

**ASSESSMENT OF SHRIMP SUPPLY CHAIN AND
DEVELOPMENT OF A FRAMEWORK FOR ITS
SIMPLIFICATION**



A Thesis

By

Sudip Debnath



Examination Roll No: MS-120623

Session: 2011-2012

The Thesis submitted to the Fisheries and Marine Resource
Technology Discipline in partial fulfillment of the requirements for
the degree of

Master of Science

In

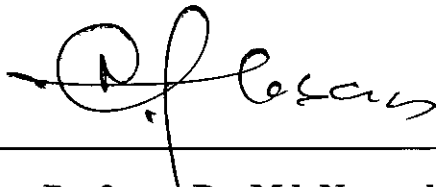
Aquaculture



April, 2013

**ASSESSMENT OF SHRIMP SUPPLY CHAIN AND
DEVELOPMENT OF A FRAMEWORK FOR ITS
SIMPLIFICATION**

Approved as to style and contents by

A handwritten signature in black ink, appearing to read 'Nazmul Ahsan', is written over a horizontal line.

Professor Dr. Md. Nazmul Ahsan

Head

**Fisheries and Marine Resource Technology Discipline
Khulna University, Khulna
Bangladesh.**

Declaration

The results submitted in this thesis are entirely of the candidate's own investigations and no part of the results has been accepted for any degree, nor is it being concurrently submitted for any degree.



(Signature of the candidate)

Sudip Debnath

Examination Roll No: MS-120623

Session: 2011-2012

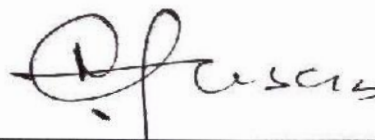
(Signature of the Co-supervisor)

Dr. Md. Golam Sarower

Professor

Fisheries and Marine Resource Technology Discipline

Khulna University, Khulna,
Bangladesh



(Signature of the Supervisor)

Dr. Md. Nazmul Ahsan

Professor and Head

Fisheries and Marine Resource Technology Discipline

Khulna University, Khulna,
Bangladesh



April, 2013

Dedicated To

My Beloved Parents

Acknowledgement

At first all my admiration goes to the supreme creator and ruler of the universe, whose mercy keeps me alive and enables me to pursue my education in Fisheries & Marine Resource Technology Discipline and to complete my thesis for the degree of M. Sc. in Aquaculture.

I am very glad to express my heartiest gratitude, sincere appreciation and indebtedness to my honorable teacher and supervisor **Dr. Md. Nazmul Ahsan**, Professor and Head, Fisheries and Marine Resource Technology Discipline, Khulna University, Khulna for his wise guidance, scholastic advice, useful comment and unfailing enthusiasm throughout the whole period of my project. I am also grateful to UNIDO for providing funding support to carry out the field activities smoothly.

I'm thankful to my great appreciation of Shahin, Saikat, and Imran for their company, encouragement, friendly behavior, contribution and cooperation.

Finally, I express my deepest sense of gratitude to my parents and my elder brother for their immeasurable blessing, continuous inspiration and financial support and also to Satabdi for encouragement throughout the study.



Sudip Debnath

Khulna University

April, 2013

Abstract

Within the overall agro-based economy of Bangladesh, the shrimp sector plays the most crucial role in generating foreign exchange. The sector represents the second largest export earner after garments which encompassed 2.73% of total export during 2010-2011. The present study aims to explore the detail summary of shrimp supply chain and development of a framework for narrowing the gaps between producers and exporters. A total of 342 interviews, four Focus Group Discussions (FGD) and two case studies were conducted in Khulna, Satkhira, Bagerhat and Cox's Bazar districts of Bangladesh. A complex shrimp supply chain has found which varies from region to region of Bangladesh. In this supply chain various intermediaries are involved from producers to exporters as faria, depot owner, aratdar, party/paiker, commission agent (account holder) and finally processor. These intermediaries perform an important function injecting informal credit into the supply chain that faces substantial credit constraints at the lower end of the chain and promoting tied transaction. The proposed simplified framework which deals with farmers to exporters through depot owners will facilitate the fair trade in shrimp supply sector and ensure the quality as well as proper profit distribution among the stakeholders.

Table of contents

	Page
Acknowledgement	i
Abstract	ii
Table of contents	iii
List of tables	iv
List of figures	v
List of box	vi
List of abbreviations	vii
Chapter 1 Introduction	1-4
1.1 Background of the study	1-3
1.3 Objective	4
Chapter 2 Literature review	5-7
Chapter 3 Data collection and methodology	8-11
3.1 Semi-structured interviews	8
3.2 Focus Group Discussions (FGDs)	10
3.3 Case studie	11
Chapter 4 Results and discussions	12-39
4.1 Ownership of the land	12
4.2 Post harvest information	13
4.3 Shrimp supply chain	13-17
4.3.1 Stakeholders involved in shrimp supply chain	14-17
4.4 Shrimp supply chain status in the study districts	18-21
4.5 Case study on Organic Shrimp Project Bangladesh (OSP-BD) of WAD Trading International (Asia) Ltd.	22-28
4.6 Case study on PRAN dairy hub, Chatmohor, Pabna	29-32
4.7 Framework development for shrimp supply chain simplification	33-39
4.7.1 Fixed price system	34-36
4.7.2 Auction system	36-37
4.7.3 Supporting services	37-39
Chapter 5 Conclusion	40
Chapter 6 References	41-43

List of Tables

Table No.	Title	Page
1	Number of individuals interviewed in the study	10
2	FGDs conducted in the study	10
3	Offices and addresses of WAB-Trading International (Asia) Ltd.	23
4	Information of PRAN dairy hub, Chatmohor, Pabna	31

List of Figures

Figure No.	Title	Page
1	District wise shrimp area and production of Bangladesh	1
2	Area sampled for interviews and FGDs	9
3	Ownership of the farm	12
4	Registration of the farm	12
5	Post harvest information before selling	13
6	Flow chart of shrimp supply chain of Bangladesh	21
7	Certification information of OSP-BD of 2009	26
8	Flow chart of shrimp supply chain of OSP-BD	28
9	Milk supply chain of PRAN dairy hub	32
10	Proposed framework for simplified supply chain of shrimp	34
11	Factors potentially responsible for the success of the framework	35



List of Box

Box No.	Title	Page
1	Major actors and their key roles in shrimp supply chain	17
2	Shrimp selling in chatal	20

LIST OF ABBREVIATIONS

CC	Collection Center
DoF	Department of Fisheries
HACCP	Hazard Analysis Critical Control Point
IMO	Institute for market ecology
OSP-BD	Organic Shrimp Project Bangladesh
UHT	Ultra High Temperature
VMCC	Village Milk Collection Center
VMCCI	Village Milk Collection Center In charge
VMCCA	Village Milk Collection Center Assistant

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Within the overall agro-based economy of Bangladesh, the shrimp sector plays the most crucial role in generating foreign exchange which is the second largest export earner after garments. Production of shrimp from culture and capture fisheries increased to a great extent in the beginning of 1980's and the production in the last fiscal year was 56559.24 MT (DoF, 2012). The brackish water shrimp farming area has been expanded to over 2.14 lakh ha of land by 2011 from 1.4 lakh ha in 1980 (DoF, 2011). In Bangladesh 90% shrimp land is located in the Khulna, Bagerhat, Satkhira and Cox's Bazar district (Tasnoova et al., 2010).

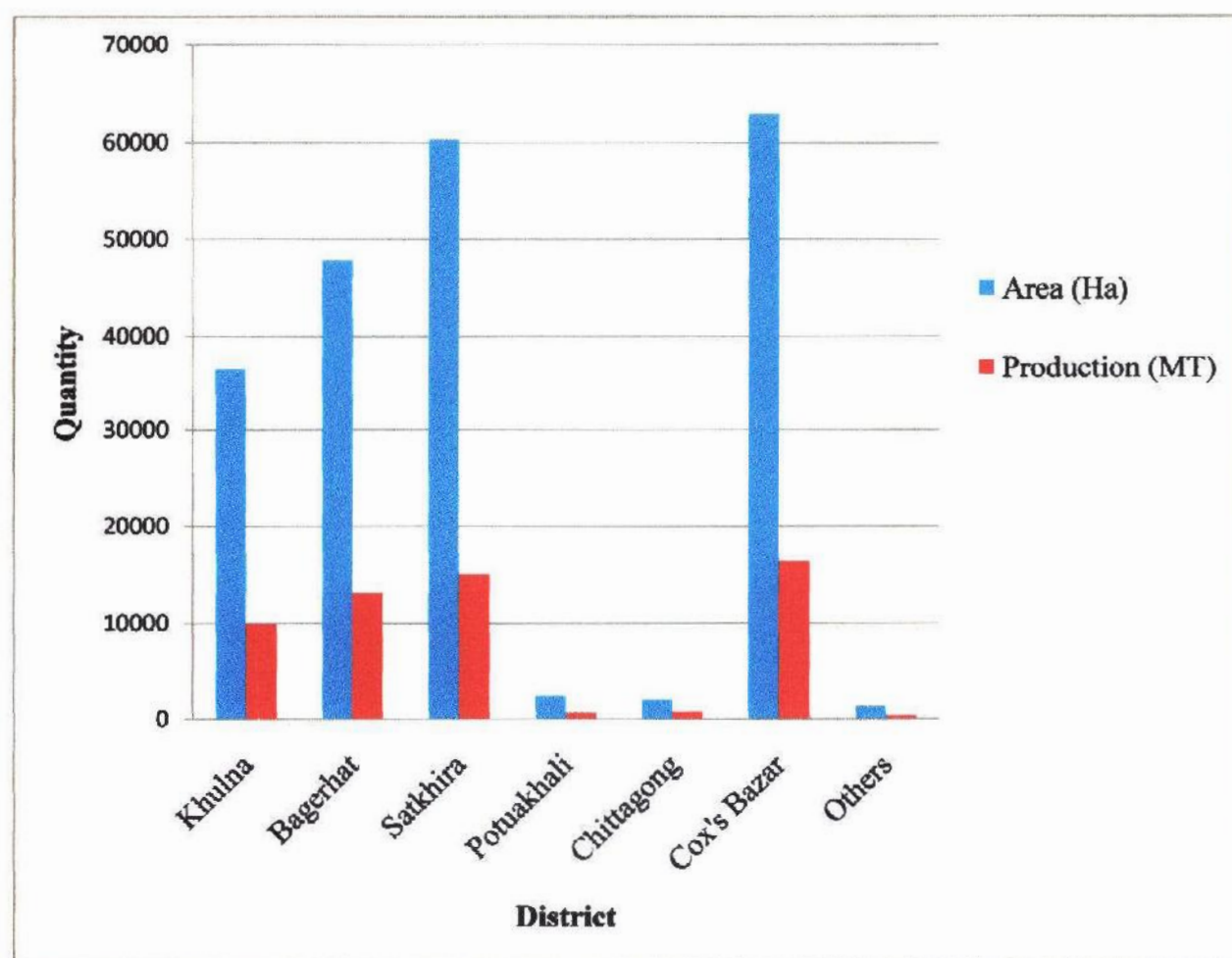


Fig. 1: District wise shrimp area and production of Bangladesh

(Source: Data computed from DoF (2012))

In Bangladesh, the production of shrimp by aquaculture method is almost export-oriented activity. In 2010-2012 fiscal years Bangladesh exported 47879.91 MT frozen shrimp and earned US\$ 364.96 million (DoF, 2012). Bangladesh is already among the top 10 exporters of shrimp in the world and account for some three percent of global production and the EU (45%), USA (35%) and Japan (4%) are the world's major shrimp importers from Bangladesh (Uddin, 2008). The export trend of shrimp has been expanding since early 90s and the contribution of fisheries sub-sector to the total export earnings is 2.73% during 2010-2011 fiscal years (DoF, 2012). Presently 82 processing plants are in operations which are HACCP certified and licensed by DoF for export of fish and fish products (DoF, 2012).

