis for industry.
- Marketing chain analysis for products.
- Other methods.

The three main research streams in the value chain literature are: (i) the French *filière* approach (Raikes *et al.* 2000), (ii) Porter’s framework (1985) and (iii) the global approach (Kaplinsky 1999; Gereffi and Korzeniewicz 1994; Gereffi 1999; Gereffi 2001; Gereffi, Humphrey, Kaplinsky and J. Sturgeon 2005).

3.2.1. The French *filière* approach

The French *filière* approach (“*filière*” means thread or chain) includes several different schools of thought and research traditions. It is a loosely knitted set of studies with the common

characteristic that the chain of activities and exchanges are used as a tool to delimit the scope of analysis. Initially, it was used to analyse contract farming and vertical intergration in French agriculture in the 1960s and was soon applied to the analysis of developing country agriculture, where it fitted well to the requirements of the French colonial model. In the latter case, the method mainly served in selected export commodities such as rubber, cotton, coffee, and cocoa as a tool to study the ways in which the agriculture production models were organized in the context of developing countries, In this context, the French *filière* study looked on how domestic production models were dealing with processing industry, trade, export and consumption.

The French *filière* concept has encompassed a strong empirical research tradition. Its main objectives have been to map the flow of commodities and to identify actors and activities. The empirical tradition does have links to theory and policy. The *filière* approach mainly focused on issues like the physical flowchart of commodities, transformations and parrale quantitative technical relationships, and has mainly attempted to measure inputs and outputs, prices and value-added along a commodity chain.

There are two main directions of the *filière* approach which share some insights with VCA.

Frist, the quantitative *filière* analysis (Raikes *et al.*2000) has mainly attempted to measure the economic and financial sides of the value chain. Inputs and outputs are measured by using an accountancy framework specific to French economics known as the effect method (*'méthode des effects'*).

Second, the strategy-focused analysis of *filière* was used in some research institutes such as the Institute National de la Recherche Agronomique; the Centre de Coopération Internationale en Recherche Agronomique pour le Développement¹ and Non Government Organizations working on agricultural development as Institus de Radioastronomie Millimétrque. The later analyses are in a modelic way the interplay of objectives, constraints and results of each type of actors in the value chain.

¹ French Research Institute

The French *filière* concept has been applied to domestic value chains, but has stopped at national boundaries (Kaplinsky and Morris 2001).

3.2.2. The Porter framework

The second research stream was elaborated by Porter in 1985 on competitive advantages.

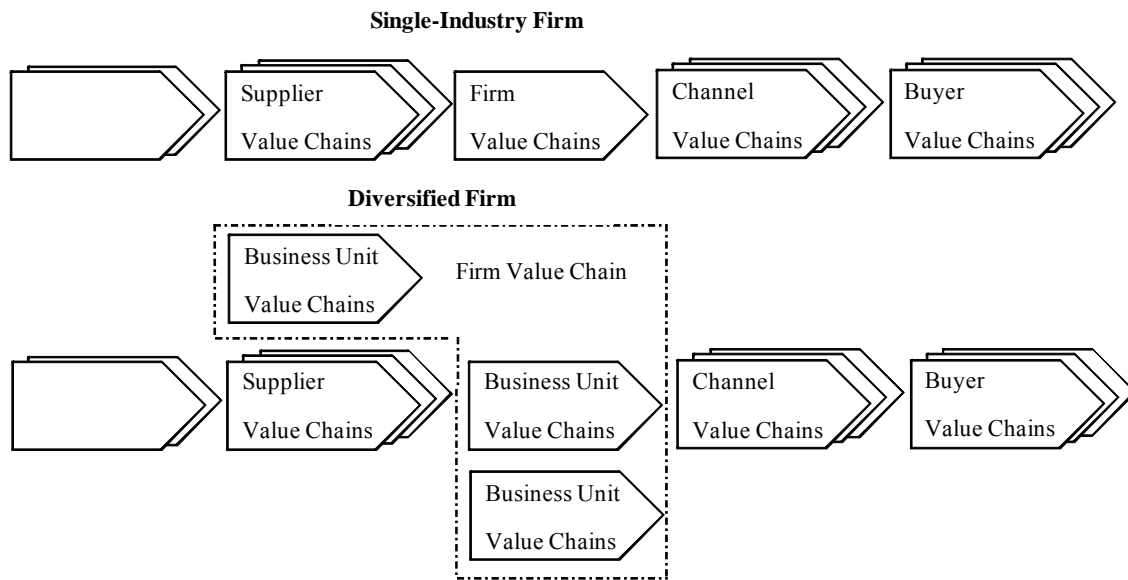


Figure 9. The Value model according to Porter (1998:35)

Porter introduced value chain as a basic tool to assess how a firm should position itself in the market and in the relationship with suppliers, buyers and competitors for the many activities it performs in designing, producing, marketing, delivering, and supporting. The competitive advantage idea of a firm can be understood as the ways a firm can provide customers with a product or service of equivalent value compared with competitors but at a lower cost. And to produce a product or service that customers are willing to pay a higher price for. Otherwise, the organization business activities can contribute to a firm's relative cost position and create a basis for differentiation. The search of competitive advantages is based on the concept of the value model (Figure 9).

In the value model, the analysis of competitive advantage is not limited to the boundaries of a single firm, its activities are considered as a part of a larger stream of activities. Suppliers have influence of a firm value chain. Products pass through the channel value chains to the buyers and

become part of its buyer value chain. A value model encompasses firm's activities involved in the production from basic raw materials to delivery of the final product to consumers. VCA of each firm by this approach provide an overview of the value model.

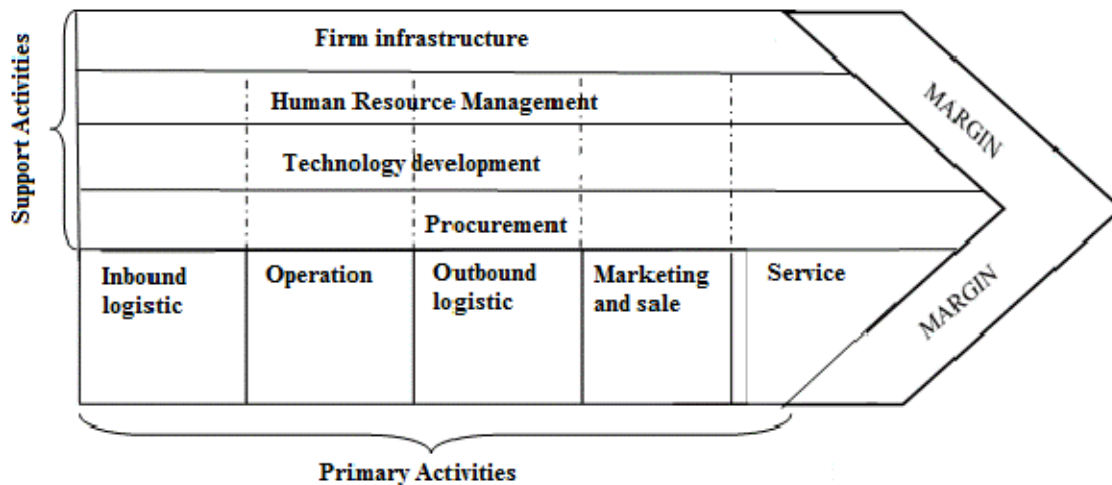


Figure 10. The generic Value Chain according to Porter (1998:37)

In Porter's framework, firm's activities are performed to design, produce, market, deliver, and support its product. Using this framework can present all these activities (Figure 10). The value chain provides a tool that firms can use to identify resources and capabilities of competitive advantage (Barney 2002).

The value chain presents total value and includes value activities and margin. Value activities are the physically and tecnologically activities that a firm creates a product valuable to its buyers. Margin is the difference between total value and the total costs of performing the value activities.

Porter distinguishes value activities between primary activities, which are the activities involved in the physical creation of the product and its sale and transfer to the buyer and directly contribute to add value to the production of the product or services. Primary activities fall into inbound logistics, production, outbound logistic, marketing & sales, and after sales services; and support activities, which support the primary activities and each other by providing purchased inputs, technology, and various firmwide functions; and have an indirect effect on the final value

of the product. Supporting activities comprise firm infrastructures, human resources development, technology development and procurement.

In this framework, the concept of the value chain does not coincide with the idea of physical transformation. It is defined for competing of a firm which does not relate exclusively to the production process in a particular industry. The value chain includes product design, input procurement, inbound logistics, and outbound logistics, operation, marketing, sale, after-saler and support servise such as strategic planning, human resource management and technology development. This value chain can be utilized to analse for firm's competitiveness. This analyse supports management decisions and executive strategies. Additionally, it identifies a number of primary and support activities that are common to a range of businesses. The value chain activities pass through a firm can create value so that is a useful to simplify analysis. But in stragegic decision, the concept of value model is mostly a tool for assisting firm executives.

3.2.3. The global approach

Recently, the analysis of globalization has applied the concept of the value chain. Gereffi and Korzeniewicz (1994) used the value chain framework to examine the ways in which firms and countries are globally integrated and to assess the determinants of global income distribution. Kaplinsky (1999) showed how value chain analysis can be used both to chart the growing disjuncture between global economic activity and global income distribution and to provide causal explanations for this outcome.

Kaplinsky and Morris (2001) observed that in the course of globalization there are three reasons why VCA is important. They are: i) Competitiveness has become increasingly important with the growing division of labour and the dispersion of production of components, ii) Efficiency in production is only a necessary condition for successfully penetrating global markets, and iii) Entry into global markets which allows for sustained income growth, requires an understanding if dynamic factors within the whole value chain. VCA can help to explain this process, particulary in a dynamic perspective.

Firstly, by mapping the range of activities along a chain, a VCA help to understand the distribution of actors then the view of global distribution can be provided after this analysis is complete. Secondly, a VCA can show how the global economy links to firms, regions and countries. This determines the distributional outcomes of global production models and individual producers have to build.

Gereffi *et al.* (2001) build a theoretical framework to explain the mode of governance of a value chain to a combination of complexity of transactions, ability to codify (or formally describe) transactions, and the competency of the supplier base, the combination(s) of which result in different coordination structures of value chains. There are five types of global value chains in this approach. They are hierarchy, captive, relational, modular, and market, which range from high to low levels of coordination and power asymmetry.

In table 6, these are all portrayed, with respect to their influences and main objectives, according to Faße *et al.* (2009).

