Quality Assurance: Shrimp Industry in Bangladesh

Fisheries and Marine Resource Technology Discipline

Khulna University

Khulna

2004

Quality Assurance: Shrimp Industry in Bangladesh

BY

SHAHANA SULTANA

ROLL NO: MS 000614

SESSION: 2000-2001

A thesis submitted to the Fisheries and Marine Resource Technology Discipline in partial fulfillment of the requirements for the Degree of Masters of Science in Fisheries

2004

Quality Assurance: Shrimp Industry in Bangladesh

Approved as to style and content by

Khairul Azam Ph.D

Head

Fisheries and Marine Resource Technology Discipline

Khulna University

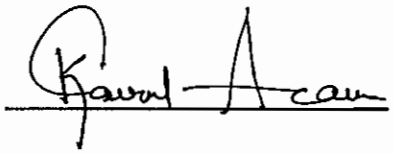
Khulna

Bangladesh

DECLARATION

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

Supervisor



Khairul Azam Ph.D

Fisheries and Marine Resource Technology Discipline

Khulna University

Khulna

Name of the candidate

Shahana Sultana

DEDICATED

TO

My BELOVED PARENTS

ACKNOWLEDGEMENT

At first all my admiration goes to the supreme creator and ruler of the universe, **Allah** for His great mercy to create and alive me.

I would like to express my indebtedness and gratitude to my supervisor **Prof. Dr. Khairul Azam**, Head, Fisheries and Marine Resource Technology Discipline, Khulna University, Khulna for his careful supervision, scholastic guidance and continual effective help to execute this project work successfully.

I recall with warm appreciation and great indebtedness for the support, guidance and suggestion extended to me by all of my respected teachers in Fisheries and Marine Resource Technology Discipline, Khulna University.

I would like to thank specially **Md. Abdur Rouf**, Assistant Professor of Fisheries and Marine Resource Technology Discipline, Khulna University for providing information and help to continue the whole work.

I would also like to thank **Momotaz apa**, **Muslima**, **Jewel**, **Habib bhai** and **Munna** for their cordial help to submit the thesis.

Last but not least, my special gratitude goes to my beloved parents for their patience, encouragement and help to complete my study.

March, 2004.

S. Shahana

Shahana Sultana

ABSTRACT

Quality aspect of seafood is very crucial for export or domestic use. Importers of shrimp product are exceedingly strict and conscious about it. Quality of seafood product is assured not only in processing industry but also at every stage of production, handling, transport and marketing. Production process must also comply with human right. Also the product is produced in an eco-friendly manner. Iso-9000 series, HACCP, Codex procedure are effectively established to control the quality as well as to maintain product hygiene. Seal of Quality is also a quality assurance program through which products are completely ensured keeping in touch with the conditions imposed to the producing countries particularly those of the developing nation. Shrimp cycle consists of fry collection, production, shrimp farming, transport, processing, export and marketing. A total of 141,352.54 ha of land is used for shrimp cultivation in Bangladesh. Rice fields are frequently converted to Bagda pond of size varying from 0.4 to 200 ha. 50% of the Bagda PL is collected from the wild and the rest from hatcheries. While 90% of Galda PL is collected from wild sources. Beach set bagnet, river set bagnet, hand push net, pull net etc. are used for PL and fry collection. A total of 79 small scale hatcheries are operated in our country. Annually an average of 43,000 tons of shrimp is produced. After harvesting, the flow of shrimp from capture site to factory takes place within 24 to 36 hours. Farias and middlemen transport the product through Depot to agent to factory. Bangladeshi shrimp are exported to USA, Japan, and EU countries. In 2001-2002 we earned Tk. 18851M or US$ 235M by exporting 30,000 tons of products. HACCP standards, principles and EU requirements are maintained at every stage of transport and processing. There are three laboratories (Khulna, Dhaka and Chittagong) to test the quality intending to comply with HACCP standard and issue certificates. In Bangladesh the Seal of Quality program has already started its activity with registered seal. Government of Bangladesh has a major role to play in the Seal of Quality program.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

Fish is today universally recognized as the ultimate answer to the problem of protein-calorie malnutrition faced by the fast growing population of the world. To the poor undernourished in the third world, it is the best quality protein food available at affordable price. To the affluent, it is the "heart food", preventing their most dreaded health problem, namely, cardiovascular diseases.