Exportable shrimp requires special care to retain as much as practicable its original physical appearance, odour and organoleptic conditions. Now, import countries have developed standard criteria and a full certification system for the shrimp production line, from farm to table (Uddin, 2008). It must be free from dirt, filth, pathogenic organisms, uncertified chemicals and any antibiotics even in the minutest quantity. The presence of filth, foreign material, harmful micro organisms and quality deterioration are the major reasons of rejection of shrimp exports from Bangladesh to the US and EU markets (Hassan, 2012). In Bangladesh shrimp marketing channel faces serious problems including quality deterioration, physical losses and delay of transportation. In this marketing channel there are excessive numbers of intermediaries. The quality of shrimp also stands to deteriorate as the number of intermediaries increase due to delay transportation, injecting foreign materials or soaking in water for long time without ice storage after harvest.

Besides the quality deterioration in the shrimp supply chain, there is a considerable debate exists as to who gets the benefit most and who stands to lose. There is a marked difference in sharing of benefits in shrimp supply chain as the profit generated from shrimp exports are not broadly shared throughout the chain where middlemen and exporters are the ones who get the major share than farmers. The intermediaries in the shrimp supply chain perform an important function injecting informal credit into a system that faces substantial credit constraints at lower level of the chain (USID, 2006).

The low returns experienced by the farmers appear to relate to the lack of knowledge and control over various input supplies as well as bargaining power in the marketing channel. Lack of bargaining powers are presumed to be due to various institutional and no institutional barriers e.g. lack of post harvest handling, high transportation cost, price exploitative market intermediaries and so on. So the urgent need in the shrimp sector is the establishment of effective supply chain linkages among the farmers, traders, processors and business service providers. Options and interventions should be developed so that the gap between the producers and the buyers can be minimized by integrating the producers with the domestic as well as the international market. Narrowing the gap not only requires institutional intervention but also improvements to the knowledge with regards to post harvest activities including handling, storage, transportation, record keeping and so forth.

Understanding and supporting the functioning of chain intermediaries is crucial to inclusive market development. On the other hand, the recent standards shift towards food safety enforcement (HACCP, GAp, Traceability), certification and the likes are creating significant challenges for inclusive modern market procurement. It is therefore necessary to examine the existing marketing channel of shrimp with particular emphasis on the role played by the intermediaries, the economic as well as socio-cultural basis of their presence in the system.

Most of the previous relevant studies on shrimp dealt with existing shrimp market structure and value chain as well as safety issues (Akhand and Hasan, 1992; Azam et al., 2010; Banks, 2003; Barman et al. 2011; Ahmed et al., 2010; Islam, 2008) but study on development of framework for simplification of shrimp supply chain of Bangladesh has not been yet done. Therefore this study deals with the existing shrimp supply chain assessment and development of a framework for its simplification.

1.2 Objectives of the study

- To analyze the marketing channel of shrimp and value added at each step of the existing chain so as to understand how and what technology intervention can benefit the farmers in the market chain;
- To identify the institutional and non-institutional barriers e.g. transportation cost, commission, taxation to the movement of shrimp;
- To identify price exploitative market players in between shrimp farmers and exporters, and
- To develop a framework to simplify the shrimp supply chain of Bangladesh.



CHAPTER TWO

LITERATURE REVIEW

2. Literature Review

As an export item shrimp market and its marketing have great importance in Bangladesh. To analysis the marketing channels and develop a simplified framework various papers were studied.

Shamsuddoha (2007) stated that, in fish market number of intermediaries and stakeholders vary depending on the extent of the market. Localized market supply chain is too short where as standard common marketing chain exists in country's domestic market. According to him length and number of nodes (participants) are varies country to country as well as species to species. A study on dry fish value chain of Bangladesh identified 4 stakeholders; fish traders, wholesalers, medium operators between producer and consumer. He also stated that in short supply chains managed by private businesses entrepreneurs, Non Governmental Organizations (NGOs) and super markets, profit maximization and profit distribution are considerably high.

According to Ahmed (2007), the Hilsa market chain from fishermen to consumers encompasses mainly primary, secondary and retail markets, involving sales agents, suppliers, wholesalers and retailers and marketing margins and profit for different species traded internationally varies widely. Hilsa value chain of Bangladesh reports lowest marketing margin and profit in primary markets and highest for secondary markets not in the retail markets.

Dubay et al. (2010) conducted study on Mexican fish market and stated that some artisanal fishermen sell shrimp to intermediaries, who sell products to processing plants for the export market. Before being sold to buyers, shrimp are processed. Within the Mexican artisanal sector, processors tend to be third-party players who are paid to process shrimp but are not directly connected to the sale of shrimp.

Hoole (2009) stated the shrimp supply chain as the intermediaries buy shrimp directly from artisanal fishermen and sell them to processing plants or to domestic operators. The benefit of these intermediaries is that they inject valuable liquidity into the artisanal sector, which enables artisanal fishermen to stay in business. The disadvantage is that artisanal producers earn less selling to coyotes compared to the domestic market value.

He also suggested that direct access to the market could enable fishermen to earn greater profits.

According to Quassem (2003), harvested shrimp supply chain is associated with farmers, small local depots, large depots, commission agents and then processing plant. Once harvested, the flow of shrimps from gher to factory takes place within 24-36 hours. The postharvest trade flow goes from farmer to sub-depot to depot to agent to factory (allowing for specific variations). All trade ultimately feeds through the agents who buy the entire product pre-sale to the factory. Large depots may employ up to 25 farias (intermediaries) each purchasing directly from the farm gate. Some larger scale farmers are able to by-pass the farias and supply direct to the 'depot' or even to the agents (estimated to be around 10% of the total). There are no direct links between farmers and the processing factories (less than 1%). Processors provide a commission to agents who compete for supplies at the depots. The agents subsequently use this finance as capital for lending (through the faria network to producers). One agent may deal with several factories who exerts influence at both ends of the scale.

Dutta et al. (2010) focused on the development and livelihood impacts of a recently established value chain node; the chatal, a primary rural auction market for farmed shrimp and prawns and showed that the 'less remote' chatals had larger numbers of arots (auction house) than remoter ones. With development of chatals, farmers could sell their shrimp and prawn under more transparent and competitive market conditions and with less delay getting product from farm to processor and explained the supply chain as farmers themselves deliver shrimp and/or prawn to chatal directly; faria and depot personnel buy from the chatal; and supply to processing plant via commission agents. Chatals consisting of multiple co-located auction houses emerged in Bagerhat and Khulna district from around 2000 onwards, located within a 20-30 km radius of regional processing plants clustered in Khulna City.

Khatun (2004) stated that shrimp supply chain involved with farmer to middleman (Shrimp collectors, moneylenders) and then fish depot (Owners/preprocessing centers) to processing plant via middleman (Shrimp supplying agent or money lender/ procurement

staff from the factories) and also stated that farmers sell adult shrimp to middlemen from whom take loan and are bound to sell shrimps to them.

According to Aftabuddin et al. (2009), there are four types of marketing channels of wild shrimp post larvae which included fry collector, local faria or arat, district fry arat, fry commission agent, fry retailer and shrimp farm owner whereas he found five types of marketing channels of hatchery reared shrimp post larvae which indicated the short marketing channel as hatchery owner to shrimp farmer and also through fry trader, commission agent, retailer to farm owner.

Tasnoova et al. (2010) stated the shrimp marketing channel as shrimp farmer to processing plant via sub-supplier (shrimp faria), supplier (depot) and agent (account holder) and she also showed that shrimp farmer directly sell shrimp to supplier (depot) and supplier also sell directly to processing plant.

Ahmed (2008) showed the prawn marketing channel as 60% prawn farmers sell their prawn to field workers and 40% sell to prawn traders where 80% prawn traders sell to commission agents and only 20% traders sell to direct processing plants and he also stated that fields worker sometimes take small amounts of credit from prawn traders to ensure the supply of prawns from farmers.

According to Hassan et al. (2012) farmers sold shrimp to faria, depots and auctioneers by 45, 35 and 20% respectively and faria sold shrimp to local depots, central depots and auctioneers by 30, 55 and 15% respectively and also showed the shrimp marketing channel from farmer to processing plant through faria, chatal auctioneers, depots (primary and secondary) and commission agents. He also suggested a concerted effort which is needed to upgrade the marketing chain of shrimp in Bangladesh to reduce the marketing cost, stabilize the prices and overall improvement of the marketing efficiency.

CHAPTER THREE

DATA COLLECTION & METHODOLOGY



3. Data collection and methodology

The study was conducted between June to October, 2012 concerning the shrimp marketing systems in Bangladesh based on the existing marketing activities in Khulna, Satkhira, Bagerhat and Cox's Bazar districts. The areas were selected based on geographical area rather than the farmer type of socio-economic status or farming type. Data and information for this study were collected from both primary and secondary sources. Primary data were collected through semi-structured interviews, Focus Group Discussions (FGDs) and case studies.

3.1 Semi-structured interviews

A total of 337 individuals were interviewed using the semi-structured questionnaires in different locations as Paikgacha, Dumuria and Batiaghata in Khulna districts; Satkhira Sadar, Kaliganj, Devata and Shamnagar in Satkhira districts; Bagerhat Sadar, Mollarhat, Fakirhat, Rampal and Sharankhola in Bagerhat district; Cox's Bazar Sadar and Chakaria in Cox's Bazar district. In this study the farmers, depot owners, aratdars, commission agents and also processors were interviewed. These interviews involved the inspection of the study areas in terms of fish distribution and marketing systems.