Table 6. Characterization of existing chain frameworks (*Source: Faße et al. 2009:4*)

	Filière approach (1960s)	Commodity Chain (1974)	Value Chain (1980s)	Global Commodity Chain (GCC) (1990s)	World economic Triangle (2000s)	Global Value Chain
Theoretical foundation	– No unified theoretical approach	– World models theory derived from dependency theory	– No unified theoretical foundation	– World models theory – Organizational sociology	– World models theory – Organizational sociology	– Global commodity chains
Objectives	– Physical inputs & outputs, prices and value added in marketing chains – Focus on agricultural commodities	– Explanation of the World – capitalist economy	– Focus on industrial Firms – Competitive advantage by breaking down its activities into the value added	– Power relations of globally linked production models (meso and micro level) – Focus on industrial goods	– Upgrade of regions or clusters – Linking cluster development & value chains	– Governance and regulation models – Linking horizontal and vertical approaches
Underlying Concepts	– No underlying concept (neutral)	– International division of labour – Core-periphery-semi periphery	– Concept of in-house value added	– Governance (consumer-driven / buyer-driven) – Organizational Learning/Upgrading	– Governance – Upgrading of clusters	– Governance – Transaction costs – Upgrading
Characteristic	– Static model – National boundaries	– Holistic point of view – Macro-orient – Qualitative analysis	– Restricted to production processes at firm level – No attention to international territorial arrangements	– Focus on governance	– Qualitative Analysis	Composition of commodity chain, GCC, World economic Triangle
Key Authors	– Raikes <i>et al.</i> (2000)	– Wallerstein (1974)	– Michael Porter (1998)	– Gereffi <i>et al.</i> (1994) – Gereffi (1999) – Gereffi <i>et al.</i> (2005)	– Messner (2004)	– Gereffi & Kaplinsky (2001) – Humphrey & Schmitz (2000), – Gereffi <i>et al.</i> (2005)

3.3. VCA in agriculture context

VCA is reasonably flexible and any one of the large number of actors in the chain can be analysed by a value chain approach. The value chain approach above describes a tool to look at the interactions between different actors in the value chain. It is a technique for analysing then improving resource utilisation and product flow within processes. The advantage of this approach is that it forces the analyst to consider both the micro and macro aspects of production and exchange activities.

The Commodity Chain Analysis (CCA) has been concerned mainly with examining power relations in global manufacturing industries (Peter 2001). It can provide better insight into the organizational structures strategies of different actors and an understanding of economic processes. CCA is part of a wider set of different approaches of chain analysis, including also value chain and global commodity chain. They all present wide common aspects and can be associated to some extent. However, CCA is specifically targeted to agriculture commodities (FAO 2005).

Kaplinsky and Morris (2001) indicated in their handbook that no VCA had comprehensively covered all the aspects of socio – economics, the approach taken fundamentally depends on the question that is being asked. Aquaculture is encompassed by agriculture so that VCA in agriculture context imply to analyse the the value chain in aquaculture. According to M4P (2008) four aspects of VCA of agriculture are particularly important.

First, VCA *modelatically maps the actors* participating in production, distribution, marketing, and sale of a particular product (or products). This work is at a basic level and evaluates the characteristics of actors, profits and costs structures, flows of goods through the chain, employment characteristics, and the destination and volumes. Details on those characteristics can be gathered from a combination of primary survey work, focus groups, participatory rural appraisals, informal interviews, and secondary data.

Second, VCA is able to play a key role in *identifying the distribution of benefits to actors in the chain*. Through the analysis of margin and profits within the chain, it is possible to determine who benefits from participation in the chain and which actors could benefit from increased support or organization. This is particularly important in the situation of developing

countries (dependent on agriculture). This analysis can be supplemented by determining the nature of participation within the chain to understand the characteristics of its participants.

Third, VCA can be used to *examine the role of upgrading within the chain*. This method upgrades in quality and product design or diversification in the product lines served, allowing producers to gain higher product value. An analysis of the upgrading process should include an assessment of the profitability of actors within the value chain as well as information on limitations that are currently present. Governance issues play a key role in defining how such upgrading should occur. In addition, the structure of regulations, entry barriers, trade restrictions, and standards can further shape and influence the environment in which upgrading can take place.

Finally, VCA *highlights the role of governance* in the value chain, which can be internal or external. Governance ensures actors within the value chain to be interacted in the structure of relationship and coordination rather than being simply random. Governance of a value chain are established when the set of standard on product, process, and logistic qualification happen.

Value chains can be characterised according to these four dimensions. These four perspectives are helpful to assist visualisation of the nature of the value chain in question and understand the differences between various value chains.

3.4. The concept of the economic agents

There are many economic actors involve in a value chain. Their activities decide the developmental trends of a value chain (it could be positive or negative). These actors could be a physical person such as farmer, trader, and consumer. A business, an authority, and a development organization are also indirect actors of a value chain. According to FAO (2005), the term “agent” is disseminated widely to imply all agents of the same type e.g. the agent “farmer” imply all farmers, the agent “trader” for all traders in the value chain.

“There are a great number of agents operating in the national economy. Nonetheless, it is possible to classify them on the basis of their principal activity: consumption, production of goods and services, financial operations, distribution. For the purposes of macroeconomic analysis, the model of national accounting has developed a typology of economic agents that distinguishes five institutional sectors”. (FAO 2005:7).

1. **Firms** produce goods and services intended for sale. They are input supply companies in agriculture production such as medicine, chemical, aquafeed companies etc;
2. **Financial institutions** are banks, private organizations or lenders through financial operations such as loans, borrowing. They supply the cash flow for the “agent”;
3. **Households or farmers** are direct “agents” to produce goods in agriculture production. Their economic activities are linked to domestic life;
4. **Government** supply legal frameworks for the community. It makes sure that all economic agent activities on the rule of law without any direct corresponding financial flow;
5. **The rest of the world** indicates for all economic agents located outside of the national territory.



Figure 11. Feed and veterinary medicine enterprise
(Source: Own photo)

In this study, a number of actors are involved in the shrimp production model such as farmers (especially small farmers) service providers who supply input materials for aquaculture (seed, machinery, equipment, tool, feed, medicines and chemicals), collectors, wholesalers, processors and the local authorities. All agents will be mapped.

3.5. Empirical studies related to VCA in aquaculture in Vietnam

In Vietnam, former research on fishery and aquaculture have applied VCA to investigate value chains of fish, especially Tra catfish. Those surveys were conducted mainly in Mekong delta and took an interdisciplinary methodology approach. Researchs were conducted using methodologies of VCA, livelihoods analysis, and policy analysis (Loc *et al.* 2009) or followed the value chain framework of Porter (1985) (Khoi 2007). The methodology for collecting primary data was designed following an abbreviated version of the “usage, attitude, image” market study (Kai 2006). Descriptive statistic was applied in analyzing the risk of farmer (Loan 2009). Costs and benefit analysis (Ho 2009), analysis margins, added value and revenues (Ha 2007) were also carried out in these studies.

These research attempts have been occupied with similar approach as mine since 2006 to 2009. They are presented as follows:

Kai (2006) designed interventions to improve the functions of the Business Development Services market. This study focussed on the *Pangasius* value chain in An Giang with a view to identify difficulties of fish farmers and processors and their experience with business development services, identify the role of food safety and quality standards, and assess shortcomings of the current business development services market. Kai recommended interventions to improve these services provision.

Khoi (2007) described the *Pangasius* value chain in Vietnam. Objectives of the study are i) Describing and analyze the organization of the Pangasius value chain in the Mekong River Delta, Vietnam; ii) Estimating the costs and benefits of various actors in the chain; iii) Identifying the main obstacles for the stakeholders in the chain. Results showed that the major problem in the fish sector was a lack of management in technological coordination to guarantee fish product quality in the whole chain. There were four major issues behind it i) the new and stricter rules concerning fish product quality and the safety import markets; ii) the lack of fish rearing techniques at farm level; iii) the opportunistic behaviour of the chain stakeholders; iv) the lack of Hazard Analysis and Critical Control Point implementation at company level.

Ha (2007) examined value chain analysis on *Pangasius* catfish in Mekong delta. This study applied descriptive statistic to analyse margins, added value and revenues in the value chain

and then grade the ranks of the actors. Results give the suitable solutions to development the industry.

Loc *et al.* (2009) examined the value chains of *Pangasius hypophthalmus* and *Henicorhynchus/Labiobarbus spp.* in Vietnam and Cambodia. This study elaborates the function and effectiveness of domestic and regional fisheries product value chains and identifies key policy interventions at local, regional and national scales to further improve: i) Small-scale rural livelihoods; ii) The competitive advantages of fisheries products and their management; iii) The responsible management of resources, which is important for the sustainability of the fishery and aquaculture resources; and iv) Understanding of value chains of *Pangasius hypophthalmus*, a high-value globally traded aquaculture species, and *Henicorhynchus spp./Labiobarbus spp.* (grouped as Ca Linh in Vietnamese and Trey Riel in Khmer), two low-value regionally traded capture species, in the Mekong Delta of Vietnam and Cambodia. An interdisciplinary approach was taken to investigate value-chains and their contribution to rural livelihoods and sustainable fisheries development. Results of the study indicated challenges for extending value chain governance to environmental and social objectives.

Loan (2009) analyzed the risk of farmers in Tra catfish (*Pangasius*) value chain in An Giang province. The study applied descriptive statistic and Nerlove's supply model. Results gave an overview of Tra catfish (*Pangasius*) value chain in An Giang province. The output price of fish in grow-out farms was one of the greatest risk impacts to farming effect. The small-scale farms have investment vision in short run; their investment decision was based on the price of previous seasons which always fluctuate on the market.

Ho (2009) analyzed Tra cat fish (*Pangasius*) value chain in An Giang province. This study used methodology of descriptive statistic, costs and benefits, and SWOT analysis. Results indicate that farmers in nurseries, hatcheries, and grow-out farming practice all face risks. Benefits and incomes in Tra catfish have not been distributed sensible yet. It has mainly focused on processing companies. Recommendations for strategies to upgrade the value chain were listed. Among them, market informations should be provided timely from government. Strengthening linkage between actors should be consolidated and expanded.

In summary, VCA approach has been used in most of studies above. However, all those studies were conducted mainly on Tra catfish in Mekong delta. Black tiger shrimp value chain has not been explored in this area. Therefore, this study targets to apply VCA in this context. Methodologies of identify difficulties of actors of shrimp value chain, describe and analyze the organization of the shrimp value chain, descriptive statistic are also applied in this study.

M4P is a toolbox for practitioners of VCA which provides the tool easy to use for value chain practitioners, with focus on poverty reduction. In context of shrimp farming industry in Bac Lieu is taken by small-scale farmers (Khai *et al.* 2006) and poverty rate² in rural (where shrimp farming is practiced) was 11.34% in 2009 (Bac Lieu Statistical Office 2010a:234). This study aims to identify their problem with data available from local authorities (Bac Lieu ARDD and Hoa Binh Agriculture and Rural Development Office) and field survey. Methodologies in this toolbox supply many “tools” that could be used to gain the objectives.

Next chapter, more details of methods will be elaborated.

² According to Vietnamese standard in 2009, in rural a household with income per capita under 300,000 VND per month (15.8 USD per month) was poverty household.

4. METHODOLOGY

This section presents the methodology of my VCA approach in Bac Lieu province. It includes mapping the value chain, analyzing costs and margins, and analyzing employment distribution. Three VCA approaches are followed the M4P A Toolkit for Practitioners of Value Chain Analysis, version 3, which was presented at 30 November 2008.

Study time frame, target groups in the research process, sampling method, sampling size, data collection, data entry and analysis will be displayed in details.