Fish, however, is one of the most perishable food items, highly susceptible to bacterial and enzymatic spoilage unless handled, processed, packed and stored scientifically. Processed fishery products is the second largest single foreign exchange earning export item for Bangladesh, earning annually more than Tk. 2032.75 crores in foreign exchange. The industry gives nutritious food to millions and gives direct and indirect employment to millions of rural poor, especially women. For the same reason, processing of fish and sell fish captured from or cultured in fresh, brackish and marine waters has become one of our major industries. Initially, Japan and the US were our major markets, but now, new markets like European Union (EU) countries and china are opening up. But the importing countries are becoming more and more quality conscious and are imposing stringent quality standards for the products imported by them. Quality concepts have undergone tremendous changes over the years. Earlier, the quality "control" was done at the end product stage. But this has now given way to new concepts like ISO 9000, Hazard Analysis Critical Control Point (HACCP) etc. These have revolutionized the food processing industry. "Quality Control" has changed into "Quality Assurance" which in the case of fish starts right from the point of catch, ensuring hygienic handling and storage, onboard the fishing vessel. At every stage of handling, transportation, storage, preprocess handling, processing, packaging, storage of finished product and actual transport of the finished product to the end market, strictest standards of hygiene are to be ensured. This needs thorough knowledge of the biochemistry and microbiology of the fish species handled and also the hygiene of the environments. Quality in not hygiene alone. It involves so many other aspects like the quality of the water used for processing (especially in freezing industry). Content of pollutants like pesticides, antibiotics, polycyclic aromatic hydrocarbons etc. in the water and fish and other toxic materials like biogenic amines in the fish are to be constantly monitored and controlled. EU countries insist on such constant monitoring which has necessitated the establishment of good analytical laboratories with

fully trained and highly qualified analysts. This human resource development has become a major need of the industry.

Shrimp culture in Bangladesh was initiated in the late 1970ies. Unique natural features, including large areas (approx. 2.5 million hectares) of low-lying tidal land, favorable environment supported by almost 600,000 ha of natural and 100,000 ha of planted mangroves, combined with a high market demand and economic returns, facilitated its rapid expansion.

Shrimp culture is mainly confined to the districts of Khulna, Satkhira and Bagerhat in the Khulna Division and the districts Cox's Bazar, Chittagong and Noakhali in the Chittagong Division. Reference is made to the map of Figure 1.

The main cultivated species is *Penaeus monodon* (tiger shrimp), more commonly referred to as **bagda** and *Macrobrachium rosenbergii* (giant freshwater prawn) commonly known as **golda**. In 2001, 25,000 tons of bagda (representing 58% of the total national shrimp production of 42,900 tons) and 12,000 tons to golda (28% of the total production) were produced. Whilst production is orchestrated to produce bagda and golda, small amounts of other shrimp species (all salt/brackish water type) are also grown as a result of poor screening and wild shrimp post larvae (PL) being trapped in the tidal ponds. These are: *Fenneropenaeus indicus*(chaka or India white shrimp); *Metapenaeus monoceros* (horina or brown shrimp); *Penaeus semisulcatus* (green tiger shrimp); and *Fenneropenaeus merguiensis* (banana shrimp). Together they account for about 6,000 tons, equivalent to 14% of the total production [Banks, 2002].

Bangladesh produce 2.5 percent of the global production of shrimp. In Bangladesh the shrimp sector is the second largest export industry, giving employment to 840,000 people. Values of total and shrimp exports of Bangladesh (total out in millions of US$) are given in Figure 2. The same study mentions that the total contribution of the shrimp sector to the country's Gross Domestic Product (GDP) is estimated at 0.6%, but that frozen seafood accounts for around 6% of the total export value, of which shrimp export constitutes almost 90%.[BCAS, 2001].