According to the need of the objectives of the study the interview schedules were prepared. At first one set of interview schedule for all actors involved in value addition process was prepared in order to collect data and the draft interview schedule was pre-tested amongst a few stakeholders. In this pre-testing much attention was given to elicit new information which was originally not designed to be asked and filled in the draft interview schedules. Thus, some parts of draft schedules were improved, rearranged and modified in the light of the actual experiences gained from the field tests. Then the final interview schedules were prepared based on the result of the pre-test.

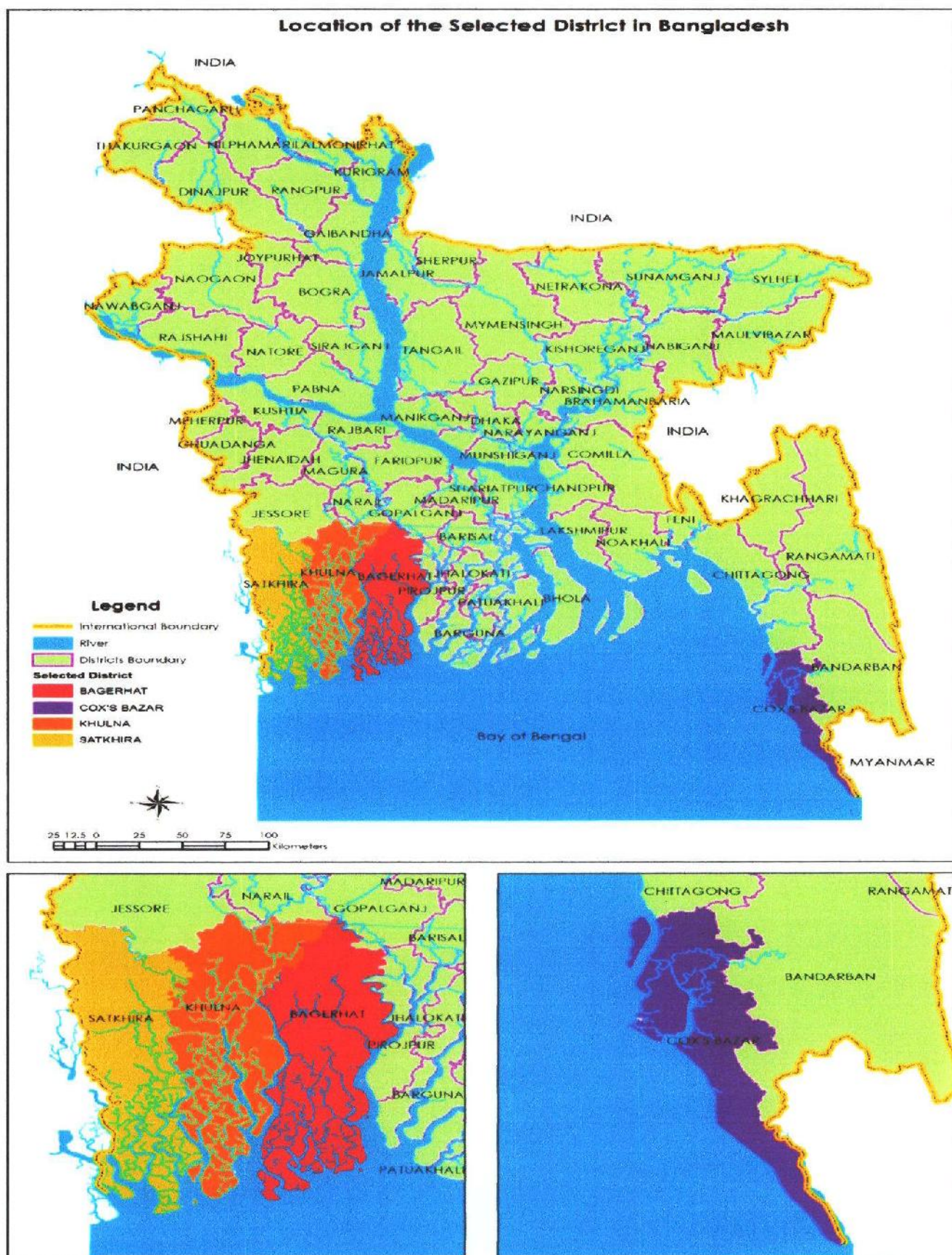


Fig. 2: Area sampled for interviews and FGDs.

Table 1: Number of individuals interviewed in the study

Type	Number				
	Khulna	Bagerhat	Satkhira	Cox's Bazar	Total
Farmer	74	71	65	47	257
Depot owner	18	15	16	10	59
Aratdar	4	2	3	2	11
Commission agents	5				5
Processors	3			2	5
Grand total - 337					

3.2 Focus Group Discussions (FGDs)

Four Focus Group Discussions (FGDs) in 7 sectors were conducted with both farmers and depot owners in different districts with different stakeholders who actively involved in shrimp supply chain. In every FGD there was one facilitator to facilitate the FGD and also one note keeper to collect information from the discussions. The participants were allowed to discuss freely about the shrimp marketing channel of that region. Different flip charts were used during discussions.

Table 2: FGDs conducted in the study

District	Location	Stakeholder	Number of participants
Khulna	Dumuria	Farmer and depot owner	18
	Batiaghata	Farmer and depot owner	16
Bagerhat	Bagerhat Sadar	Farmer	12
		Depot owner	11
Satkhira	Satkhira Sadar	Farmer	10
	Kaliganj	Depot owner	11
Cox's Bazar	Cox's Bazar Sadar	Farmer and depot owner	23

3.3 Case studies

Two case studies were conducted on Organic Shrimp Project (OSP-BD) of WAB-Trading International (Asia) Ltd., Kaligonj, Satkhira and PRAN dairy hub, Chatmohor, Pabna. During this study different shrimp collection centers of organic shrimp project of WAB-Trading International (Asia) Ltd. and different village milk collection centers of PRAN dairy hub were visited and inspected the direct market flow of both organic shrimp and milk.

Besides these, secondary data and information from various organizations as well as from published and unpublished sources of government agencies and trade organizations in Bangladesh in the type of documents, reports, handouts, notifications, etc. having relevance with this study were collected. In addition to these, follow-up telephonic discussions were also conducted with other knowledgeable personnel. The data and information from all these field surveys, interviews, communications and discussions were analyzed and summarized.

CHAPTER FOUR

RESULTS & DISCUSSIONS

4. Results and Discussions

4.1 Ownership of the land

As a very profitable business most of the farmers culture shrimp in their own land whereas few farmers culture shrimp in only leased land rather than both (Fig. 3). With the increasing the export demand of shrimp most cultivatable land owner in the southeast and southwest region of Bangladesh are interested in shrimp farming rather than others agricultural business. Among the shrimp farmers most of them have no farm registration code (Fig. 4).

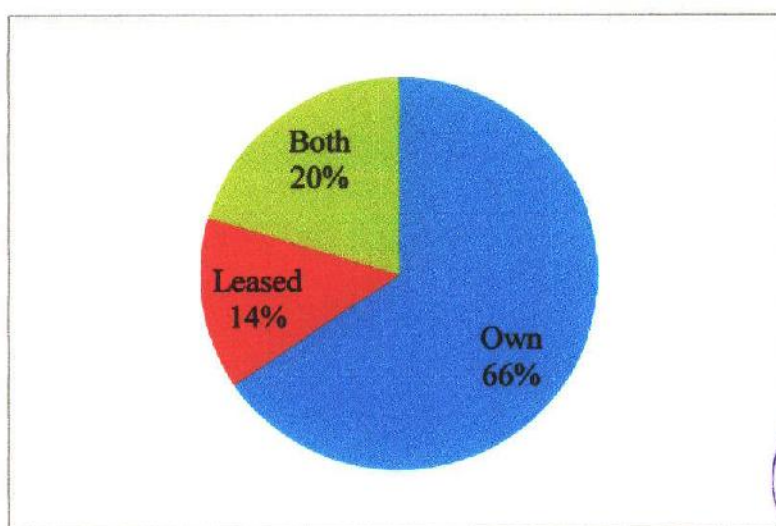


Fig. 3: Ownership of shrimp farm

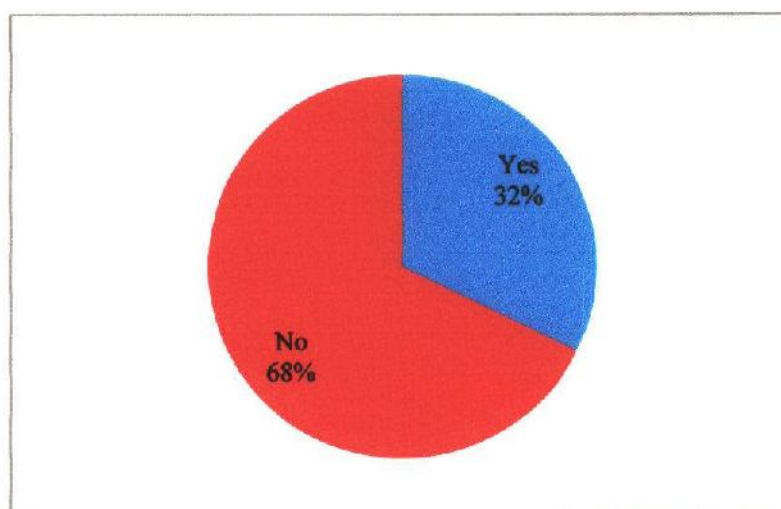


Fig. 4: Registration of the farm

4.2 Post harvest information

After harvest most of the farmers wash the captured shrimp with pond or tube well water to remove the dirt or foreign materials attached with shrimp. About 54% farmers perform shorting and grading before selling but nearly 90% farmers do not use ice for initial storage of shrimp.