4.1. Mapping the value chain

The first step of a VCA is mapping. By this, the boundaries to other chains and the actors are defined. Then the traced product flows within the chain is mapped, including input supply, production, processing, and marketing activities. The objective of this step is to give an illustrative representation of the identified chain actors and the related product flows. A mapped value chain includes the actors, their relationships, and economic activities at each stage with the related physical and monetary flows (Faße *et al.* 2009). Making a value chain map is a way of making what is seen and encountered more easily understood. Value chain mapping provides a broad picture of the value chain to be studied. A value chain map is a way to illustrate (or perhaps simplify) the complexity of the value chain in the real world. VCA needs to go beyond the process of drawing a value chain map.

Regardless of what choices are made, the following dimensions are of necessity and therefore should be mapped to provide an overview of the studied value chain.

First, following the question what *core processes in the value chain* are? In other words, what are the processes happening from input of raw material until the product reach the final customers? Limiting VCA to a certain number of core processes is important. Otherwise it will be too complex, and therefore consume too much time and resources.

Second, identifying and mapping *the main actors involved in process* along with the identification of core processes in the value chain. According to main occupation of actors, distinction between actors is dependent on the level of complexity which the exercise of

mapping tries to reach. In Bac Lieu shrimp industry, collectors perform the collection network of shrimp from pond to processing plants, while farmers are those involved in production. This type of categorization is simple but does not provide much information. Shrimp farmers can be classified into large, medium and small-scale farmers. The classification can also be grouped into intensive, extensive, integrated mangrove-shrimp, and integrated rice-shrimp models.

Third, once step 1 and 2 are completed, actors and specific activities in the value chain have been mapped out, *the product flow is going to be identified*.

“A flow chart illustrates the process by which a product or service goes through several stages in the value chain until it reaches the final customer”. (ILO 2009:67).

This step creates a clear picture of the flow of products from raw materials to final product, which is ready for sale to the final customers. After mapping the product flow deciding the volume of the product remains. The volume of the product, when identified, will provide a notion of the sizes of different channels within the value chain.

Four, mapping *the value at different levels of the value chain* by method of analyzing cost and margin (see section 4.2) will depict the monetary flow and provide an overview of the earnings at different stages.

Five, mapping *services that feed into the value chain* will be done by finding crucial information in the rule and regulations that are governing the value chain. A proper VCA should consider the world surrounding the value chain.

Last but not least, the value chain map includes also *advantage and disadvantage* of actors in the value chain. During the VCA, they could be identified and added. It is important to keep in mind that disadvantages are listed. The causes of these disadvantages and their solutions remains to solve for deeper analysis.

4.2. Analyzing costs and margins

After the value chain has been mapped, certain aspects of the value chain could be put into analysis for better insights. There is a wide range of aspects that could be discovered by analysis on costs and margins. This step aims to enabling the understanding on:

- Costs and margins incurred by different actors as they perform their activities in value chain.
- The distribution of costs, revenue and profit over different actors.
- Value chain comparisons.

4.2.1. Calculating opportunity costs

Opportunity costs can be divided in two cost types: variable costs and fixed costs. Variable costs relevant to economic decision-making in the short run. In shrimp farming, variable costs are shrimp feed, seed, chemicals, medicine, lime, electricity, fuel, renovation, and labour wages. On the other hand, fixed costs are costs that are independent from the size of the production. In shrimp farming, fixed costs are watch-tower, machinery, maintenance, etc. Not all costs are easily categorized into fixed or variable costs. Once the classification is completed, costs per unit will be calculated and presented for each stage of the value chain. In the value chain, each level consists of a certain number of actors. So, the cost values representing for the whole level have to be average values. After the calculation, there should be a summary in which cost items are listed for each level over the whole value chain.

$$\textit{Total costs} = \textit{fixed costs} + \textit{variable costs} + \textit{other costs}$$

4.2.2. Calculating revenues per actor

After costs per unit for each level of the value chain have been calculated, the revenues have to be identified. Revenues are calculated by multiplying the volume sold (Q) with the selling price (P) and adding additional sources of income.

$$\textit{Revenue} = (Q * P) + \textit{other sources of income}$$

Selling prices received by a seller are not the same for every output he produces. In Bac Lieu, collectors will classify shrimp by sizes after collecting shrimp from farmers before selling to processing firms. The middleman receives a higher price for big shrimps than that for smaller shrimps. Therefore, price received have to be averaged.

$$\text{Unit price} = \text{revenues}/Q$$

4.2.3. Calculating financial ratios

After opportunity costs and revenues are computed the financial position of the value chain actors can be analyzed. They are:

- Net income (or profit) is the difference between revenue and total costs (variable, fixed, and other costs).

$$\text{Net income} = \text{revenue} - \text{total costs}$$

- Net margin in currency of product is the net income per product. This is calculated by dividing the net income by the total number of products sold (Q).

$$\text{Margin} = \text{Net income}/Q$$

- Net profit margin in percentage is found by dividing the unit profit (profit per unit) by the unit price.

$$\text{Net profit margin} = \text{unit profit}/\text{unit price}$$

- Return on investment (ROI) for each actor in the value chain shows how attractive the activity is relative to other potential capital uses.

$$\text{ROI} = \text{Net Income}/\text{Total costs}$$

4.2.4. Calculating relative financial position of actors in the value chain

After financial ratios are computed, the next step in this study is to calculate added costs and marketing margins. All these items are to be computed are at unit values.

Added costs is the difference between total costs per unit and procurement costs from the previous level in the value chain. And marketing margin is the difference between purchasing price paid to the previous level and selling price paid by the next level in the value chain. After the calculation has been done for every stage in the value chain, the value added margin and profits along the chain is given from the table 7.

Total costs (F) of the final product sold to the final customer is constituted of added costs incurred by different chain actors. The added unit cost at each level/stage of the value chain reflects the efforts of different chain actors in adding value to the final product.

Table 7. Formulas for calculating relative financial position of actors

Value Chain Actor	Unit total costs	Added Unit costs	(%) Added Unit costs	Unit price	Unit Profit	(%) Total Profits	Unit margin	(%) Unit margin
Farmers	A	-	A/F	E	E-A	(E-A)/(I-F)	E	E/I
Collectors	E+B	B	B/F	G	G-B-E	(G-B-E)/(I-F)	G-E	G-E/I
Wholesalers	G+C	C	C/F	H	H-C-G	(H-C-G)/(I-F)	H-G	H-G/I
Processors	H+D	D	D/F	I	I-D-H	(H-C-G)/(I-F)	I-H	I-H/I
Total		F=A+B+C+D	100		I-F	100	I	100

The profit is made up of marketing margins belonging to different actors in the value chain. Therefore, the marketing margin, when showed in percent, reflects the distribution of retail price to different chain actors. Profit from selling the final product to the final customer is comprised by profits accruing to different chain actors.

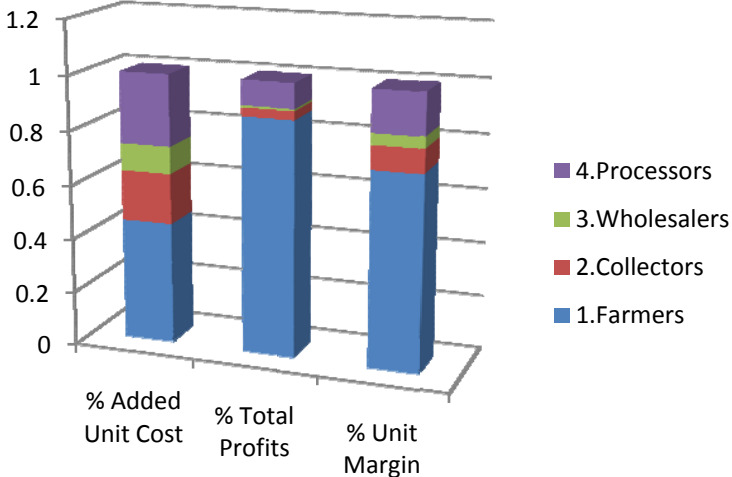


Figure 12. The distribution of revenue, profit, and added costs (Source: M4P 2008, cited from National Economic and Social Development Board of Thailand (2004): Training course on integrating value chain analysis and methodologies into policy analysis)

The distribution of retail price, profit and added costs are drawn in the same graph as general figure 12 to show the value chain margin for the actors in each level.

From finishing those calculations, we can explore why certain actors in the chain on average have higher margins and lower cost than others.

“What do prices and value distribution at different levels tell you about the underlying modelatic causes of this particular value distribution? Why value is distributed in this way? Why do small producers get a relative smaller share of the overall value than large companies? Knowing who gains most is therefore not enough. You also need to know why those who are gaining less are prevented from gaining more. Every calculation of value distribution must therefore be accompanied by efforts to seek the underlying modelic causes for unequal value chain distribution and to understand the incentives of market players to invest in higher-value-added activities”. (ILO 2009:107).

4.3. Analyzing employment distribution

Analyzing distribution of employments recognize individual actors that participate in a number of different value chains and within a particular value chain.

“Therefore, livelihood strategies made by various actors are influenced by labour constraints and any analysis must take this into account. This step help improving the distribution of labour, taking into account seasonality in demand and availability of labour and also the competitiveness between labour intensive and labour saving upgrading strategies”. (M4P 2008:129).

First, analyzing distribution of employment within a value chain based on mapping of the value chain (see sectin 4.1), adds employment specific information like age distribution. In shrimp farming practice, it reflects the experience in technical skills and management.

Second,if the distribution of employment is compared across each stage of the value chain a comparison of opportunities at various levels of the chain. Determining employment at each level of the value chain is conducted through a survey.

- *Farmer:* Direct interview at farms the number of farmers based on area. Data were cross checked with district authorities.

- *Collectors:* Interviews with district officers are conducted which estimate the number of collectors under of each trader/wholesaler. This also estimates the total volume of sales, and the typical volume per transport unit, the number of people required per transport unit, the time required to transport, and the number of full time equivalent employees.
- *Wholesales:* Conducting a survey of wholesalers is generally not too time-consuming. Be aware of seasonal variation; in the off-season the number of wholesalers is much smaller than in the main season.



Figure 13. Packing PL in a hachery (*Source:* Own photo)

- *Feed and veterinary medicine enterprises:* Direct interviews with district officers were carried out. Agents were asked the total traded volume of a product in a value chain and the daily turnover.
- *Processors:* The number of processors in an area was identified from official sources.

Third, the impacts of governance on employment are determined by comparing employment across sub-chain of the value chain that has difference governance structures.

4.4. Study time frame

The study was carried-out in August 2010. The economic, production data was collected from year 2009 onwards.

- Surveying costs and margins in Vinh Hau A commune, Hoa Binh district, Bac Lieu province.
- Surveying the activities of hatchery in Nha Mat Ward, Bac Lieu city.
- Surveying the activities of trading in shrimp feed, medicine and chemicals in Hoa Binh district and Bac Lieu city.
- Surveying activities of trading in shrimp in Vinh Hau commune (for local collectors) and in the district of Hoa Binh and Bac Lieu town (for the agents supplying shrimp to processors).
- Surveying activities of operations in fisheries management agencies under the Department of Agriculture and Rural Development of Bac Lieu province.