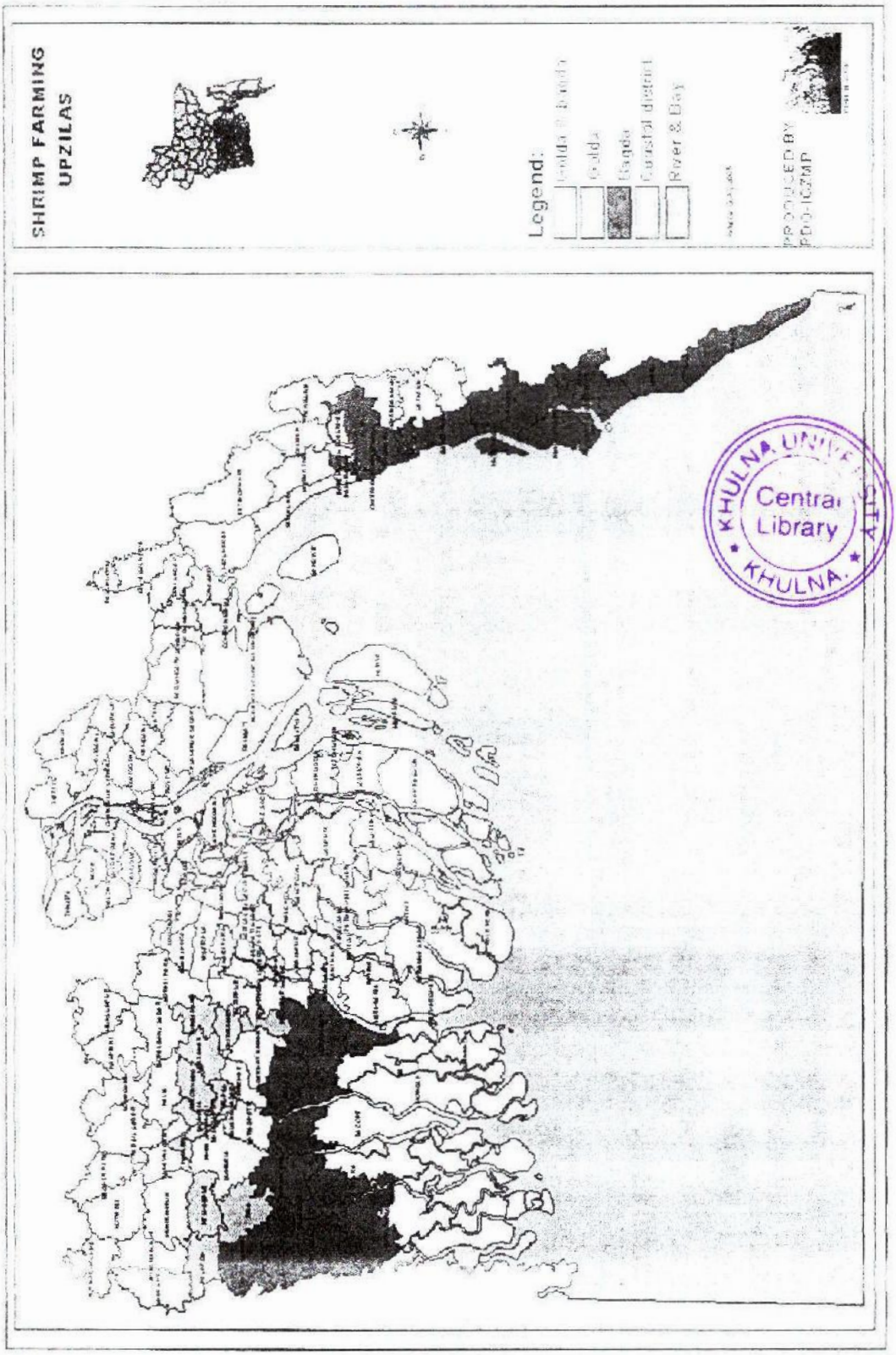


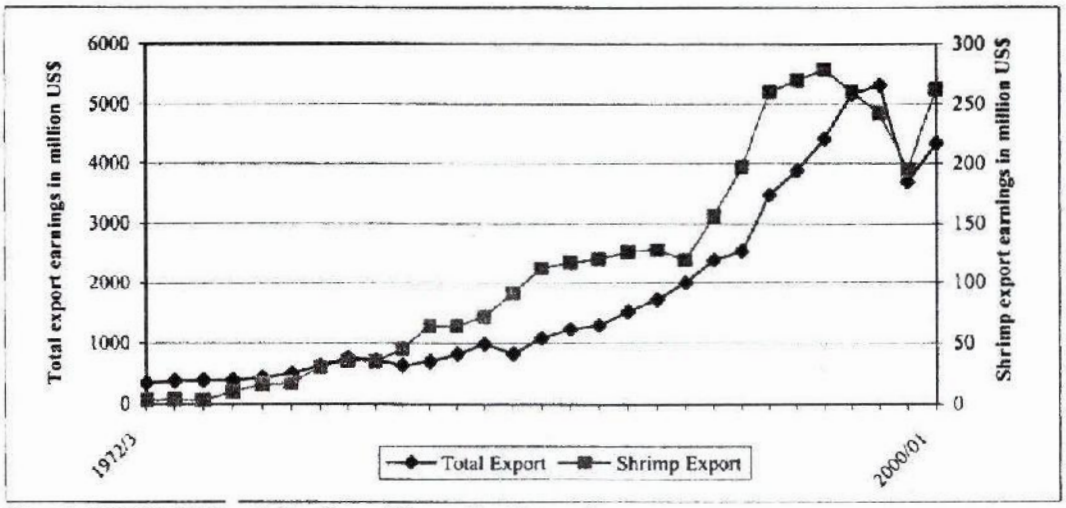
Figure 1: Map of the Coastal Zone and Main Shrimp farming Upazillas.