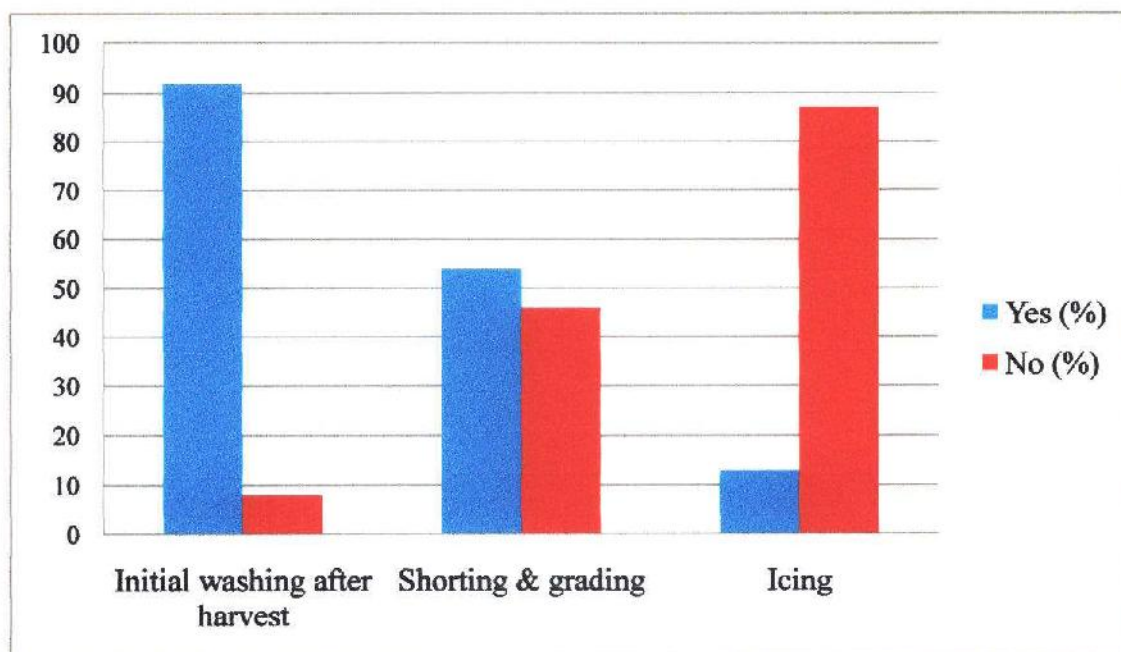


Fig. 5: Post harvest information before selling.

4.3 Shrimp supply chain

Generally in Bangladesh shrimp supply chain is more complex than other shrimp producing countries which is involved with large number of intermediaries starting from farmers as the first link of supply chain and then faria, depot owners, aratdars, parties, commission agents and finally processors of our country.

4.3.1 Stakeholders involved in shrimp supply chain

4.3.1.1 Shrimp farmers

Farmer is the first link of shrimp supply chain who operates his culture either in own or leased land or both. Farmer directly sells shrimp either to faria or depot or arat. Generally faria come to the farm site and buy directly from farmer otherwise farmer goes to depot or arat to sell shrimp. According to the survey, shrimp price depends on size and quantity as more large size and large quantity of shrimp getting higher prices. Most of the small farmers reported that micro credit is available from different NGOs but interest rate is higher than the governmental financial institution which is not available to them, so they take the advance money from faria or depot owner or aratdar and locked up with them to sell the shrimp to them.

4.3.1.2 Shrimp faria

Shrimp faria are those who buy shrimp from farmers and sell the shrimp to other stakeholders as depot owner or aratdar. Faria buy shrimp directly from farm either predetermined price or current market price. They conduct business throughout the year, but the peak season for their business lasts for five months. But they do not have any business license and generally all shrimp faria are male. Faria usually sell all the purchased shrimp to a depot or an aratdar in the same day or the next day. Generally faria do not need to store or provide any food for shrimp. If they need to store, they use primitive refrigeration methods with blocks of ice or crushed.

“Faria are used to soaking the shrimp in water overnight to gain the extra weight.” (Monirul, Shrimp farmer, Bagerhat Sadar, July, 2012).

In general, poor and marginal farmers take conditional loan (which is locally known as “dadon”) from faria for shrimp production. According to the terms and conditions of the conditional loan, farmers have to sell their product to faria at a price that they determined. The shrimp faria tries to pay the shrimp farmer as little as possible for the shrimp in order to maximize the profits the faria earns when selling to other stakeholders. The shrimp faria also supply equipment and materials to the shrimp farmers including lime, fertilizer, fries, feeds etc. If the farmers violate the conditions or sometimes sell their

product to other faria or other stakeholder for higher market price, then the faria verbally or physically assault the farmers. According to the farmers faria try to get extra weight (100-200g) per kg shrimp from farmers.

"They try to get extra weight (locally known as "dolon") from us as 100-200 g per kg shrimp." (Shafiqul, Shrimp farmer, Satkhira, August, 2012).

As like as farmer shrimp faria also take loan from depot owner or aratdar where they sell their purchased shrimp.

4.3.1.3 Shrimp aratdar

Aratdar is a commission agent who has a fixed establishment and helps the traders to sell their product and usually charges a fixed commission of sales revenue. Aratdar take shrimp from faria and farmers in his selling place called "arat" or "auction centre" (locally known as "chatal"). Shrimp are sold either through auction or buyer-seller negotiations. Since commission is charged on sales revenue, an aratdar tries to sell the shrimp at higher prices. They hire laborers and salaried person to perform different functions such as loading, unloading, grading, weighting etc. Usually they handle large volume of shrimp than farmers and faria. A farmer or faria may take money from more than one aratdar and in this case he divides his products and sells through different aratdars. The most important aspect of aratdar's business is that they do not purchase shrimp but facilitate to sell the shrimp with the provision of taking commission.

"I take 2% commission from farmers or faria for facilitating the selling process in my chatal (arat)." (Uttam Saha, Aratdar, Khulna, June, 2012).

4.3.1.4 Depot owner

Depot owner buy shrimp from both faria and farmer in his trading place called "depot". Depot owner have financially more purchasing power than faria. The shrimp are brought in depot in basket or plastic containers by farmers or faria for trading. There are two types of depots as small depot and large depot (locally known as "chalani depot") which have direct contact with shrimp commission agent. The large depots buy shrimp from small depots also. Some depot owners have some manpower to collect the shrimp directly from farm. As like as some farmers, faria take dadon (conditional loan) from

depot owner for business. So they have to sell their products to the particular depots based on the contract of conditional loan. Under the conditional loan farmers or faria do not sell their shrimp to other depot even the existing market price is high. Depot owner need to store shrimp for later selling. So they use primitive refrigeration methods with blocks of ice or crushed ice. In the peak season they sell their shrimp in the same day in which day they purchase. The large depots sell their shrimp to the shrimp commission agent. The depots send their shrimp to the processing plant through auto mobile transportation as pickup or truck.

4.3.1.5 Paiker/party

Paikers are those who transect large volume of shrimp form aratdar. Some paikers act as stuff of commission agents. In some places they are known as “bepari”. They buy shrimp directly from aratdar through auction or negotiation using sampling system from depot.

“They separate whole shrimp of my depot into different baskets and I select one basket among them and whole pricing is done on the basis of that basket.”
(Rejaul, Depot owner, Bagerhat, July, 2012).

They send their purchased shrimp to the processing plant and receive a receipt and collect money from account holders. Generally they have to negotiate the price with the farmers and aratdars.

4.3.1.6 Shrimp commission agent

Shrimp commission agent act as the account holders who make the link between large depot owners or paikers and exporters and constitute the major profit making actors in the shrimp value chain with the least risk. They receive a commission fees for per unit of shrimp selling to the exporters. Some accounts holders also buy directly shrimp from aratdar and sell to exporters by own manpower. Account holders finance paikers and depot owners and provide credit to the processing plants and receive payment only after the processor has shipped to his overseas customers. One account holder may have several accounts in different processing plant. They receive receipt from paikers and depot owners and give cash to them. They also provide conditional loan to paikers and also depot owner to buy the shrimp.

4.3.1. 7 Processors/Exporters

After buying from paikers and depot owners through commission agents, processors or exporters process their shrimp in their processing plant. These plants have an establishment with several facilities such as processing rooms, laboratory, store rooms, bathrooms, a first-aid room and administrative offices etc. The exporters buy shrimp from paikers or depot owners at a fixed rate and pay the money to the commission agents after shipment. Most of the exporters sell shrimp using their own brand name and also the brand name of importers and buyers.

Box 1. Major actors and their key roles in shrimp supply chain.

Farmer	Faria	Depot owner	Aratdar	Paiker/party	Commission agent	Processors
Produce shrimp	Buy shrimp from farm site from farmer and	Receive shrimp from farmer and faria.	Facilitating price negotiations.	Buy shrimp from arat though negotiation.	Receive commission from processing plants.	Receive fish as raw material.
May store shrimp in ice or not.	sell to depot or arat.	Sometimes buy from aratdar through negotiation	Receive commission from farmer or faria.	Transfer shrimp to processing plant and receive money from commission agent (account holder).	Provide credit facilities to both party and depots.	Process using HACCP procedures
		Grading and weighing.				Pack processed fish.
		Store fish in ice.				Negotiate price with importers and agents.
		Transfer collected shrimp to the processing plant.				

4.4 Shrimp supply chain status in the study districts of Bangladesh

Khulna is situated in the southwest corner of Bangladesh. In Khulna 34% farmers sell their shrimp to faria whereas 29%, 20% and 17% farmers sell their shrimp to small depots, arats and large depot respectively. In the remote areas the number of faria is high as the nearly unavailability of depot facilities rather than the area of available depots. The auction centers or arats are located within a 20-30 km radius of regional processing plants clustered in Khulna City. The most commission agent's depots and processing plants are located in the Notun Bazar, Khulna city along the Rupsa river.

Some aratdars are eager to sell their shrimp to the processing plant directly but they cannot as they have no account number in the processing plants.

"We have no problem to sell shrimp directly in factory but we have no account number so we cannot sell directly to processing plant (Chitta, Aratdar, Khulna, September, 2012)."

The parties of commission agents buy shrimp from different arats surrounding the Khulna city and deliver those shrimp to the processing plants and receive money from that commission agent.

"We give advance to the party to buy shrimp form different arats and sell them to the different processing plants in credit. The processing plants pay the money after shipment of their product. Sometimes processors make payment problems as delayed payment even year to year. Though they get financial government subsidies but their payment system is not satisfactory (Wahid Hasan, Commission agent, Notun Bazar, Khulna city, September, 2012)."

Satkhira district is situated in the Southwest region of Bangladesh. The shrimp supply chain of Satkhira is different from other three districts as in 4 upazilas (Kaliganj, Shyamnagar, Debhata and Asasuni) WAB Trading International (Asia) Ltd. operates Organic Shrimp Project (OSP-BD). Under this project all farmers sell their shrimp in

collection centers in peak seasons. But all time this collection centers do not receive shrimp then the organic shrimp farmers sell their shrimp to faria or depot or arat.

Generally we sell shrimp to collection centers cause timely money payment though the price is lower than outside but they do not receive shrimp all time, so then we sell the shrimp to faria as long distance to depot or arat (S. M. Abdur Rob, Shrimp farmer, Kaliganj, Satkhira, July, 2012).

In Satkhira 38% farmers sell their shrimp to faria whereas 31%, 17% and 14% farmers sell to small depots, large depots and arats respectfully.