4.5. Study approaches

The participation of target groups in the research process had been maintained throughout the research process to ensure reliability of information collected from the agents involved in the value chain. The specific methodology applied is:

- The information was collected with a prepared questionnaire. This method was applied to collect statistical information, mainly to assess the status and estimate manufacturing production efficiency and all “agents”.

- Semi-formal interviews with open questions: This method was applied mainly for non-farmers participating in the value chain. The research team interviewed leaders of organizations involved at many different stages. For example, the leaders of different units at levels of hamlet, district or province in the specialized departments and establishments, primary producers, collectors, wholesalers, processors, and service providers.

- Secondary data: to collect the relevant information for the research issues at the international level, in countries and provinces. In the framework of the subject, mainly information on trade and commercial standards, hygiene standards and food safety laws and regulations relating to fisheries and aquaculture were collected.

4.6. Sample size

Interviews were conducted on 71 household include

- 9 shrimp hatcheries were surveyed (3 large-scale, 3 medium-scale, 3 small-scale).
- 8 shrimp nurseries were surveyed (4 receiving larvae within Bac Lieu and 4 outside).
- 5 feed and veterinary medicine enterprises were surveyed.
- 29 shrimp households were surveyed (of which 5 intensive, 10 extensive, 7 integrated mangrove-shrimp, and 7 integrated rice-shrimp culture model).
- 5 collector persons.
- 10 wholesaler agents.
- 5 processing companies.

4.7. Data collection

Secondary data from Bac Lieu ARDD and Hoa Binh Agriculture and Rural Development Office:

- Database on culture area, production, and exports,
- Database on fisheries management, human resources, and others related laws and regulations.
- Database on the number of processor, processing capacity, ownership, mode of acquisition, distribution, processing and export.
- Database on number and distribution of hatcheries, traders, ways to provide inputs for farmers.

Primary data from survey:

- General information on shrimp farming households (address, area of production, crop production, production experience).
- Fixed costs such as investments costs digging ponds and embankments, water canals, water pumps, protection nets.
- Variable costs such as seed, shrimp feed, drugs for disease prevention and cure, vitamins, minerals and digestive enzymes (pro-biotic), water treatment chemicals (e.g. stabilization of pH with lime and/or dolomite), energy (petrol, electricity), dredging costs and costs for treatment of pond after each crop. etc.
- Volume sold, selling price, and shrimp yield (two most recent crops in 2009).

- Farmers' awareness and capacity on shrimp culture techniques.
- Farmers' awareness of about environmental changes caused by shrimp farming.
- Demand on information and information resources about the seed, food safety management, environment, consumption market and product's quality.

4.8. Data entry and analysis

4.8.1. Data entry

Data is coded by information groups as described in the structures of the questionnaires. All data/information was checked and entered into the database.

4.8.2. Data analysis

The methods of data analysis are: Statistical description analysis: simple statistical indicators such as average, variance, Standard Deviation, and percentage were used to describe cultured area and socio-economics of farming models. Based on these indicators, interpretation was made more specific and clearly. Microsoft Excel was used for data analysis.

In summary, a total sample size of 71 surveyed household were conducted and analyzed for this study. Each level of Black tiger shrimp value chain in Bac Lieu from farmers, collectors, wholesalers, feed and veterinary medicine enterprises, and processors were interviewed by separate questionnaire. The results and discussion will be presented in chapter 5.

5. RESULTS AND DISCUSSION

This chapter consists of four main sections. First, value chain map and main actors involved in the processes are presented by a map of actors. Second, analyzing costs and margins of each level in value chain are showed in detail. Third, analyzing employment distribution from farmers, collectors, wholesalers, feed and veterinary medicine enterprises and processors include their activities, advantages and disadvantages. Last, comparative return on investment of actors in the value chain.

5.1. Value chain map and main actors involved in the processes

Starting from the hatchery, through the grow-out process, to the processing companies, and finally to the table, many actors was identified as involved in the shrimp value chain, with their contribution to the commercial value of this product. These range from the main contributors (such as input suppliers to farmers, collectors, wholesalers, and processors), to secondary contributors (such as infrastructure, the management of local and national authorities, support loans from banks, quality control and shrimp export industry agencies). All of them have formed relationships and operate as elements of the shrimp value chain.

Through the survey, the organization, activities, operations and internal relationships of the main actors related to the shrimp value chain have been clarified. Those actors impact the quality of shrimp products. Also, the survey results outline the cost of inputs and the value of outputs.

The Black tiger shrimp value chain in Bac Lieu province is depicted in Figure 14, with the main actors involved directly and indirectly to the chain. These actors dominate the chain from input supply up to final consumption, export and domestic market, sale, respectively. The first channel was a vertically integrated international chain, involving all stages from producers to processors and export markets. The trade extends to well establish markets such as Japan, US and Australia.

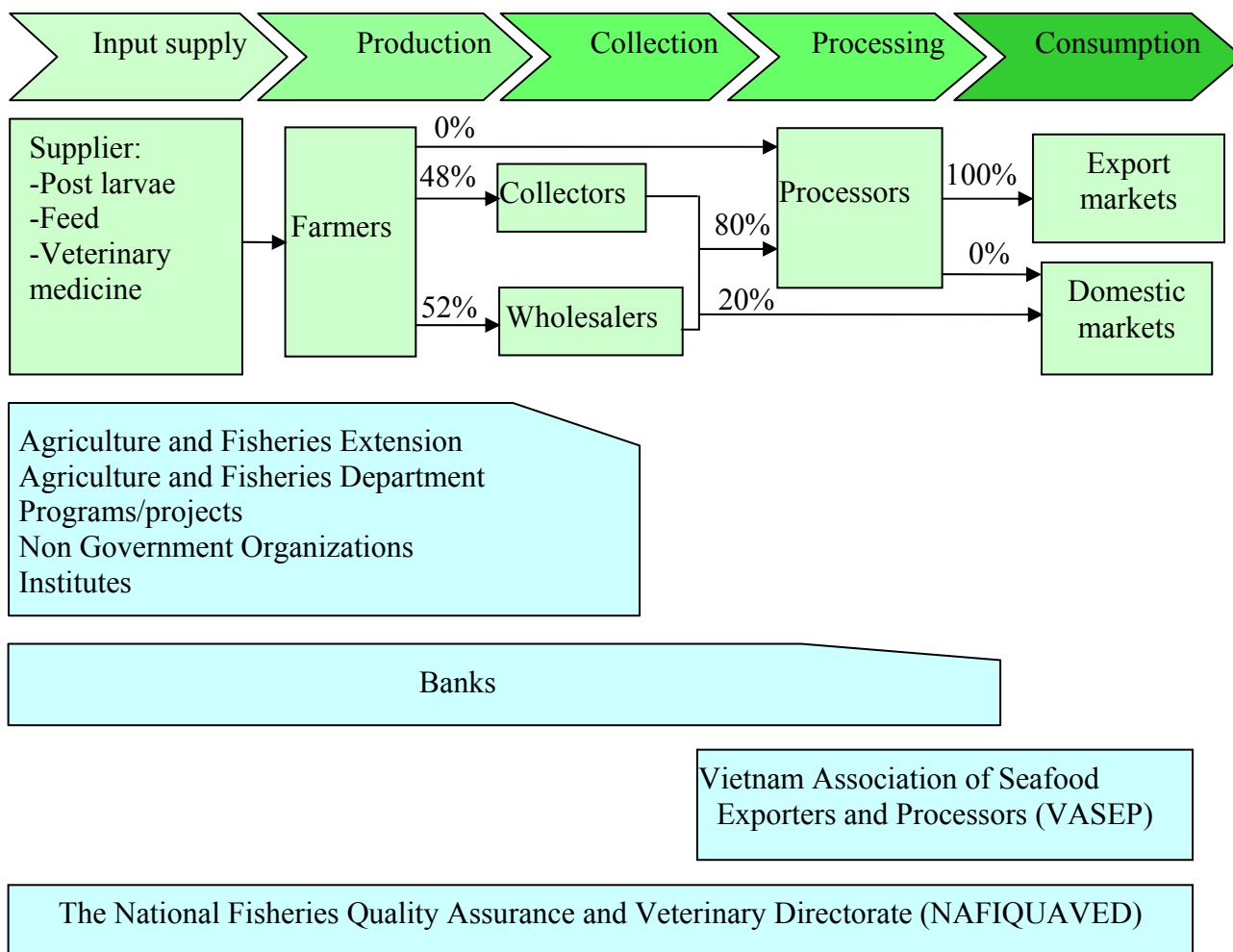


Figure 14. Black tiger shrimp value chain in Bac Lieu province in 2009
(Source: Own illustration)

The second channel was a domestic independent flow of shrimp from farmers, to collectors, wholesalers and finally consumers in major urban centers such as Can Tho and Ho Chi Minh City. The domestic channel was also secondary markets for farmers, collectors, and wholesalers who could supply live shrimp for supper markets or low quality domestic shrimp markets.

The main source of technical support for farmers is the Agriculture and Fishery Extension officers, who belong to the Agriculture and Rural Development Department. They offer training new aquaculture technologies to hatcheries and farmers as well as instruct farmers on governmental policies to increase shrimp hygiene and safety. In addition, there is a range of technical programs for Sustainable Management of Coastal Forest Ecomodel, GTZ and Non Government Organizations programs for technical training and relevant other supports.

There is a large number of private and civil society organizations who facilitate both domestic and international trade. These actors or organizations can be classified into financial, market and technical functions. State and private banks provide financial support to farmers and processors, and the input suppliers. Farmers and input suppliers receive private loans mainly from the AgriBank. Processors receive loans from a range of Vietnamese and international banks.

Vietnam Association of Seafood Exporters and Processors (VASEP) have provided market support. They train and provide market information to support aqua product processors and exporters such as market information, international trade, and understanding quality requirements and standards.

The National Fisheries Quality Assurance and Veterinary Directorate (NAFIQUAVED) have provided support in checking, controlling as well as certifying shrimp products for export.

5.2. Analysing costs and margins

The input costs of each cultural model was clearly different. Figure 15 showed expressed on a per kg shrimp basis, that the costs of the intensive model, extensive model, integrated mangrove–shrimp model and integrated rice-shrimp model was 53,375 VND, 31,854 VND, 36,956 VND and 25,639 VND, respectively.

During 4-5 months rearing time, if the crop is success, farmers got profit from 82% to 87%, and the added value until selling was also very high, ranging from 45% - 63%. For integrated mangrove-shrimp and integrated rice-shrimp models, although the value production and value added of these models were high with large size and high export value, the farmers income was still low because of the low productivities, (190 kg per ha and 283 kg per ha respectively. See appendix 3). With high profit per kg shrimp and limited productivity, the farmers increased their profits by increasing the area with diversification of farming area practices within the existing area.

According to Bac Lieu Statistical Office (2010b), Bac Lieu had more than 126,338 ha of shrimp in 2009, exceeding the targets set for 2010. It showed that there were many extensive farms. This can lead to some negative consequences in quality control, diseases, and water inlet and outlet model development.