Total sales from both bagda and golda farms in 2001 was Tk 17,169M (US$ 301M). From this, bagda gher outputs account for 80% (Tk 13, 864M or US$ 243), and golda ghers outputs for 20% (Tk 3,305M or US$ 58M). In case of bagda farms, approximately 82% of the earnings are divided from shrimp. In respect to golda farms approximately 75% are derived from golda [Banks, 2002].

In 2001, the total sector gross value added was estimated at Tk 15,942 M (US$ 279M) [Banks, 2002]. Bagda ghers are the highest contributors to this value added (50%; Tk 7,674M or US$ 135M), [FFP,2002], followed by golda ghers (16%; Tk 2,389 M or US$ 42M), processing (18%), fry collection (9%) and hatcheries (7%). See figure3.

Bangladesh exports shrimp to three major markets the US, Japan and the EU, competing with Thailand, Ecuador, Indonesia, India, Mexico and Vietnam. Despite the relative importance of shrimp for economic growth, the industry is plagued by inefficiencies (institutional, production, processing and marketing) and is exposed to important social and environmental risks. Fiscal policy has provided incentives to the processing and hatchery sectors to the extent that they now operate at over-capacity yet the production from the farming sector is stagnating due to limited institutional support and poor infrastructure. Bangladesh has realized only a fraction of its potential for sustainable shrimp production and the gains made so far are threatened by poor management practices throughout the supply chain, abuse of human rights and a disregard for land rights and property resources in shrimp producing areas. The industry urgently needs to prepare and respond to emerging trends in the competitive global market place.

As a globally traded commodity shrimp products from Bangladesh and the conditions under which they are produced must comply international standards. The emergence of tighter international standards is probably the most important challenge of globalization currently facing the shrimp industry. Growing concerns over food safety have prompted the introduction of international Codex standards and mandatory HACCP requirements to improve quality. Shrimp producers elsewhere are increasingly undertaking voluntary certification (ISO 9000) and registering with Codes of Conduct schemes. In particular, awareness of environmental and social issues is increasing in consumer countries and there is growing pressure for the shrimp industry to attain higher standards of sustainable and equitable shrimp production.



Source: BCAS, 2001 (after Export Promotion Bureau).

Figure 2: Value of total and shrimp export earnings for Bangladesh in the period 1972/73-2000/01

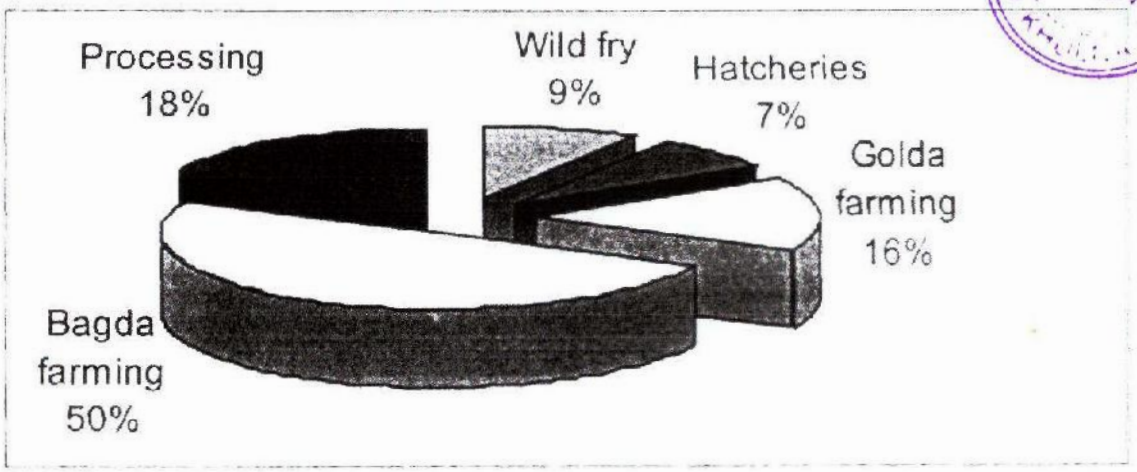


Figure 3: Break down of value added of the shrimp sector

This will intensify with the introduction of Eco-labeling schemes. The threat of a complete ban on imports of shrimp from Bangladesh by the two main importers, the US and the EU, is very real and could be highly damaging for the industry. The immediate priority must be to introduce measures that will enable the shrimp industry to comply with international standards arising from the SPS Agreement. In the longer term, there is also potential for these standards to drive out the prevailing human rights abuses and improve the overall sustainability of the sector.

The objective of the present study was to collect information on Quality Assurance techniques such as ISO 9000, HACCP, Codex and to investigate the present scenario of shrimp industry in Bangladesh.