Bagerhat is located in the southwest region of Bangladesh. In Bagerhat 31% farmers sell their shrimp to faria whereas 30%, 25% and 14% shrimp farmers sell shrimp to small depots, arats or auction centers and large depot respectively. In the overall supply chain in Bangladesh the payment problem is not satisfied to lower level stakeholders. According to the farmer faria play very interesting role in the marketing channel, because sometimes they buy per kg shrimp from them at local market price without grading or underweight or dry weight of shrimp at farming areas. After buying they grade according to size fo grading system and keep shrimp into water of plastic containers or big aluminum pot for 1-2 hours or long time results in gaining the water and the weight of shrimp is increased compared to farming areas. Therefore, even though they buy shrimp from farmer at same existing market price, they earn substantial profit from their trading. Sometimes some large depot owners face payment problem in case of selling shrimp to the factory.

I get still now 8 lakh taka to commission agent of Khulna for last year business (Faruk Sheikh, Large depot owner, Bagerhat Sadar, July, 2012).

Cox's Bazar is located in the southeast part of Bangladesh where 33% farmers sell their shrimp to the arat or local auction centers to get more prices than depot for negotiation process. About 28% farmers sell shrimp to faria whereas 22% and 17% sell to large and small depots respectively.

Generally I sell shrimp to local arat because shrimp is sold in negotiation process which helps to get more money than from depot or faria in fixed pricing system (Rajjak, Shrimp farmer, Cox's Bazar, September, 2012).

Box 2. Shrimp selling in chatal in the farm site.

In some region in case of large farm and during peak production season some farmers sell their shrimp in own chatal, established in farm site and made up of generally concrete. Both faria and local depot owner come here to buy shrimp. Farmer negotiates the price with them and whole shrimp is sold on the basis of higher price called by faria or depot owner. Sometimes farmer distribute the shrimp among the faria and local depot owner as their capacity to buy or their eagerness so that no one become disappointed.

In overall Bangladesh 33% farmers sell shrimp to faria and 45% farmers sell to depots (28% in small depots and 17% in large depots) which are supported by Hassan et al. (2012). Only 22% farmers sell shrimp to arat through negotiation. After buying from farmer 53% faria sell their purchased shrimp to large depots whereas 29% faria sell to small depots and only 18% faria sell to arat through negotiation.

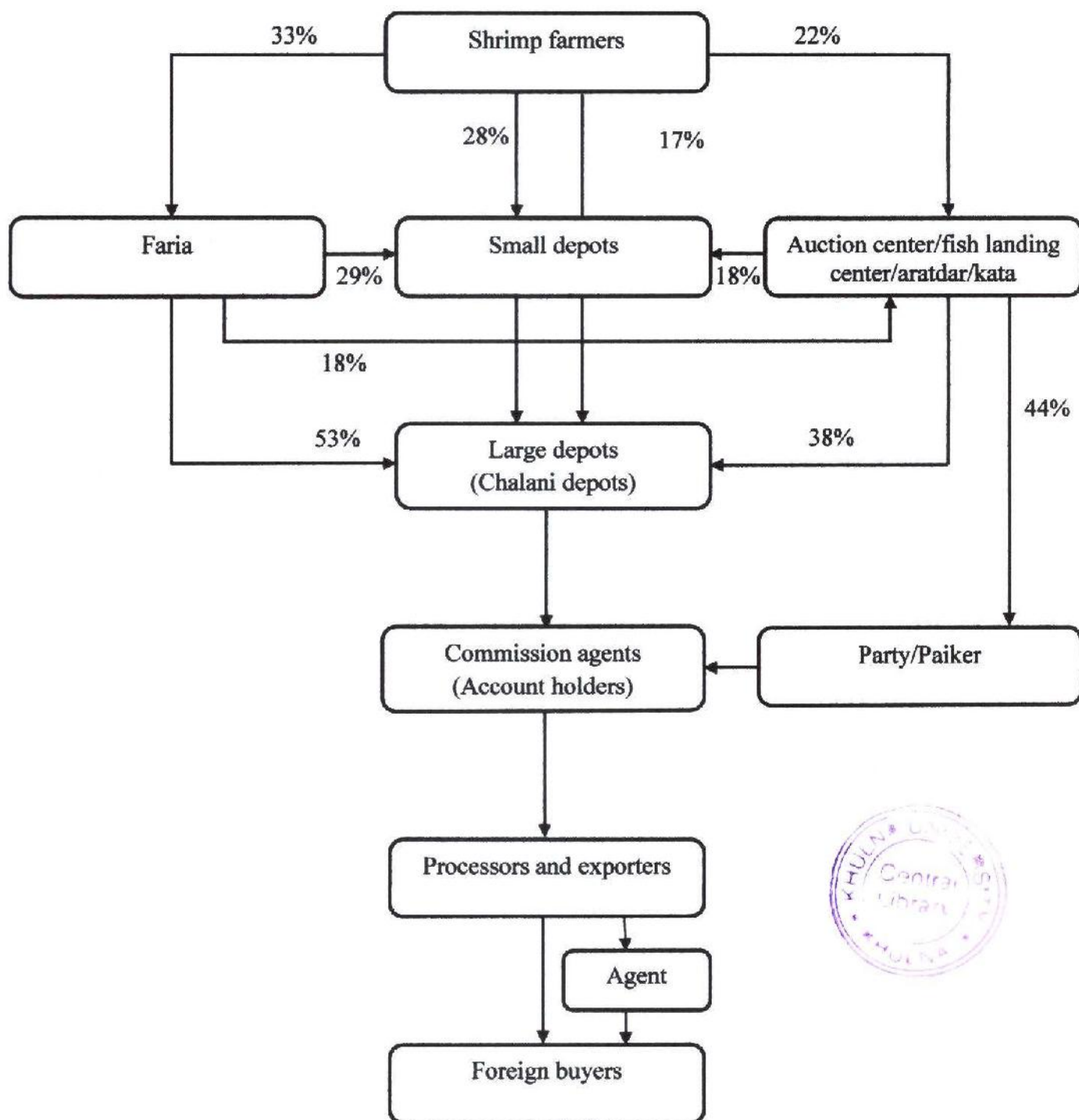


Fig. 6: Flow chart of shrimp supply chain of Bangladesh.

4.5 Case study on Organic Shrimp Project Bangladesh (OSP-BD) of WAB-Trading International (Asia) Ltd.

4.5.1 Overview of WAB-Trading International (Asia) Ltd.

WAB is an international trading company for sea food marketing with a strong involvement in developing new products like the organic shrimp/prawn from Bangladesh. It is a legal registered company in Germany, Spain & Hong Kong which was founded in June, 2008. It is the exclusive distribution company in Europe for the whole European market for the organic shrimp from Bangladesh.

4.5.2 History of OSP-BD

The organic shrimp project started in 2005 by Sippo (Swiss import promotion program) in collaboration with Shushilan a National NGO. Shippo closed its activities in 2007 then Eurocentra (Wünsche) took the responsibilities of Organic shrimp project. Later Eurocentra wanted to discontinue the project in the same year. After that WAB-Trading international (Asia) Ltd took over the responsibilities of OSP-BD.

4.5.3 Working partner

WAB works with Zam Zam hatchery Ltd. to produce improved conventional PL for the OSP farmers of Organic Shrimp Project, Bangladesh, and Gemini Sea Food Ltd to process the organic shrimp and ship out to Europe.

4.5.4 Working area and working team

WAB works in 15 unions of 4 upazilas (Kaliganj, Shyamnagar, Debhata and Asasuni) of Satkhira district. There are about 27 collection centers (CC) in the working area for organic shrimp collection which are approved by DoF.

Table 3: Offices and addresses of WAB-Trading International (Asia) Ltd.

Office	Address
Liaison office	House – 32 (Apartment A 2), Road – 116, Gulshan – 1, Dhaka – 1212.
Project Office	Grils school road , Kaliganj , Sathkira, Bangladesh
Field Office	Kaliganj West
	Kaliganj East
	Kaliganj South
	Burigoalin

4.5.5 ICS (Internal control system) Team

The operating team of the WAB is called ICS team which includes different types of man power as:

- ICS Manager (2)
- Hatchery manager (1)
- Inspection coordinator (1)
- Inspector (7)
- Field officer (15)
- Regional manager (7)
- Field monitor (54)
- No. of computer operator (3)
- Documentation officer (1)

4.5.6 Major activities of OSP-BD

- Organize farmer group and conduct training on organic shrimp farming by OSP training team.
- Assist and support farm to follow the organic shrimp culture practices like compost preparation, dyke greening, good quality PL stocking, proper post

harvest management & quality control and documentation by the follow up team.

- Conduct yearly basis twice internal farmer inspection to every farmer by the inspection team (fill out inspection form and recorded GPS data for every farmers).
- Documented all farmers collected information data in the XL sheet and GPS data in the google earth program by documentation team.
- Establish the proper traceability system from PL to final finish product, each farmer have green book, ID number and ID card and farms GPS information.
- Organize a third party external inspection (by IMO Switzerland) for Naturland (Germany) certification.
- Provide technical support through the OSP. A shrimp hatchery expert under the guidance of scientific coordinator of OSP work in the Zam Zam hatchery in Cox's Bazar – a private hatchery to produce improve conventional PL and establish traceability documentation process for them.
- Assist Gemini Sea Food Ltd. by OSP quality control expert to process organic shrimp separately for maintains product special quality and traceability.
- Marketing the organic product in the European supermarket which also creates the image of Bangladesh product.

4.5.7 Process of approval of the farmer

4.5.7.1 Individual contract

Field officer and field monitor contract with farmer and explain them about OSP aims and objectives and invite farmer in group meeting.

4.5.7.2 Group formation

In the farmer meeting regional manager and field officer discuss OSP activities, aim objective, Naturland standards. After that they form a farmer group with 20-30 farmers.

4.5.7.3 Farmer training

Each group of farmer receives 4 training session during the whole culture season. Such as:

1. Combine session (pre stocking management, stocking management and post stocking management).
2. Important of proper use organic fertilizer in the organic shrimp farm.
3. Diseases Management and
4. Marketing and post harvest treatment.

OSP runs according to the Naturland standards and they follow 8 Naturland standards which are-

1. Farmers have to attend training.
2. They are not allowed to use any chemical fertilizer, antibiotic or pesticide in his farm.
3. No use of artificial feed in his farm.
4. Not allowed to stock wild catch PL.
5. Not allowed to do the parallel production.
6. They have to make the dike green.
7. They have to ensure the top quality of the shrimp.
8. They have to maintain regular documentation about their farms.

4.5.7.4 Internal inspection

Internal inspection team is a separate team. They inspect farmer activities and check the documentation whether farmer follow the Naturland standards or not.