The collectors bought shrimps from farmers and sold them to wholesalers or processing companies within 24 hours (maximum 3 days). For this middlemen role they increased the price about 13% - 19% and got a profit of 3% to 4%. The average profit was 3,240 VND per kg of shrimp.

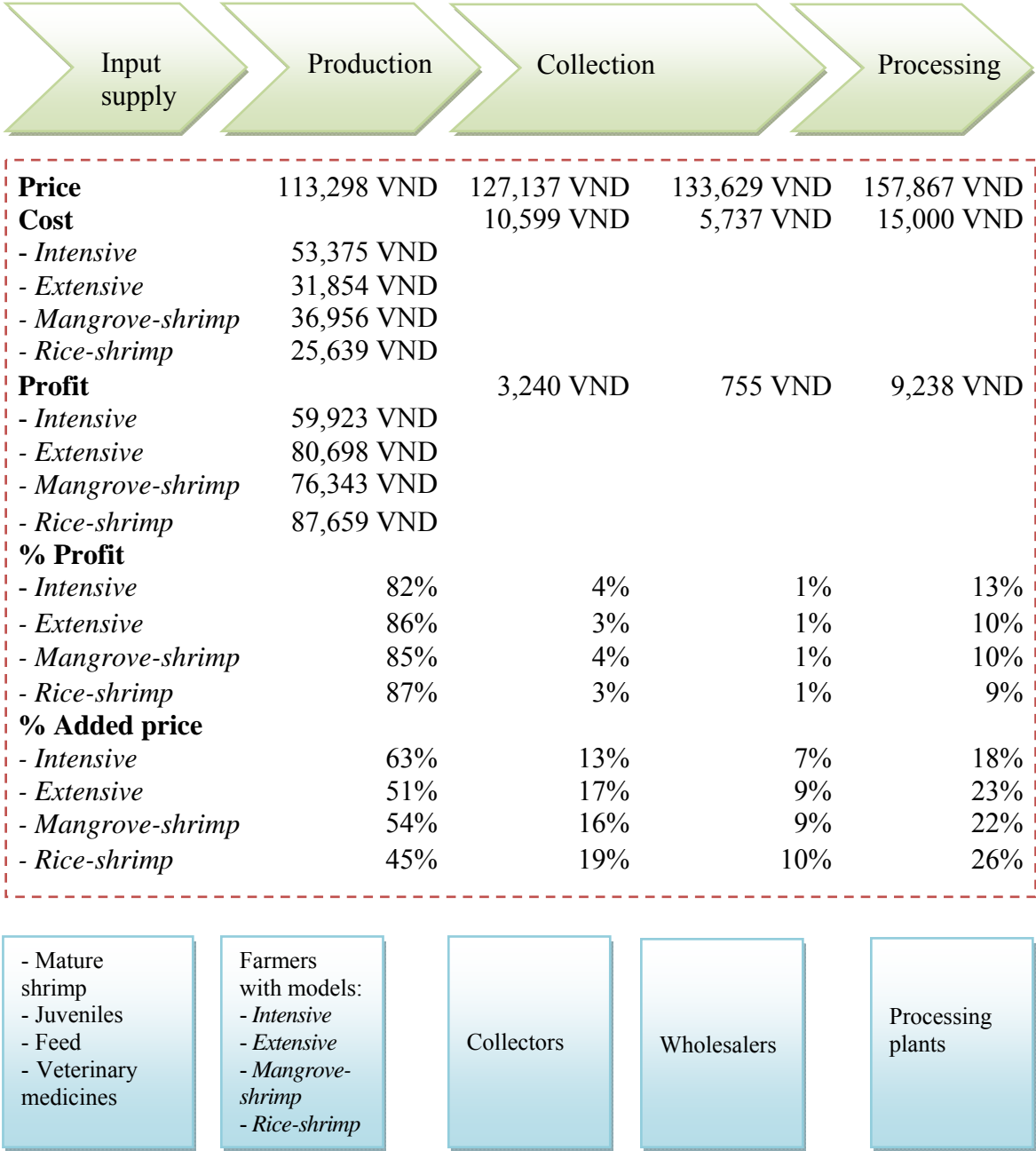


Figure 15. Average revenue, costs and profit per unit in value chain of 1 kg raw shrimp (Source: Own illustration)

Wholesalers also bought shrimps from farmers or collectors and sold them to the processing companies within 24 hours. The costs increased by 7% to 10% and the profit they got only 1% of the sale price or about 755 VND per 1 kg shrimp.

The processing companies bought raw materials and sold the frozen shrimp. The average price per kg shrimp was 157,867 VND. This price was about 18% - 26% higher than the price stated by collectors or wholesalers. Their profit was about 9,238 VND per kg.

Collectors and wholesalers in the Black tiger shrimp value chain had a value added lower than the farmers and the processing plants, however the duration time is short. They pack shrimp in plastic container with ice to take to the processing companies. This stage mainly affected on the shrimp quality. The value of the shrimp product increases by about 20% - 30% within 24 hours. The main inputs were manpower, ice and transportation. The increase of the shrimp value can also stem from the sorting of the shrimp size and water absorption.

5.3. Analyzing employment distribution

5.3.1. Hatcheries

In 2010 there were 160 hatcheries in Bac Lieu and mainly located in Nha Mat ward, Bac Lieu city (Bac Lieu ARDD 2010). They have been active since 2001 with a professional team. Most hatchery workers (87.5% of the total workforce across all hatcheries) were local people.

Hatcheries are small and medium sized, and managed by the private owners (except for Viet Uc company, Toan Cau company, and Kim Sa hatchery). The hatcheries' activities are simple, low construction and operation costs, and low-technical inputs but operations were flexible depending on the season and supply of wild seed. This type of hatchery often had disease and water quality problems, but it was easily and quickly disinfected and reopened without serious losses. Both Viet Uc and Toan Cau companies have received foreign investment. All of them have waste water treatment procedures. 87.5% of the hatcheries are associated with farmers by supply contracts while only 37.5% are associated with nurseries.

Hatcheries produce PL from blood stocks (mother shrimp) under controlled conditions. The hatchery obtains the blood stocks from marine fishermen. For breeding purposes, the blood stock is kept in a dark quarantined room at a controlled temperature. Cleanliness and quietness are emphasized as critical factors for successful breeding. In 2009, the blood stocks

were supplied mainly from Rach Goc, accounting for 75% of the total. They have been imported from Malaysia, Singapore, and Indonesia etc.

From surveyed data, each foreign investment hatchery supplied 800 – 1,200 million PL per year, while each local hatchery produced about 25 million – 40 million PL. Average survival rate from nauplius to PL of 15 days was 73%. Among these PL, 91.25% of total passed disease testing. The hatcheries in Bac Lieu province supplied about 40-50% of the local demand. Remains were supplied from Vung tau province and Central provinces of Vietnam.

Table 8. Average costs of a hatchery in Bac Lieu

(Unit: VND)

	Percentage	Hatchery
Total income (A)		10,665,303,125
<i>Volum sold (PL)</i>		272,606,250
<i>Price (VND per PL)</i>		39
Total costs (B)	100	1,866,431,250
<i>Bloodstocks</i>	16.67	311,187,500
<i>Bloodstocks feed</i>	1.65	30,706,250
<i>Mixed feed for PL</i>	6.77	126,312,500
<i>Chemical and medicine</i>	0.41	7,625,000
<i>Artemia (live feed for PL)</i>	66.25	1,236,487,500
<i>Labours cost</i>	5.85	109,250,000
<i>Depreciation</i>	0.43	7,937,500
<i>Fuel and electricity</i>	1.98	36,925,000
Profit (A – B)		8,798,871,875

(Source: Surveyed result in 2010)

Most of the costs accruing the hatcheries stems from feed for PL (66%) and followed by blood stocks cost accounted for 17% (Table 8).

In general, advantages for the development of a seed industry are the geographical location and ecological characteristics of Bac Lieu province. All hatcheries applied biotechnology to improve productivity and quality, reduce production costs and improve competitiveness. Producers have accumulated much experience and the market is stable in and outside the

province. However, production volume is still low and scattered, and the opportunities for the establishment of cooperative production like farmers clubs do not get noticed. Further, prices of input costs go up but output prices do not increase accordingly. Brood stock from Vietnamese coastal waters is gradually becoming more seldom, and some hatcheries have to import from overseas to keep their activities going. In sum, this important industry is still dependent on wild natural resources as the life cycle of Black tiger shrimp has not yet been closed in culture, in contrast to White legged shrimp.

Hatcheries with high investment capacity have applied high technology processes, from brood stock selection, water treatment and application of biotechnology in order to meet the market demand of disease-free PL. PL from these hatcheries is paid about 50-55 VND per PL, which is higher compared to products from other provinces such as Vung Tau province or the Central provinces. Quality of PL depends on the quality and the reproductive capacity brood stock, and technique of PL rearing in the hatcheries. There are several methods to check the quality of PL before buying and stocking them into grow-out ponds. The Polymerase Chain Reaction Method is very common and important method to test the quality of PL before stoking.

5.3.2. Nurseries

Nurseries are transit station, where PL are adapted to the grow-out farm production environment. Based on the demand from farmers, they buy shrimp larvae from hatcheries, then nursed with suitable salinity and sold the bigger PL to farmers. In some cases, PL pass through nurseries before being delivered to the grow-out farms.

Nursery shrimp practice is a new value addition option in the Black tiger shrimp value chain that help to improve survival rates of PL from hatchery to grow-out farms. Nurseries has the potential to increase the quality of PL in rearing ponds and provide employment opportunities. On average 1-2 persons work within each nursery. Fifty percent of the nurseries have been involved in trading shrimp products before they started nurseries activities.

Table 9 indicates that PL was the highest costs component for nurseries with 65% of total costs. It is followed by labour cost accounting for 9%. Nurseries are small, or medium sized and managed by the private owners. The operations are flexible depending on the season.

Table 9. Average costs of a nursery in Bac Lieu*(Unit: VND)*

	Percentage	Nursery
Total income (A)		643,000,000
<i>Volum sold (PL)</i>		13,608,466
<i>Price (VND per PL)</i>		47
Total costs (B)	100	361,440,000
<i>Mix feed for PL</i>	5.2	18,771,207
<i>Chemical and medicine</i>	3.6	12,976,261
<i>Artemia (live feed for PL)</i>	1.3	4,718,004
<i>Labours cost</i>	9.3	33,486,570
<i>Depreciation</i>	3.9	14,217,892
<i>Fuel and electricity</i>	4.5	16,195,609
<i>PL input</i>	64.7	233,962,704
<i>Others</i>	7.5	27,111,754
Profit (A – B)		281,560,000

(Source: Surveyed result in 2010)

Besides, the nurseries' activities are simple with low construction and operation costs, and low-technical inputs. Disease and water quality problems occur often, which have affected the yield and shrimp quality at the farms.