2.0 MATERIALS AND METHODS

Documents and papers were collected from Bangladesh Frozen Food Exporters Association (Khulna), processing farm, Shrimp Seal of Quality head office, Dhaka and Bangladesh Agricultural Research Council Library, BANSDOC, Journals and Books. Frequent visits were made to SSOQ zonal office of Boira, Khulna. Hatchery, farms, Ghers were also visited. Elaborate discussion with shrimp farmers, hatchery owners, middlemen and employees of processing farm were made in respect to quality of the shrimp. Deliberate opinion from the processing farm owners were considered also. All the collected information obtained from the sources are accumulated, grouped and interpreted according to the objectives and presented.

3.0 RESULTS AND DISCUSSION

3.1 Seafood quality

3.1.1 Quality

Quality is considered as the degree of excellence. Quality is often related to the price at which a commodity is purchased or the purpose for which it is to be used. In relation to sea foods, quality is the sum total of its composition, nutritive value, degree of freshness, physical damage, deterioration while handing, processing, storage, distribution and marketing, hazards to health, satisfaction on eating, and yield and profitability to the producer and middlemen. In short, fish quality means all those attributes which a fish consumer considers to be present individually or collectively in the item. (Iyer, 2002)

3.1.2 Quality Control

Quality Control, in the case of seafoods means all the steps taken between harvesting and retail trade to protect the quality of the final product. Inspection consists of monitoring which is necessary to measure the effectiveness of the quality control procedure and also those official devices which are used to protect the consumer and facilitate trade.

Quality Control of seafoods differs a lot from that of any other food. Fruits, vegetables etc are harvested under ideal conditions i.e. the right type of food is harvested at the right time and at the right place. This means that it is possible even to select the right species, to rear them to the desired level of growth and harvest them in a pre-determined place as per pre-determined schedule. In the case of seafoods, the harvesting is from the sea, rivers and other water areas from the stocks of unknown identity as to age,sex etc. under the most difficult conditions. Hence, the intrinsic quality varies in all possible combinations. Another phenomenon which complicates the quality control of seafoods is the unpredictability of catch. At times the catches may exceed the handling capacity when even ice may not be available in sufficient quantities. Sometimes, catches are poor and the processing units have to remain idle for weeks together. Another peculiarity of tropical fisheries is the presence of large number of species in limited quantities making quality control more difficult. (Iyer, 2002)

3.1.3 Quality Assurance

Quality assurance include planning and designing activities that must be under taken to get an end product with assured quality attributes. Quality of a product depends on the following factors.

- The various materials used in the process
- The material utilized in the process
- The measurement system used in controlling the process
- The equipment used in the process
- The environment in which the process operates

Quality assurance gives importance in five factors so that the end product quality is assured. Quality control program stresses more on end product analysis rather than strict control of the intermediate processes.

3.1.3.1 ISO 9000 Series

The international standards organization (ISO) is located in Geneva, Switzerland and it is a federation of national standard bodies representing almost 100 countries.

Based on the good experience gained by the British standards (BS) 5750 series published in 1979 they were adopted by ISO and the ISO 9000 series were published in 1987 aiming at providing an international acknowledgement of quality efforts. Today more than 50 countries have adapted the ISO 9000 series, which is equivalent to the BS 5750 standards. In United States standards are published as the ANSI/ASQC Q90 series and in the European community they are published as the European Norm (EN) 29000.

The ISO 9000 series include 5 separated standards as shown in Table (1) bellow.

Table 1. ISO 9000 series

ISO standard	Field of application
ISO 9000	Selection of the appropriate ISO 9000 standard
ISO 9001	Quality system requirements for product development, production, delivery and after sales functions.
ISO 9002	Quality system requirement for production and delivery.
ISO 9003	Quality system requirements for final inspection and testing.
ISO 9004	Guidelines for ISO 9000, Quality system elements.

(Source: Basu, 2000)

For food processing companies the most relevant standards with are ISO 9001 and 9002 containing the elements shown in above table.