4.5.7.5 Documentation

In the office they have individual farmer record book, information in the computer XL sheet and GPS (Geographical Position System) and soogle earth information.

4.5.7.6 External inspection

External body (IMO) checks the documentation, checks the internal inspection and visits the farm and checks farmer documentation.

4.5.7.7 Naturland certification

Institute for Market Ecology (IMO), Switzerland audits the organic shrimp project of WAB-Trading International (Asia) Ltd. and this project is certified by Naturland e.V. (e.V. = registered association), Germany.

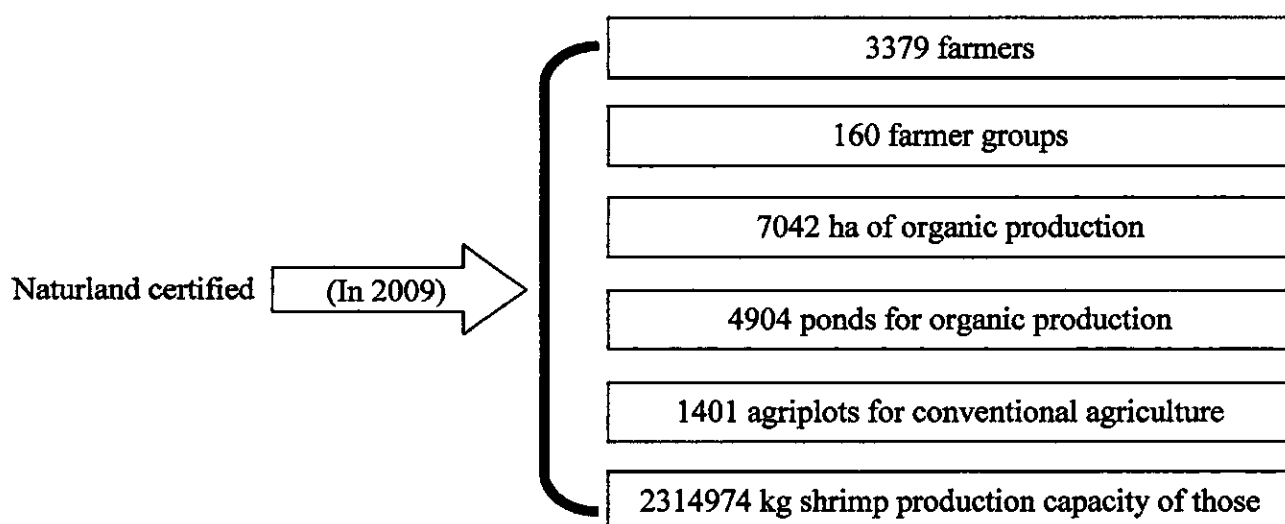


Fig. 7: Certification information of OSP-BD of 2009

4.5.8 Supply chain of OSP-BD

After Certification by Naturland farmer start to sells their organic shrimp in the collection center using their individual ID.

4.5.8.1 Harvest material

Every individual farmer receive OSP delivered harvest material (Thermo box, styrofoam box and bucket according to the size of the gher) for carry ice and shrimp from farm to collection center.

4.5.8.2 Ice supply

During harvest period in the afternoon farmer receives ice from the collection center supplied by the processor. Farmer keeps the ice in their farm house. In the morning farmer harvest shrimp and keep the shrimp with ice. From the ICS team, monitor checks that whether farmer keeps the product in ice properly or not. Before harvesting shrimp, monitor arrives in the farm in morning. The monitors also check the total harvest amount of shrimp of the farmer. Field monitor also inform the field officer over cell phone that visited farmer quantity of shrimp. One field officer is responsible for the one collection center

4.5.8.3 Collection Center

In the collection center buying officer grader and also casual labor from processor, field officer and field monitor from ICS team present when farmer bring their product. Buying officer and grader responsible for product grading, weighing, documentation and fill out the buying record. The field officer fills out the buying record and field monitor fills out the record book. After completing receives both buying officer and field officer calculate the total harvest of the day and they signature in the both buying sheets when total receives is same in both sheet.

4.5.8.4 Processing Plant

The processing plant supplies truck to carry the shrimp from CC to processing plant. From the truck every collection center receives shrimp basket keeping separate with tag. The total received shrimp kg in that day calculated in ICS supplied sheet by processor responsible person. After that track lock and inform the departure time and total kg shrimp to the ICS team in processing plant.

4.5.8.5 ICS team in processing plant

When truck arrives to the ICS team in processing plant people under lock the truck and ICS team measures the inside track temperature and checks the documentation sheet send from collection center. The ICS team keeps the record in every step of the processing plant. In the processing plant product are processed in the CC groups wise and also keep the master carton in cold storage marking CC groups.

4.5.8.6 Shipment

Before shipment chemical test is carried by DoF and health certificate and other document issued accordingly. During shipment first in first out procedure followed and check by ICS team and packing list also send to the Germany before shipped out. In Germany container also receive according to the packing list.



Fig. 8: Flow chart of shrimp supply chain of OSP-BD of WAB-Trading International (Asia) Ltd.



4.6 Case study on PRAN dairy hub, Chatmohor, Pabna

4.6.1 Overview of PRAN

PRAN is the largest producer and processor of agricultural products in Bangladesh. The company supplies more than 150 processed products, including carbonated beverages, mineral water, juices, baked goods, candy, fried snacks, spices, and dairy and aromatic rice products and leads the market for many food categories, exports to 77 countries. PRAN focuses its business on low and middle-income consumers.

4.6.2 Dairy hub

A dairy hub is a centre combining collection of smallholder milk with services and training for farmers. The dairy hub organizes and supports small dairy farmers by providing dedicated services and logistics support such as veterinary care, animal husbandry, dairy shelters, and advice on feeding and breed improvement. The objective of dairy hub is to make dairy farming a profitable opportunity for small farmers in rural Bangladesh.

4.6.3 History of PRAN dairy hub

PRAN's dairy operations started in 2004 on a small scale, primarily with ultra high temperature (UHT) milk but now it has expanded operations into three main dairy products: powdered, UHT, and pasteurized milk.

PRAN's innovations have included introducing dairy hubs to help modernize dairy farming by addressing some of the constraints on dairy farmers while enhancing the availability of local processed milk. To develop the dairy industry in Bangladesh, PRAN has started dairy hub operations in Bangladesh at its own cost through organizing farmers, counseling for rearing of dairy & providing cattle feed, artificial insemination and other veterinary support to the farmers to increase the dairy yields.

The first hub concept was come in June 2009, when Engro Foods, in partnership with Tetra Pak Pakistan, set up the Kassowal community dairy hub as part of a 'cow to consumer' value chain approach in Pakistan the third largest milk producer in the world.

In an effort to increase the collection of locally produced milk for industrial processing, DeLaval and Tetra Pak joined forces to support PRAN Dairy Ltd, part of the PRAN-RFL Group food processing conglomerate, in expanding its collection network by setting up dairy hubs.

The first hub in Bangladesh opened in September 2010 in Chatmohar in Pabna district, and the second in July 2011 in Natore district and third hub will be established in Rangpur in 2013. As introducing dairy hub, collection costs for each liter of milk have gone down and intake of local milk has also increased.

4.6.4 PRAN dairy hub activities

PRAN dairy hub works for farmer to provide them technical services and logistic supports to make a profitable dairy farming. These include:

- Dairy farm survey
- Farmer registration (selected villages)
- No. of registered animals and ear tagging
- Animal data base making
- Farmers training
- FCT setup
- Ensuring free and fresh water access for cows
- To ensure scientific feeding according to body weight and production of cow.
- Veterinary treatment
- Farm input supply by discounted rate through hub shop.
- Vaccination
- Artificial insemination
- Silage and hay making
- Mineral mixture sold
- Shed design (model farm)
- Farm economics
- Record keeping and evaluation
- Green fodder cultivation
- Collect quality milk directly from farmer by market price.

Table 4: Information of PRAN dairy hub, Chatmohor, Pabna.

Information	Quantity
Total village	20
Total village collection center	20
Area	38.56 square km
Total farmer	1485
Total cattle	4650
Total milch cow	1892
Local breed	32.94%
Cross breed	67.06%
Total milk production per day	13755 liters
Milk production/cow/day	7.27 liters

4.6.5 PRAN's Dairy Supply Chain

4.6.5.1 Farmers

In Chatmohor, Pabna there are 14485 farmers selling their milk in dairy hub. They bring their produced milk in the collection centers once or twice a day. Some farmers have model farm supported by Pran dairy hub. To introduce a model farm the technical support is provided by PRAN dairy hub but financed by farmer. In the model farm separate data sheet is used for separate cow in which every data is recorded as feeding, milking etc. They supply milk daily but get weekly payment on the basis of fat percentage of supplied milk. They bring milk in the tank which is bought from the collection centers. All the farmers get dedicated services and logistics support such as veterinary care, animal husbandry, dairy shelters, and advice on feeding and breed improvement as artificial insemination.

4.6.5.2 Village Milk Collection Centers (VMCC)

These are simple one-room structured house having 1,000 liter cooling tank and quality control equipment. There are 20 VMCC in Chatmohor, Pabna. Farmers bring milk to these centers once or twice a day. After being tested for quality, the milk is stored and

sent to the processing plant once a day. Milk tests perform during milk collection in milk collection center are alcohol test, soda test, CLR test, starch test, sugar test, urea test, formalin test, acidity test, salt test, and fat test. Generally in one VMCC there is one Village Milk Collection Center In charge (VMCCI) and two Village Milk Collection Center Assistants and their number may vary according to the volume of milk collection. VMCC is connected with generally local electricity line and in each VMCC there is a generator of a fixed power depending on the volume of cooling tank.

4.6.5.3 Hub collection center (Mother plant)

Generally in one dairy hub there is a mother plant which act as accumulation center of collected milk from 20 VMCCs and it also act as a VMCC. Farmers also bring their produced milk here and milk is received through after tested. The collected milk of other VMCC is also further tested for checking its quality well and then the milk is kept in chilling condition. The whole day collected milk is transferred from the mother plant to the main processing plant located in Norsindi district. There are three 5000 L, one 2500 L, one 2000 L and two 1000 L chilling tanks in the mother plant. To operate this plant there are two Quality Controllers (QC), four VMCCI, four VMCCA and also 4 daily labors.