5.3.3. Farmers

The Black tiger shrimp farming industry in Bac Lieu province is strongly developed with various models such as intensive, extensive, integrated mangrove-shrimp, and integrated rice-shrimp. The previous occupation and the length of shrimp farming duration can reflect the experience of the farmers. Experience is one of the key factors which affect farming success. In Hoa Binh district, in the case of integrated mangrove-shrimp and integrated rice-shrimp models, all the farmers were doing agricultural activities before farming shrimp, implying that they are well-informed about the weather and the land of this area.

In the intensive and extensive model, farmers have on average 8.6 and 7.8 years of experience, respectively. While experience in the integrated mangrove-shrimp model was about 11.1 years, the corresponding figure within the integrated rice-shrimp was about 13

years. In the extensive model, the longest experience was 21 years and the shortest 2 years. Hence farmers seem to have gained farming knowledge through extensive experience (Table 10).

Table 10. Number of experiences years in shrimp aquaculture in Hoa Binh.

	Intensive model	Extensive model	Integrated mangrove-shrimp model	Integrated rice-shrimp model
Average (year)	8.6	7.8	11.1	13
Max (year)	10	21	21	14
Min (year)	5	2	7	10

(Source: Surveyed result in 2010)

The survey results on the employment within the four farming models in Hoa Binh district is presented in the table 11 with average manpower per household.

Table 11. The average family labour full time working

	Intensive model	Extensive model	Integrated mangrove-shrimp model	Integrated rice-shrimp model
Family labours (person/farm)	2.8	2	2.9	2.1
Max	6	4	6	4
Min	1	1	2	1
Hired labours (person/farm)	2.6	1.2	0.0	0.0
Max	7	10	0	0
Min	0	0	0	0

(Source: Surveyed result in 2010)

The average family labour of the intensive, extensive, integrated mangrove-shrimp, and integrated rice-shrimp was 2.8, 2, 2.9, and 2.1 persons per farm, respectively. Besides family labour, some households also hired labour. The scale of hired labour depends on the total of farming area and farming models. Table 11 shows that the regularly hired labour for the intensive and was about 2.6 persons; the highest number of manpower was 7 persons. The

extensive was 1.2 person. The integrated mangrove-shrimp and integrated rice-shrimp model did not hire labour. The main season for stocking was January and February, and then harvesting in May and June. During this time households hire labours for their crop. The number of hired labour could reflect the farming scale; a farm with small area would not hire labour during the year.

There were differences in total costs (fixed and variable cash costs) for the different farming models. The intensive model had the highest costs (370,878,260 VND per ha), then followed by extensive model, integrated rice-shrimp, and integrated mangrove-shrimp model, with 198,862,044 VND, 22,597,429 VND, and 9,251,487 VND per ha, respectively. (Table 12).

Table 12. Average costs of farming per ha

(Unit: VND)

Costs	Intensive model	Extensive model	Integrated mangrove-shrimp model	Integrated rice-shrimp model
Total costs=A+B	370,878,260	198,862,044	9,251,487	22,597,429
Variable costs (A)	359,573,913	196,517,744	8,927,899	13,954,571
Feed cost	238,008,695	131,027,064		
Seed cost	13,739,130	4,696,480	2,577,473	6,204,571
Chemical, medicine, lime cost	40,869,565	23,443,000	606,729	1,321,429
Electricity, fuel cost	33,913,043	17,217,800	4,372,940	1,285,714
Renovation cost	14,782,608	7,604,200	1,370,757	1,714,286
Labour cost	18,260,869	12,529,200		3,428,571
Fixed cost (B)	11,304,347	2,344,300	323,589	8,642,857
Watch-tower cost	869,565	2,344,300	323,589	1,142,857
Description cost	3,478,260			
Others (pump, tax...)	6,956,521			7,500,000
Price (P)	101,400	105,900	124,821	121,071
Volume sold (Q)	6,948	2,042	90	283
Revenue=Q*P (C)	704,527,200	216,247,800	23,715,990	34,263,093
Net income=C-(A+B)	333,648,939	17,385,756	14,464,503	11,665,664

(Source: Surveyed result in 2010)

5.3.4. Feed and veterinary medicine enterprises

Feed and veterinary medicine enterprises sold feed, chemicals and veterinary medicines. The average business age was 8.8 years. The experience of all enterprises was quite long which gives greater advantages for their business and contribute to minimize the risk.

Feed and veterinary medicine enterprises also have two kinds of labours: Family labour and frequently hired labour. The frequently hired labour can be referred to as direct labour; they were local inhabitants who conducted manual activities such as loading, receiving and delivering products. The family labour was the indirect manpower, they are the educated persons who manage the store, or consulte/introduce the product to the customers. These were normally the owners or their family members who had the practical experience and shrimp technology knowledge. They frequently update information from Government and market about the circular, decree, decision involved in aquaculture and fisheries export to ensure in quality and food safety, and reached production certification from domestic and international appropriate authorities.

Table 13. Labours in feed and veterinary medicine enterprises

Kind of labours	Number of labour (person)		
	Average	Max	Min
Family labours in these enterprises	3,4	5	1
Frequently hired labours	1,8	3	1

(Source: Surveyed result in 2010)

These feed and veterinary medicine enterprises were the agents of some feed or chemical or medicine companies and they also sold the products supporting for the aquaculture sector. None of the them marketed only one product. The payment method is mainly by cash or deposit. Other payment methods are part payment and half payment. The feed companies also provide preferential conditions or extra-promotional support to prestigious and long term dealers.

The feed and veterinary medicine enterprises buy feed, chemicals etc. from the producers under contracts or a trading agreement. Feed and veterinary medicine enterprises can identify the quality of the products at the store by sense (eyes, hands, etc.). They also check the logo

and wrapping for consistency. Besides, they can also request the producers to supply a product quality certificate. Furthermore, based on feed-back from farmers, the wholesalers will decide whether to continue the business with the product or not. The feed and veterinary medicine enterprises would like to continue to engage in business with the customers/farmers, so they always pay attention to the product quality.

The number of products which the feed and veterinary medicine enterprises buy in the whole year round is unstable, since it depends on the market status. If the demand of the market is high, they will stock more products; in contrast, if the demand is slow, they will keep fewer products in stock.

Discounts and promotion regimes are applied regularly and flexibly by the producers depending on their business strategy. The basic discount and promotion regimes were applied for feeds. The feed price discount varies from 2,300 to 4,000 VND per kg. For chemicals, it was 15% - 35% depending on the supply companies policy. Among the surveyed enterprises, 60% of them also operated partly in aquaculture activities. Their main income was from selling feed and veterinary and medicine products while the aquaculture income constituted about 20%.

The feed and veterinary medicine enterprises in Bac Lieu were established in long term and have the prestige/business with customers. They have many friendly customers which help to reduce the business risks. But they got high competition in price which reduce the profit. In some cases, the product quality cannot be identified; it can lead to lost prestige with customers and losing the customer.

5.3.5. Collectors and wholesalers

In Bac Lieu province, the processing companies often collect the raw materials via collectors and wholesalers, not themselves. The reason was that the processors do not have the capacity to organize a direct collection network from the farmers or the necessary investment budget was too high for the enterprises to establish their own logistical model.

Collectors and wholesalers have been established since the farming industry appeared. The average experience duration of collectors was 5.2 years while the average experience duration of wholesalers was 11.6 years.

Table 14. Experiences years of collectors and wholesalers

Actor	Experiences (years)		
	Average	Max	Min
Collectors	5,2	10	2
Wholesalers	11,6	26	2

(Source: Surveyed result in 2010)

All of the collectors and wholesalers operated their business located on their own land. The collectors often used their own capital while the wholesalers often borrow about 14% of their capital. Collectors often had no warehouse, so they bought shrimps from the farmers and then sold them to processors or wholesalers directly. About 60% of wholesalers had warehouses. Shrimps were often kept in containers with ice before transporting them to the processing companies. Thus, the shrimp quality depends on transportation time and interval to the processing companies and time they were kept in ice.

The average productivity of collectors was 6.68 tons/years, and the highest was 20 tons/years while the productivity of wholesalers was 200 tons/year where the highest peak was 500 tons/year. Each wholesaler had a linkage with 3 processors on average. Collectors often had smaller business scale than wholesalers, but their business activities were more flexible with various products such as crab, fish, etc. While the wholesalers often do business with only one product (shrimp).

The collectors and wholesalers have a long business relationship with the farmers, so they can buy the local raw material actively. They have also sufficient foundation, land as well as transportation means due to participating in the local shrimp market for a long time which can help the dealers and collectors in approaching the suppliers and the buyers. However, they must pay a deposit for shrimp at the farmers, which can be a large investment. There were critical competition between wholesalers and collectors from internal and external provinces. The main big consumers in Ho Chi Minh City are markets, supermarkets, and restaurants which prefer the shrimp alive. They directly approach the farmer's ponds for buying the shrimps alive, and then store them in cool boxes by using ice and equipping them with air supply to ensure that the shrimps are still alive at the consumers' hand. The price of live shrimp is higher than the iced shrimp.

5.3.6. Processing companies

In 2009, there were 11 processing companies in Bac Lieu province. They focused on producing processed shrimp products for exports. The processing companies bought shrimp raw materials from collectors and wholesalers, then sold the shrimp products to traditional and new markets. 88% of total products were exported to foreign markets, and only 12% was delivered to local markets by agencies, supermarkets and food shops (Bac Lieu Statistical Office 2010b).

Processing companies incur costs of labour, electricity for ice, freezing machines, and storage, water, chemicals and packing materials, ect. Total costs was 15,000 VND per kg. Through processing procedure, they sold shrimp products in the main forms of “head on shell-on” (HOSO) or “headless, shell-on” (HLSO). In this study, the sale price for foreign markets in form of “head on shell-on” was 157,867 VND.

The processing companies know potential markets via international trade fairs for shrimp, fish and fishery products that have been organized in many European Union countries. The most relevant fair for exporters of fishery products was the European Seafood Exposition together with Seafood Processing Europe, held once a year in Brussels, Belgium (Khoi 2007).

In shrimp processing, the hazards could occur in any stage from input to distribution. To keep the final shrimp products free from the hazards and assure hygiene, safety and quality, Hazard Analysis and Critical Control Points (HACCP) procedures has been applied as crucial tools.

The processing companies applying HACCP and seafood of Vietnam is diversification and high quality product. Marketing was weak and lack of consumer information. Final products were still raw with low price and low growth rate of export volume and value. Processing companies is developing while shrimp farming practices are more difficult because of disease, bad weather, ect. cause lack of raw material. This is really challenge for sustainable development of shrimp industry in Bac Lieu.

5.4. Comparative financial out come for actors in the value chain

There were four main actors involved directly in shrimp value chain. They were farmers (in four different models as intensive, extensive, integrated mangrove-shrimp, integrated rice-

shrimp), collectors, wholesalers, and processors who produce and add value to shrimp products. Relative financial of these actors are presented in table 15.