3.1.3.2 HACCP

Pillsbury Company of USA were asked by the NASA to develop food for their first space program in 1960. Traditional methods of ensuring food safety which includes inspection, testing and examinations, education and training, serve only as postmortem monitoring and cannot ensure the desired 100% safety. Besides large portion of the product is utilized for analysis leaving behind only a small portion for actual use. After a long evaluation, they concluded that only way to supply safe food is to control the process, the raw materials, the environment and the people. This approach was similar to "failure made end effect analysis" successfully used in quality assurance in hardware sector of engineering industry. Using this approach the Pillsbury Company developed the HACCP concept for food safety. Both in ISO 9000 and HACCP system the principles are very similar as well as so flexible and suited to serve as complimentary. The emphasis on both the systems are on prevention of non-conformance of the HACCP, the scope is mainly focused on food safety and wholesomeness. The elements of both the quality systems are compatible and complementary to each other. (Basu, 2001)

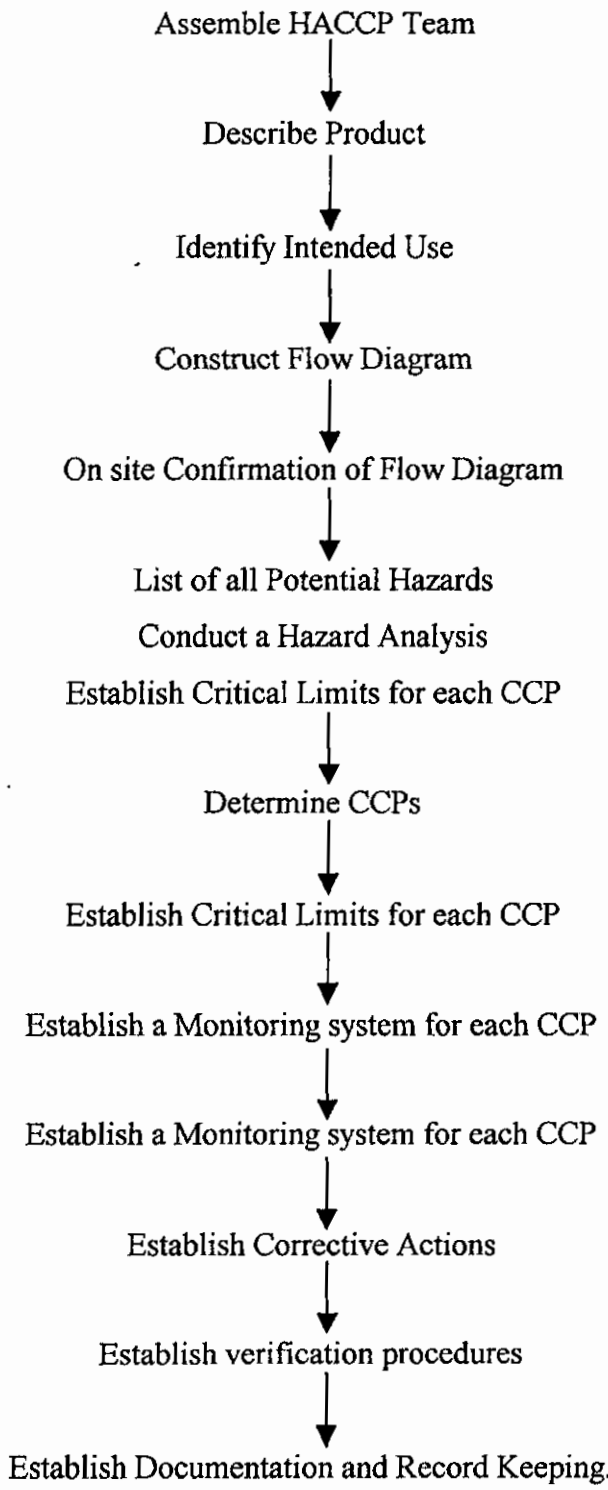


Figure 4. Logic sequence for the application of HACCP

3.1.4 International standards for Food Products-The Codex at Alimentarius Commission and Food Hygiene.

Food laws deals primarily with areas of food quality: safety and composition of food.

1. Safety of foods- The law protects that the consumers health e.g. by ensuring that reasonable standards of hygiene are practiced and that the food additives and contaminants are controlled.
2. Composition of food- The law protects the consumer against fraud e.g. by preventing.
    a. The sale of adulterated, impure or low quality food.
    b. The sale of food of short weight and
    c. Extravagant claim being made on labels or in advertisement.

The main concern of the lawmakers is, therefore, to produce laws for the safety, identification, compositional quality, labeling and advertising of foods, both to inform and protect the consumer and to sustain fare basis for honest trading.

3.1.4.1 The Codex Alimentarius Commission.

The Codex Alimentarius Commission (CAC) was established by FAO in 1961. Since 1982 it has been responsible for implementing the joint FAO/WHO food standards program, whose primary aims are to protect the health of consumers and to ensure fare practices in the food trade. CAC is an intergovernmental body with 158 member Governments as on 31st August 1997. The Codex Alimentarius Commussion (meaning "Food code" or " Food law" in Latin) is a collection of food standards codes of practice and the recommendations presented in a uniform way. Codex standards, guidelines and other recommendations ensure that the food products are not harmful to the consumer and can be traded safety between countries.