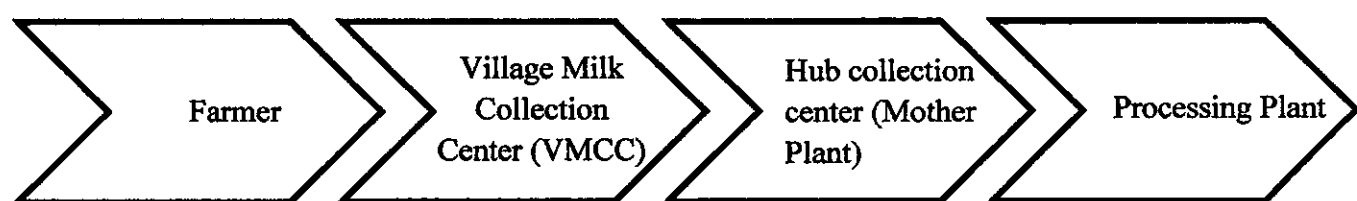


Fig. 9: Milk supply chain of PRAN dairy hub.

4.7 Framework development for shrimp supply chain simplification

The complexity reduction framework breaks down the supply chain complexity into its component parts that can be modified to increase supply chain performance. Only one way to simplify the shrimp value chain is that the removal of some intermediaries from the chain but it is not easy to completely remove them as their livelihood status is directly involved with it. So an easy supply chain model should be developed to incorporate them as well as reduce the hands and ensuring shrimp quality. In this supply chain we have to ensure the standard criteria and a full certification system for the shrimp production line from farm to processing plant.

A piloting project should be operated to link the farmers directly to processing plants. There is an urgent need to develop linkages between shrimp farmers and processing plants. This would reduce the number of intermediaries and ensure greater product integrity, maximizing quality and traceability. Collaborating with the government the processing plants should take the initiatives to link up with farmers directly which enables to create an easy market environment in shrimp sector and remove the informal credit injection into the supply chain as well as ensuring the quality.

Governments should ensure that an effective institutional framework at the local and national levels, as appropriate, be established for sustainable shrimp supply chain development and management. Where possible, governments should establish a single aquaculture management authority, which would be responsible for the development and management of shrimp supply chain and deal with all issues relating to this activity. Where a single aquaculture management authority cannot be created, governments should set up an appropriate administrative framework with a view to ensuring coordinated development and management of sustainable shrimp supply chain. Because there is a need to provide for laws and regulations which are practical and worth enforcement, governments should set forth, as appropriate, monitoring and inspection schemes as well as appropriate effective sanctions for violations and non-compliance with relevant legal measures in force.

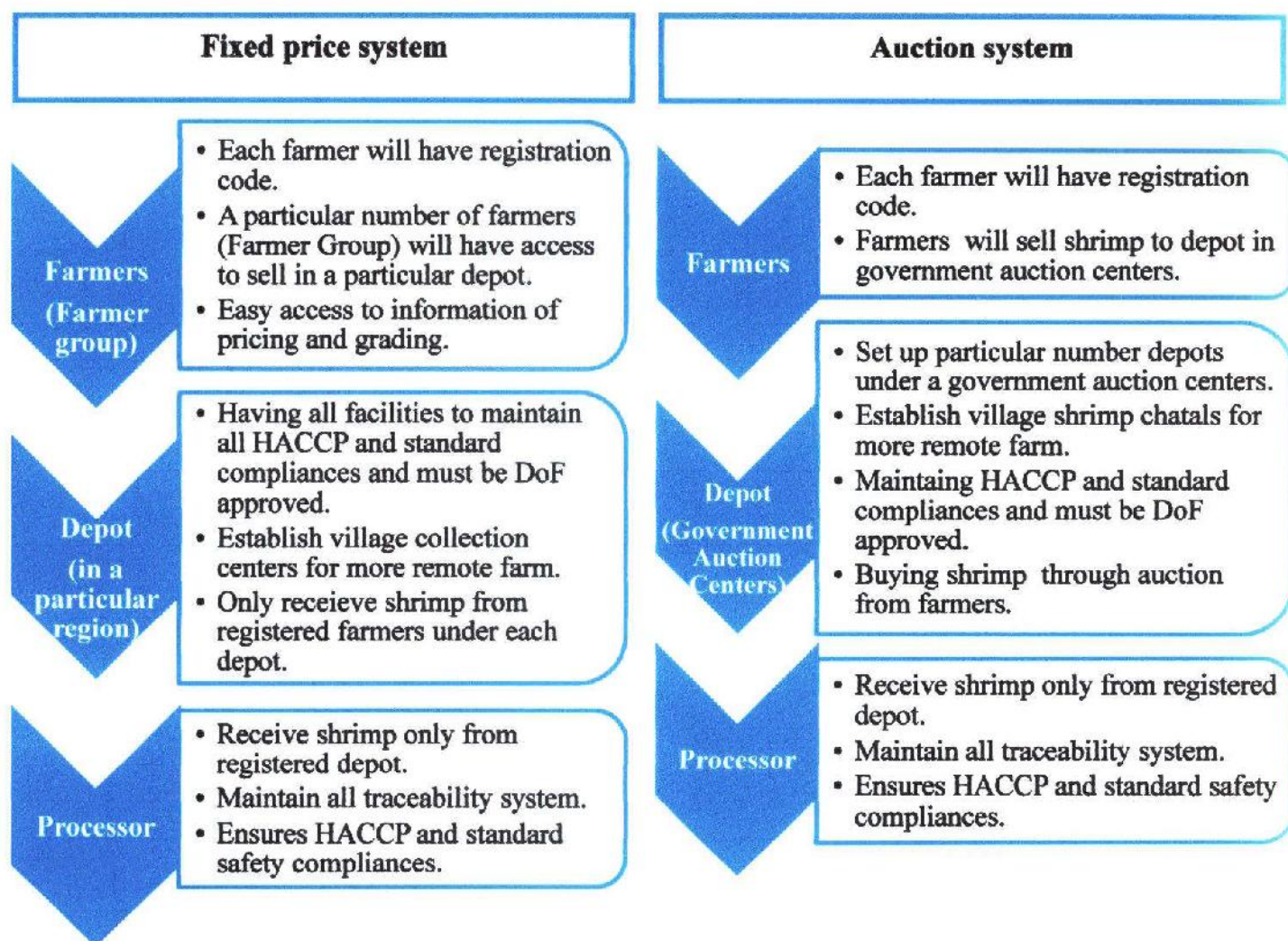


Fig 10: Proposed framework for simplified supply chain of shrimp.

4.7.1 Fixed price system

4.7.1.1 Farmer group

In fixed price system there should be some farmer groups comprising particular number of farmers. These groups may be done on the basis of technology, farm size, production volume or region. Under a group each farmers will have their own farm registration number. A particular number of farmers will have access to sell shrimp in a particular depot, established in that region. All the farmers will have to maintain good storage facilities after harvest. In this fixed price system all farmers will have easy access the information about the grading and pricing system of the country.

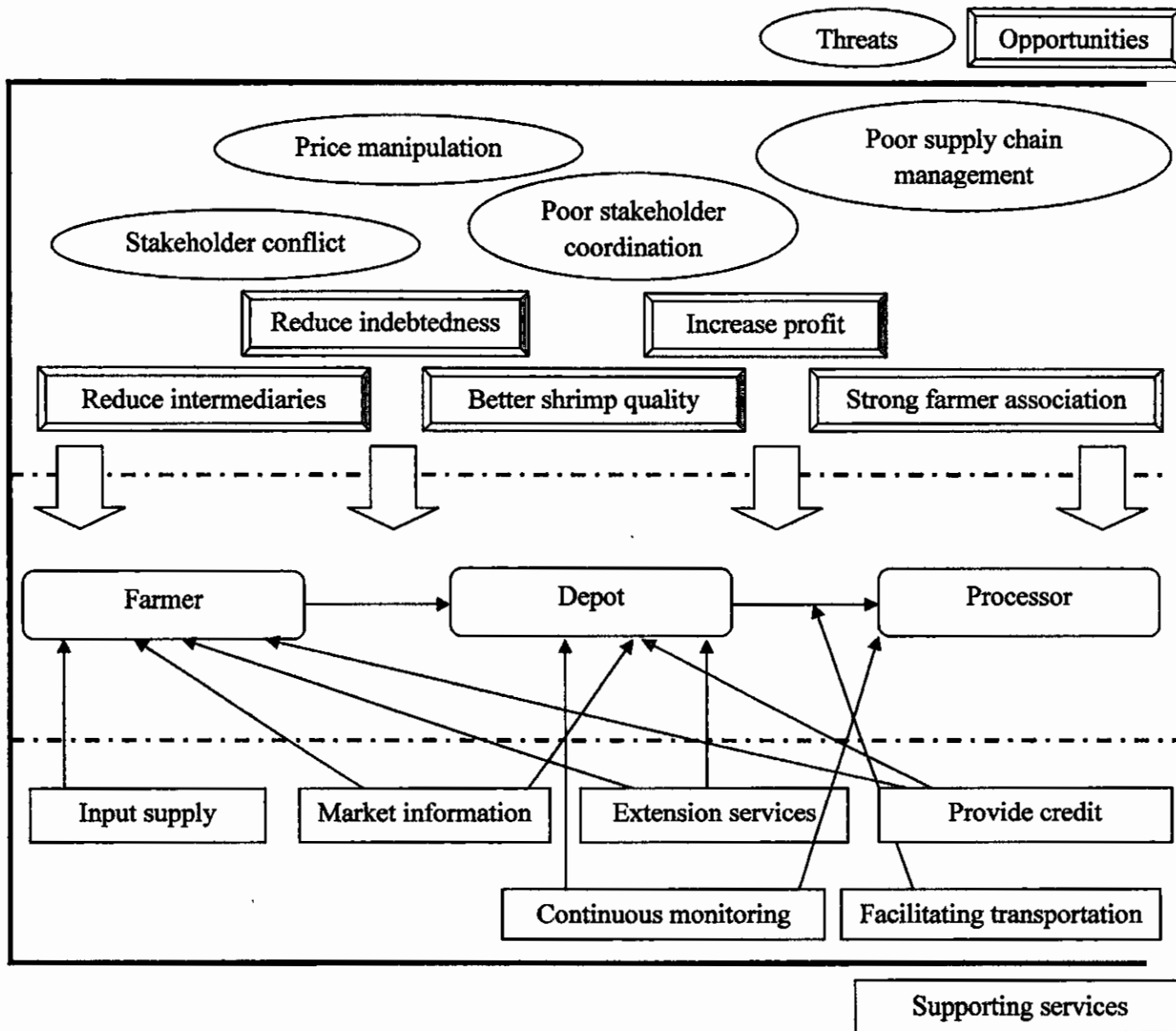


Fig. 11: Factors potentially responsible for the success of the proposed framework.