Table 15 shows that the return on investment of farmers in intensive, extensive, integrated mangrove-shrimp, and integrated rice-shrimp model were 1.12, 2.53, 2.07, and 3.42, respectively. These ratio are highest to compare with other actors, who produce shrimp products directly, in the Black tiger shrimp value chain. The next order was processing companies, collectors, and wholesalers with the return on investment of 0.62, 0.31, and 0.13, respectively. Return on investment indicates attractive the activity is relative to other potential uses of capital in each actor. Thus, farmers got the best of using of capital. However, farmers have carried out their crop about 5 months with many risks form weather conditions, disease, ect. Shrimp farming in Bac Lieu was mainly extensive model with small-scale accounting for about 90% of the total shrimp farming area in 2010. While, inputs supply increase together inflation every year. If the shrimp crop is failure, farmers will got a lot of difficulties for next crops. Farmers are consumers to consume products from hatcheries, nurseries, and the feed and veterinary medicine enterprises. Their risks in shrimp farming practice can not swith to another actors. Farmers got not only highest profits but also worst risks.

Table 15. Return on investment (profit and cost ratio) per 1 kg shrimp of main actors.

	Costs (VND)	Profit (VND)	Profit/ Cost	Order
Farmers				1
- <i>Intensive</i>	53,375	59,923	1.12	
- <i>Extensive</i>	31,854	80,698	2.53	
- <i>Mangrove-shrimp</i>	36,956	76,343	2.07	
- <i>Rice-shrimp</i>	25,639	87,659	3.42	
Collectors	10,599	3,240	0.31	3
Wholesalers	5,737	755	0.13	4
Processors	15,000	9,238	0.62	2

(Source: Surveyed result in 2010)

Meanwhile, processing companies were the second rank in the value chain but they were equipped with advanced equipment and modern processing chains. Quality of shrimp products were improved and diversified to increase the added value of products. In addition, most processing companies got the European Union code that made easier for them to export to European markets. They were the most powerful actor in the Black tiger shrimp value chain.

Collectors and wholesalers were the third and last rank in return on investment in the value chain, the activities of collectors and wholesalers were simple such as buying, storing and transporting shrimp to the processing companies for 24 hours to 3 days (meanwhile grow-out shrimp practice was about 5 months). They seem not to get any risks on their business.

In summary, farmers were the weakest actor in the Black tiger shrimp value chain in Bac Lieu though profit and cost ratio per 1 kg shrimp of them were highest. Most of them were small-scale models and had limitation of opportunities to upgrade their production. They were the most vulnerable actor and their production depend on other actors in the value chain.

6. CONCLUSION

6.1. Conclusions

The value chain of Black tiger shrimp in Bac Lieu province has four main actors which contributed directly to shrimp production and effected to the commercial value, and shrimp price. They are farmers, collectors, wholesalers and processing companies. In spite of added value of farmers are highest, they are the weakest and the most vulnerable actor and shrimp farming practice depend on weather condition and other actors in the value chain. Other agents, such as hatcheries, nurseries, feed and veterinary medicines enterprises also impacted the economic efficiency and the value chain development orientation.

The added value will increase about 45%-63% at the farms and 18%-26% at the processing companies. There was a clearly difference between the added value of farmers and processing companies. But, processing companies got more advantages to increase the opportunities and benefits from trade, they are the most powerful actor in the value chain.

The farmers achieve a profit of 82% to 87% per kg of shrimp, but it was unsustainable. In the case of market fluctuation of shrimp prices, the farmers are vulnerable because they are also affected by the three remaining links in the chain. In the case of market fluctuation of supply prices, the added value was also affected directly.

Surprisingly, the value of the shrimp product at the remaining actors, collectors and wholesalers increased with about 20% - 30% within 24 hours. They had a value added lower than the farmers and the processing companies, however the duration was short and the main inputs are manpower, ice and transportation. These actors mainly affected on the shrimp quality.

Hatcheries are the places where PL can be produced under controlled conditions that supplied about 40-50% of the local demand. The geographical location and ecological characteristics of Bac Lieu province are advantages for hatcheries' activities. While, nurseries help to improve survival rates of PL from hatchery to grow-out farms, and was a new value addition option in the Black tiger shrimp value chain. Hatcheries have been still depend on brood stock form wild natural resources, which is open-access resources, the life cycle of Black tiger shrimp has not yet been closed in culture.

The feed and veterinary medicine enterprises are the agents of feed or chemical/medicine companies. The information of circular, decree, decision involved in aquaculture from government are updated to support their business. They have indirectly influences to shrimp quality.

6.2. Recommendations

Shrimp farming clubs or farmers' association should be established not only for co-management, the implementation of better management practices for sustainable shrimp farming but also for reducing the input costs. In order to help small-scale farmers share their experiences and provide mutual help who got the most vulnerable in the value chain.

Banks, especially Vietnam bank for agriculture and rural development, should have an active financial support policy for farmers and processing companies to access the special source of credit capital with low interest rates, capital size and loan terms, and conditions.

Government should need to conduct a risk insurance policy for farmers and the processing and exporting companies to help them overcome the crisis of liquidity loss or bankruptcy caused of crop failure or failure in market competition.

Farmers, hatcheries, and nurseies should need to link to feed and veterinary medicine enterprises and processing companies with contract systems to meet the market demands and ensure sustainable development of shrimp industry. This linkage would be for various benefits, mainly quality assurance and food safety in socially acceptable, environmentally sound and economically viable manner.

Research Institutes and Universities should focus on dosmetric studies of Black tiger shrimp in order to gain self-control of blood stock supply in shrimp seed production.

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APPENDIX

Appendix 1. List of interviewees in Bac Lieu province

Actor	Name	Address	
Farmers	Intensive	Nguyen Van Nguon	Hamlet no. 17, Vinh Hau A commune, Hoa Binh district
		Thach Can Quyet	Hamlet no. 12, Vinh Hau A commune, Hoa Binh district
		Tran Van Son	Hamlet no. 17, Vinh Hau A commune, Hoa Binh district
		Nguyen Chi Tinh	Giong Giua hamlet, Hiep Thanh commune, Hoa Binh district
		Nguyen Van Vi	Hamlet no. 12, Vinh Hau A commune, Hoa Binh district
	Integrated mangrove-shrimp	Vo Thanh Binh	Hamlet no. 12, Vinh Hau A commune, Hoa Binh district
		Nguyen Thanh Hien	Hamlet no. 13, Vinh Hau A commune, Hoa Binh district
		Hoang Van Dinh	Hamlet no. 14, Vinh Hau A commune, Hoa Binh district
		Le Van Bu	Hamlet no. 14, Vinh Hau A commune, Hoa Binh district
		Ngo Trung San	Hamlet no. 14, Vinh Hau A commune, Hoa Binh district
		Hoang Van Han	Hamlet no. 14, Vinh Hau A commune, Hoa Binh district
		Vu Van Sinh	Hamlet no. 14, Vinh Hau A commune, Hoa Binh district
	Extensive	Tran Quoc Toan	Hamlet no. 12, Vinh Hau A commune, Hoa Binh district
		Nguyen Khanh	Hamlet no. 17, Vinh Hau A commune, Hoa Binh district
		Nguyen Thanh Le	Hamlet no. 17, Vinh Hau A commune, Hoa Binh district
		Huynh Van Lien	Hamlet no. 17, Vinh Hau A commune, Hoa Binh district
		Bui Van Bach	Hamlet no. 17, Vinh Hau A commune, Hoa Binh district
		Ta Thanh Tan	Hamlet no. 17, Vinh Hau A commune, Hoa Binh district
		Bui Huy Nam	Kinh Te, Nha Mat A commune, Bac Lieu city
		Tang Hong Ly	Giong Giua hamlet, Hiep Thanh commune, Hoa Binh district
Nguyen Thanh Phuong		Hamlet no. 12, Vinh Hau A commune, Hoa Binh district	
Huynh Van Tai		Hamlet no. 17, Vinh Hau A commune, Hoa Binh district	

Appendix 1. List of interviewees in Bac Lieu province (cont.)

Actor		Name	Address
Farmers	Integrated rice – shrimp	Tran Phuoc Thai	Long Hai commune, Phuoc Long district
		Truong Cong Dat	Long Hai commune, Phuoc Long district
		Truong Van Vuot	Long Hai commune, Phuoc Long district
		Tran Thanh An	Long Hai commune, Phuoc Long district
		Truong Van Dien	Long Hai commune, Phuoc Long district
		Nguyen Minh Khang	Binh Ho hamlet, Vinh Phu Tay commune, Phuoc Long district
		Truong Van Tu	Long Hai commune, Phuoc Long district
Collectors		Phan Thanh Tung	Phuoc Tho ommune, Phuoc Long district
		Nguyen Thi Lan	Hamlet no. 12, Vinh Hau A commune, Hoa Binh district
		Doan Quoc Khanh	Binh Ho hamlet, Vinh Phu Tay commune, Phuoc Long district
		Bui Thi Huong	Hamlet no. 12, Vinh Hau A commune, Hoa Binh district
		Nguyen Van Hoa	Hamlet no. 15, Vinh Hau A commune, Hoa Binh district
Wholesalers		Duong Van Hoang	Tra Ban 2 hamlet, Chau Hung commune, Vinh Loi district
		Nguyen Hung Vien	Cong Dien hamlet, Vinh Trach commune, Bac Lieu city
		Tran Thanh Thai	Kinh Cau hamlet, Vinh Trach commune, Bac Lieu city
		Nguyen Van Hai	Gia Hoi hamlet, Hung Thanh commune, Vinh Loi district
		Ly My Khon	38 street, Hamlet no. 17, Commune no.5, Bac Lieu city
		Nguyen Minh Hieu	Thao Lang hamlet, Vinh Trach commune, Bac Lieu city
		Chau Van Tuan	Commune no.5, Bac Lieu city
		Thai Minh Quang	419 KB, Commune no.9, Bac Lieu city
		Pham Thanh Quan	Nam Can hamlet, Hung Thanh commune, Vinh Loi district
		Luu Quoc Hung	Vinh An hamlet, Vinh Trach commune, Bac Lieu city

Appendix 1. List of interviewees in Bac Lieu province (cont.)