3.1.4.2 Scope of Codex

It is needed to produce standards for all the principal foods, whether processed, semi-processed, or raw. Codex documents also include provisions in respect of food hygiene, food additives, pesticide residues, contaminants, labeling and presentation and methods of

analysis and sampling. The commission has established various specialist committees to deal with separate areas. These are of two types-

1. Commodity fish products

e.g.	Fish and fish products	(Norway)
	Fats and oil	(United Kingdom)
	Meat and meat products	(West Germany)
	Poultry and poultry meat	(USA) etc.

2. General subject committees,

e.g.	Hygiene	(USA)
	Labeling	(Canada)
	Additives	(Netherlands)
	Pesticide residues	(Netherlands)
	General principal	(France)

The responsibilities of running each committee and for piloting standards through the various stages is taken by the member government responsible for that particular committee.

3.1.4.3 Codex Procedure

Many countries are collaborating in the drafting of comprehensive minimum standards for a wide range of fishery products. In order for a "Recommended International Standard" to be agreed, it must pass through a complicated procedure. Following various draft stages, the final standard is eventually submitted to governments for their formal acceptance. The "recommended standard is then published as a codex standard when the commission determines that this is appropriate in the light of the acceptance received. The assumption is that standard acceptable in a worldwide basis and published as codex alimentarius standards will be legally binding to those countries operating them.

There are more than 300 codex standards, guidelines, and other recommendations relating to food quality composition and safety. Food hygiene has been a major area of activity of CAC since the commission's establishment, the codex committee on food hygiene, hosted by the government of the United States, was founded in 1963. Because food hygiene is best regulated at the production and processing stage in the exporting countries, the

committee's main outputs have been codes of hygiene practice rather than end product microbiological standards.

Taking this philosophy a step further, CAC has adopted the guidelines for the application of the Hazard Analysis Critical Control Point (HACCP) system through its committee on food hygiene. In doing this it has recognized HACCP as a tool to assess hazards and establish control system that focus on preventive measures instead of relying primarily on end product testing.

3.1.5. The Uruguay Round Agreements

The Uruguay round of multilateral trade negotiations, which concluded in 1994, established the world trade organization (WTO) to replace the general agreement on tariffs and trade (GATT).

The Uruguay round negotiation was the first to deal with the liberalization of trade in agricultural products, an area excluded from previous round of negotiation. The Uruguay round also included negotiation on reducing non-tariff barriers to international trade in agricultural products and concluded with two binding agreements: the agreement on the application of sanitary and phytosanitary measures (SPS agreement) and the agreement on technical barrier to trade (TBT agreement). The agreements will be applied by members of WTO, and the general terms are also applicable to countries that are not WTO members.

3.1.5.1 The agreement on the application of sanitary and phytosanitary measures:

The SPS agreement confirms the right of WTO member countries to apply measures necessary to protect human, animal and plant life and health. This right was included in original 1947 GATT as a general exclusion from the other provisions of the agreement provided that "such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same condition prevail, or a disguised restrictions on international trade." Despite this general conditions for the application of national measures to protect human, animal and plant life and health, it had become apparent that national sanitary and phytosanitary measures had become weather by design our accident, effective trade barriers. The SPS agreement therefore sets

new rules in an area previously excluded from GATT disciplines. The purpose of the SPS agreement is to ensure that measures established by govt. to protect human, animal and plant life and health, in the agricultural sector only, are consistent with obligations prohibiting arbitrary or unjustifiable discrimination on trade between countries where the same conditions prevail and are not disguised restrictions on international trade. The SPS agreement covers all food hygiene measures and food safety, measure such as the control of residues of veterinary drugs, pesticides and other chemical used in meat production. In addition, it covers animal and plant quarantine measures. The SPS agreement state that any measures taken that conform to international codex standards, guidelines or other recommendations are deemed to be appropriate, necessary and non-discriminatory. Further more, the SPS agreement calls for a programm of harmonization of national requirements based on international standards.

3.1.5.2. The agreement on technical barriers to trade

The agreement on technical barriers to trade (TBT Agreement) is a version of the same name first developed under Tokyo Round of GATT negotiations in the 1970s. The objective of the agreement is to prevent the use of national or regional technical requirements, or standards in general, as unjustified technical barriers to trade. The agreements covers standards relating to all types of products, including industrial and agricultural products, with the execution of aspects of food standards related to sanitary and phytosanitary measures. It includes numerous measures designed to protect consumers against deception and economic fraud. Examples of food standards covered by the TBT Agreement are those related to quality and labeling.