4.7.1.2 Depot

As like as collection centers of OSP (WAB), in this system well organized depots can be set in a particular region or existing depots may be used for collecting shrimp from farmers. Under a depot a fixed number of farmers as well as farmer groups are registered from whom depot only can purchase the shrimp. Each depot must have a registration number and must be DoF approved. It should maintain all HACCP conditions and

standard safety compliances sets by foreign buyers. The depot owners or group of depot owner will have account number to the processing plant for money transaction.

4.7.1.3 Village shrimp collection centers

Each depot owner may establish few small village collection centers to collect the shrimp from registered farmers under his depot as like as Pran dairy supply chain near the farming area where the catch is small and farmers are not eager to sell their small amount catch to main depot for long distance. In these collection centers all hygiene and sanitation conditions should be maintained.

4.7.2 Auction system

4.7.2.1 Establishing government auction centers

Most of the farmers sell their shrimp to faria or local small or large depots due to unavailability of locally auction centers. Besides the interrelationship may also a crucial factor to sell the shrimp from farmer to other stakeholders. If government establishes an auction centers in each union of shrimp producing region then it will promote the local farmers to sell their shrimp in that auction centers and helps to get higher price than now they get from faria or depots. Under an auction center all the farms data should be recorded as well as daily buy and sell information also recorded. The area of the auction center should be in such a place that most of the farmers can easily move here to sell their shrimp.

4.7.2.2 Transferring the registered depots to auction centers

All the registered depot owners will set up their depots in the government auction centers. Without registration no depot owner can continue business in that auction center as well as no one can business in other places. The code of conduct for depot should be strictly maintained in all depots to ensure the safety compliances. All the depots must have a registration code number issued by DoF by which code number shrimp are received in the processing plants. This registration must be renewed every year through the inspection by relevant authority to ensure the proper maintenance of safety compliance.

4.7.2.3 Village shrimp chatals

As like as Pran dairy supply chain near the farming area of a village few small chatals of depot owners will be established to collect shrimp from farmers when the catch is small and farmers are not eager to sell their small amount catch to auction centers for long distance which will help to remove the hand as faria from the supply chain. In these chatals all hygiene and sanitation conditions should be maintained and will be registered and continuously monitored by the inspection team.

4.7.3 Supporting services

4.7.3.1 Testing facilities

The presence of filth and foreign materials and delayed storage in ice are the main cause of quality deterioration, so some testing facilities should be incorporated to identify these types of shrimp. In Pran dairy hub different tests are done to identify the milk's purity but it not easy to justify the low quality shrimp cause during peak season huge amount of shrimp is produced and it is not liquid that a small amount of sample is kept and tested as like as milk. So further research should be needed to find out the different testing facilities to identify low quality shrimp in the receiving spot through sampling.

4.7.3.2 Certification

The depots of a particular region or depots under an auction centers all depot owners must be certified and provide a code number by DoF on the basis of some strict rules and regulations as maintaining hygiene and sanitation condition and following the approved code of conduct. This certification must be renewed yearly through inspection to ensure that the supply chain stakeholders maintain all the safety cautions approved by DoF. Under this certification process no farmer sell their shrimp to the auction centers or depots without code number which helps the total shrimp traceability system of Bangladesh.



4.7.3.3 Icing facilities

Under this framework to keep the shrimp quality good the ice availability must be improved through set up an ice factory with the auction centers for continuous ice supply so that the farmer also get ice easily and they can store their shrimp in ice just after harvest. There should be a strict rule that without ice the shrimp is not received in the auction centers or in depots (in fixed price system) as well as the same rule for depot owner that after buying from farmer shrimp should be quickly iced to save from deterioration.

4.7.3.4 Extension services

Extension services and technical assistance can be provided through a variety of mechanisms. Extension services could be provided through the Department of Fisheries, NGOs working in particular regions, the Bangladesh Shrimp and Fish Foundation, as well as through shrimp processing plants to ensure the integrity and continual supply of shrimp. Through extension services the both the farmers and depot owner can increase their post harvest procedures which facilitate maintaining the proper hygiene condition according to code of conduct after harvest and it will helps to ensure good quality shrimp to processing plants.

4.7.3.5 Credit and financial services

To remove the interlocking system in the supply chain the only one way is clear payment and providing credit and financial services to the supply chain stakeholders, cause in existing supply chain the lower level stakeholders are locked up to the upper level due to debt as dadon. It reduces them in free choosing selling agents and act as a barrier to get proper market price. So providing flexible credit to enable small producers and depot owners to invest, upgrade and adopt better management practices would remove debt burdens and free agents to seek better contracting arrangements. Though historically credit has been available in the sector, but has been targeted at the higher end of the value chain. An appropriate payment policy should be applied through responsible agencies which help in the total payment system of shrimp supply chain.

4.7.3.6 Regular monitoring

Regular monitoring will be done by monitoring and inspection team to every depot or auction centers whether both farmers and depot owners maintain the safety compliance or not and also monitoring the pricing and selling system so that the farmers will not be deprived from their legal price which helps to run a fair trade in the shrimp sector of Bangladesh.

4.7.4 Major threats

Due to the improper policy implementation, in the proposed framework some problems could be raised such as stakeholder conflict, price manipulation etc. In fixed price system the depot owner may set a fixed price in his depot so all farmers must have easy access to the market information about the grading and pricing of shrimp. Besides due to the poor stakeholder coordination the whole supply chain may be hampered which increase improper supply chain management. So responsible agencies should create appropriate policy to maintain the proposed simplified supply chain and implement throughout the chain.

CHAPTER FIVE

CONCLUSION

Conclusion

Shrimp is an important export item in Bangladesh and its market and marketing has great importance. This study reveals that in shrimp supply chain in Bangladesh there are multiple number of intermediaries who share the major profit than farmers and increase tied transaction through providing conditional loan. Moreover significant loss or spoilage occurs as the shrimp pass through multiple intermediaries before reaching the processing plant. So efforts need to be made to reduce indebtedness lower down the supply chain and free up farmers to sell in depot according to the proposed framework without being tied to lenders. The national policies concerning this supply chain sector need to be implemented. Collaborating with the government the processing plants and other responsible agencies should take the initiatives to organize the farmers to sell their shrimp in depots according to the proposed framework. It enables to create an easy market environment in shrimp sector and remove the informal credit injection into the supply chain as well as ensuring the quality. Finally the proposed framework should be piloted in major shrimp producing area through responsible agencies and promote the fair trade in shrimp supply sector which ensures the quality as well as proper profit distribution among the stakeholders involved with the shrimp sector of Bangladesh.



CHAPTER SIX

REFERENCES

References

- Aftabuddin, S., Zafar, M., and Abdul Kader, A., 2009. Marketing system of wild and hatchery reared fry of *Penaeus monodon* and its value chain in Bangladesh. African Journal of Marketing Management. Vol. 1(5), pp.122-127.
- Ahmed N., 2007. Value chain analysis for Hilsa marketing in coastal Bangladesh. Aquaculture News, University of Sterling, Sterling, UK, pp 14-19.
- Ahmed, N., 2008. Fresh water prawn marketing in Bangladesh. Global Aquaculture Alliance. pp. 36-38.
- Ahmed, N., Lecouffe, C., Allison, E. H., and Muir, J.F., 2010. The sustainable livelihoods approach to the development of freshwater prawn marketing systems in Southwest Bangladesh. Aquaculture Management & Economics, vol. 13(3), pp. 246-269.
- Akhand, A. M., and Hasan, M. R., 1992. Status of freshwater prawn culture in Bangladesh. Kerala Agricultural University, Thrissur, India, pp 32-41.
- Azam, k., Nazmul, A. S. M., and Naher, S. S., 2010. Quality assessment of farmed black tiger shrimp in supply chain: Organoleptic evaluation. Journal of Food Processing and Preservation. Vol. 34, pp. 164-175.
- Banks, R. 2003. "Brackish and Marine Water Aquaculture. Report on fisheries sector review and future development." Department of Fisheries(DoF), Matshya Bhaban, Ramna, Dhaka 1000, Bangladesh, pp. 2-17.
- Barmon, B. K., Chowdhury, M. and Munim, S. S., 2011. Value chain and marketing channels of shrimp/prawn sector of gher farming system in Bangladesh. World Review of Business Research. Vol. 1, pp. 10-24.

- DoF (Department of Fisheries), 2012. Fisheries Statistical Year Book 2010-2012, Ministry of Fisheries and Livestock. The Government of Peoples republic of Bangladesh, Dhaka, pp: 32-33.
- DoF (Department of Fisheries), 2011. Annual report, 2011. Ministry of Fisheries and Livestock. The Government of Peoples republic of Bangladesh, Dhaka, pp. 14-15.
- Dubay, K., Tokuoka, S., and Gereffi, G., 2010. A Value Chain Analysis of the Sinaloa, Mexico Shrimp Fishery, Center on Globalization, Governance and Competitiveness, Duke University.
- Dutta, K., Ali, H., Murray, F. J., and Little, D. C., 2009. Development of auction markets (chatal) as an additional tier in the value chain of farmed shrimp and prawn in Bangladesh. Aquaculture News, University of Sterling, Sterling, UK, pp 23-26.
- Hassan, M. N., Rahman, M., Hossain, M. M. and Hossain M. B., 2012. Post harvest handling and marketing of shrimp and prawn in south-western region of Bangladesh. World Journal of Fish and Marine Sciences. Vol. 4(6), pp. 651-656.
- Hoole, R., 2005. Five ways to simplify your supply chain. Supply chain management: An International Journal. Vol. 10(1), pp. 3-6.
- Islam, M. S., 2008. From pond to plate: towards a twin-driven commodity chain in Bangladesh shrimp aquaculture. Food Policy, vol. 33, pp. 209-223.
- Khatun, F., 2004. Fish trade liberalization in Bangladesh: Implications of SPS measures and eco-labelling for the export-oriented shrimp sector. Project PR 26109. Food and Agricultural Organization (FAO), Rome.
- Quassem, K., 2003. Market structure of shrimp and prawn sector in Bangladesh. World Review of Business Research. Vol. 3, pp. 13-24.

- Shamsuddoha, M., 2007. Supply and value chain analysis in the marketing of marine dried fish in Bangladesh and Non Tariff Measures (NTMs) in international trading. Participatory research and development initiative. Dhaka, Bangladesh.
- Tasnoova, S., Yukata, T. and Iwamoto, I., 2010. Market structure and procurement of shrimp export industry in Bangladesh. 4th Asian Rural Sociology Association (ARSA) international conference. Lepazi city, Philippines.
- Uddin, M. T. 2008. Value chains and standards In shrimp export. Discussion Paper No.169. GSID. Nagoya University, Nagoya, Japan.
- USAID, 2006. A Pro-Poor Analysis of the Shrimp Sector in Bangladesh. The United States Agency for International Development (USAID), Development and Training Services, Arlington, VA.