Actor	Name	Address
Processors	Trinh Thanh Hung	Gia Rai Import-export company
	Ho Nhu Quy	Vinh Loi Import-export company
	Tran Khanh	Nigico Co. Lt
	Mai Minh Ky	Minh Hai Co. Lt
	Tran Ai Quang Minh	Grobest Co. Lt
Service providers	Nguyen Huu Kiet	6A, I Road, Business center, Bac Lieu city
	Quach Van Hiep	392, street no.38, Bac Lieu city
	Hoang Van Minh	Cao Van Lau street, Nha Mat ward, Bac Lieu city
	Le Hoa Xinh	Vo Thi Sau street, ward no.8, Bac Lieu city
	Ngo Tan Loc	Chua Phat commune, Hoa Binh district
Hatcheries	Nguyen Kim Sa	Kinh Te, Nha Mat commune, Bac Lieu city
	Tran Van Thanh	43/6B. Kinh Te, Nha Mat commune, Bac Lieu city
	Do H. Minh Chau	Xom Chua, Nha Mat commune, Bac Lieu city
	Pham Van Thanh	Xom Chua, Nha Mat commune, Bac Lieu city
	Do Thanh Phi	Xom Chua, Nha Mat commune, Bac Lieu city
	Toan Cau Co. Lt	Kinh Te, Nha Mat commune, Bac Lieu city
	Lam Hoang Ngon	Kinh Te, Nha Mat commune, Bac Lieu city
	Viet – Uc Co. Lt	Kinh Te, Nha Mat commune, Bac Lieu city

Appendix 2. List of questionnaires

Order	Type	Interviewees
1	Secondary questionnaire	Local authorities
2	Questionnaire for shrimp farmer	Shrimp farmers
3	Questionnaire for shrimp hatchery	Shrimp hatcheries
4	Questionnaire for shrimp nursery	Shrimp nurseries
5	Questionnaire for service provider	Feed and veterinary medicines enterprises
6	Questionnaire for collector	Collectors
7	Questionnaire for wholesaler	Wholesales
8	Questionnaire for processor	Processor managers

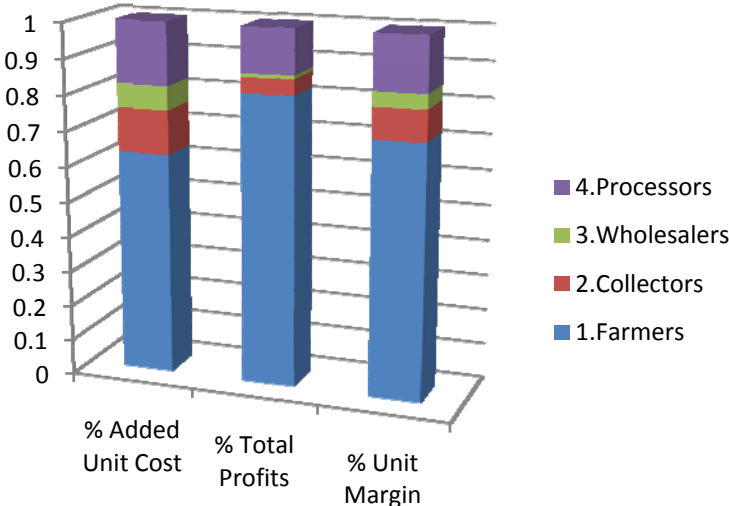
Appendix 3. Calculating costs and required investments

Costs (VND)	Intensive model	Extensive model	Integrated mangrove-shrimp model	Integrated Rice-shrimp model
Variable costs (A)	827,020,000	196,517,744	8,927,899	13,954,571
Feed cost	547,420,000	131,027,064		
Seed cost	31,600,000	4,696,480	2,577,473	6,204,571
Chemical, medicine, lime cost	94,000,000	23,443,000	606,729	1,321,429
Electricity, fuel cost	78,000,000	17,217,800	4,372,940	1,285,714
Renovation cost	34,000,000	7,604,200	1,370,757	1,714,286
Labour cost	42,000,000	12,529,200	-	3,428,571
Fixed cost (B)	26,000,000	2,344,300	323,589	8,642,857
Watch-tower cost	2,000,000	2,344,300	323,589	1,142,857
Description cost	8,000,000		-	-
Others (pump, tax...)	16,000,000		-	7,500,000
Total cost=A+B	853,020,000	198,862,044	9,251,487	22,597,429
Price (P) per kg	101,400	105,900	124,821	121,071
Volume sold (Q) (ton)	15,982	6,243	250	881.36
Revenue=Q*P (C)	1,620,525,636	661,118,550	31,247,813	106,708,037
Net income=C-(A+B) (D)	767,505,636	462,256,506	21,996,326	84,110,609
Net margin (VND)=C/Q	48,024.59	74,045.67	87,865.76	95,432.28
Net profit margin (%)	0.47	0.70	0.70	0.79
ROI=D/(A+B)	0.90	2.32	2.38	3.72
Unit price (VND per Kg)	53,375	31,854	36,956	25,639
Total area (ha)	2.84	3.41	3.00	3.59
Culture are (ha)	2.30	3.06	1.31	3.11
Yield (ton per ha)	6,948	2,042	190	283

Appendix 4. Calculation of marketing margins of Intensive model

(Unit: VND per kg)

Value Chain Actor	Unit total costs	Added Unit costs	(%) Added Unit cost	Unit price	Unit Profit	(%) Total Profits	Unit margin	(%) Unit margin
Farmers	53,375	53,375	0.63	13,298	59,923	0.82	113,298	0.72
Collectors	113,298	10,599	0.13	127,137	3,240	0.04	13,839	0.09
Wholesalers	127,137	5,737	0.07	133,629	755	0.01	6,492	0.04
Processors	133,629	15,000	0.18	157,867	9,238	0.13	24,238	0.15
Total		84,711	1.00		73,156	1.00	157,867	1.00

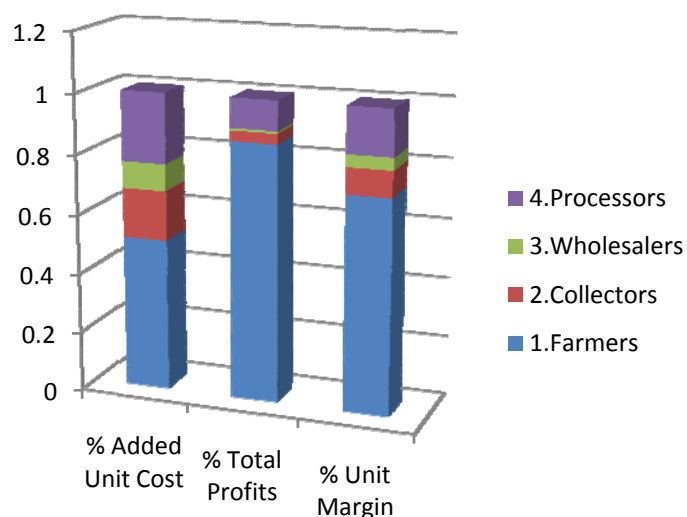


Appendix 5. Value chain margin for the actors in each level of the value chain as a percentage of the overall value added of intensive model

Appendix 6. Calculation of marketing margins of extensive model

(Unit: VND per kg)

Value Chain Actor	Unit total costs	Added Unit costs	(%) Added Unit cost	Unit price	Unit Profit	(%) Total Profits	Unit margin	(%) Unit margin
Farmers	32,600	32,600	0.51	113,298	80,698	0.86	113,298	0.72
Collectors	113,298	10,599	0.17	127,137	3,240	0.03	13,839	0.09
Wholesalers	127,137	5,737	0.09	133,629	755	0.01	6,492	0.04
Processors	133,629	15,000	0.23	157,867	9,238	0.10	24,238	0.15
Total		63,936	1.00		93,931	1.00	157,867	1.00

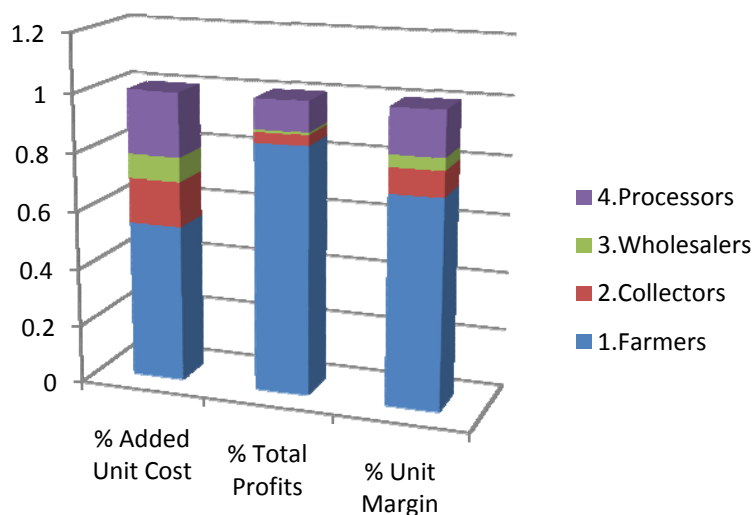


Appendix 7. Value chain margin for the actors in each level of the value chain as a percentage of the overall value added of extensive model

Appendix 8. Calculation of marketing margins of integrated mangrove-shrimp model

(Unit: VND per kg)

Value Chain Actor	Unit total costs	Added Unit costs	(%) Added Unit cost	Unit price	Unit Profit	(%) Total Profits	Unit margin	(%) Unit margin
Farmers	36,956	36,956	0.54	113,298	76,343	0.85	113,298	0.72
Collectors	113,298	10,599	0.16	127,137	3,240	0.04	13,839	0.09
Wholesalers	127,137	5,737	0.08	133,629	755	0.01	6,492	0.04
Processors	133,629	15,000	0.22	157,867	9,238	0.10	24,238	0.15
Total		68,291	1.00		89,576	1.00	157,867	1.00

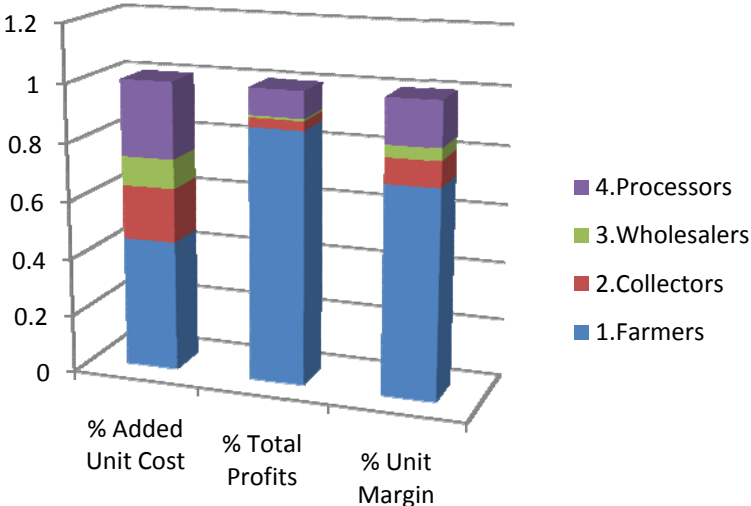


Appendix 9. Value chain margin for the actors in each level of the value chain as a percentage of the overall value added of integrated mangrove-shrimp model

Appendix 10. Calculation of marketing margins integrated rice-shrimp model

(Unit: VND per kg)

Value Chain Actor	Unit total costs	Added Unit costs	(%) Added Unit cost	Unit price	Unit Profit	(%) Total Profits	Unit margin	(%) Unit margin
Farmers	25,639	25,639	0.45	113,298	87,659	0.87	113,298	0.72
Collectors	113,298	10,599	0.19	127,137	3,240	0.03	13,839	0.09
Wholesalers	127,137	5,737	0.10	133,629	755	0.01	6,492	0.04
Processors	133,629	15,000	0.26	157,867	9,238	0.09	24,238	0.15
Total		56,975	1.00		100,892	1.00	157,867	1.00



Appendix 11. Value chain margin for the actors in each level of the value chain as a percentage of the overall value added of integrated rice-shrimp model