The TBT Agreement basically provides that all technical standards and regulations must have a legitimate purpose and that the impact or cost of implementing the standards must be proportional to the purpose of the standard. It also says that if there are two or more ways of achieving the same objective, the least trade – restrictive alternative should be followed.

3.1.5.3. The work of CAC in the environment of Uruguay Round Agreement:

In this environment codex standard, guidelines and other recommendations take on unprecedented importance with respect to consumer protection and international food trade. As a result, the work of the codex alimentarius commission – including the guidelines for the application of hazard analysis control point (HACCP) system has become the reference for international food safety requirements.

3.1.6. Seal of Quality (SOQ)

Seal of Quality (SOQ) is a legally registered symbol owned by the Seal of Quality Organization (SOQO) which controls and authorizes its use. The use of the SOQ certifies that the product was produced and processed in strict compliance with SOQO standards and codes of conduct.

3.1.6.1 Seal of Quality Organization (SOQO)

Seal of Quality Organization is an independent, private, non -profitable company that controls the use of the SOQ, establishes codes of conduct, certifies and monitors compliance to the codes and production standards and promotes the finished products in the international markets. The organization provides training, technical support, laboratory services, and market research and development. Membership is based on verification and certification that members meet the SOQO standards and codes. Members are monitored for compliance by the SOQO and an outside third party certifier.

3.1.6.2 Shrimp Seal of Quality (SSOQ)

Shrimp seal of Quality is an organization that intends/aims to control entire shrimp farming and processing activities in compliance with SOQO.

3.1.6.3 Third Party Certification (TPC)

Third Party Certification (TPC) is process whereby an internationally recognized independent organization monitors and certifies that products bearing the SOQ are

produced and processed in full compliance to the SOQO standards and codes of conduct. The Seal of Quality Organization is talking with the Global Aquaculture Alliance, the World Wildlife Fund, and similar organizations about providing third party certification. It will be advantageous to Bangladesh if such organizations serve as third party certifiers as these are the very organizations that are developing codes of conduct and the international certification. Hence, Bangladesh could gain significantly by being associated with the world's leaders of the certification movement.

3.1.6.4 Codes of Conduct (COC)

Codes of Conduct (COC) are standards or regulations defining minimal, internationally acceptable, operations and management practices pertaining to technical, environmental, and social standards.

3.1.6.5 Operation of SOQO

The SOQO is developing codes of conduct in the areas of human rights, fair labor practices, environmental management, and food safety/hygiene conforming with internationally accepted codes. The SOQO will inspect the operations of those entrepreneurs applying for certification. Entrepreneurs that meet the certification standards will be allowed to use the Seal of Quality on their products and to certify their operations as SOQ approved. The SOQO will notify international certification organization, buyers, and consumer groups that entrepreneur and enterprise have complied with the certification codes. In order to provide certification the SOQO will provide certified laboratory services to the industry that international buyers and consumers can trust. Teams of monitors and auditors will be employed to conduct unannounced checks to ensure compliance by entrepreneurs who have been certified. In order to ensure the transparency of the system, the SOQ organization itself will be monitored by a third party certifier.

To help as many entrepreneurs as possible qualify for the SOQ, the SOQO will operate a private extension service that will provide training in best practices to the industry.

The SOQO will work with international organizations, consumers groups, and the government to attempt to brand Bangladesh in a positive way as the country producing the

world safest, cleanest shrimp under humane social conditions. The goal is to help change the international image of both Bangladesh and its shrimp industry.

3.2 Present Scenario of Shrimp Industry Of Bangladesh

Shrimp industry was only thought to be processing plants in Bangladesh. However, the term "Shrimp industry" now consider all the stakeholders engaged in shrimp activities and processing and export and marketing.

3.2.1 Shrimp activities

3.2.1.1 Fry collection and fry production

In case of bagda, 50% of the PL is derived from fry collectors and 50% from hatcheries, while for golda, 90% of the PL is derived from wild sources and 10% from hatcheries. Wild sources are still preferred by farmers as many believe that wild PL has a lower mortality rate: 40% as compared with 60-80% for hatchery-produced PL [Nuruzzaman, 2002].

3.2.1.1.1 Wild fry collection

Fry collection emerged as an important economic activity for coastal people in the early 1980ies [Hoq and Halder, 1995]. Wild shrimp fry collection is widely distributed along the whole coastline of Bangladesh. From Table 2, which refers to both bagda and golda catches, it can be seen that 80% of people in the southwestern and south-central regions catch only 40% of the total catch and that the average productivity per collector is seven times higher in the eastern regions. The reason may be attributed to the depletion of fries in the western region. For golda alone, the distribution is different: 60% is collected from Khulna, 35% from Comilla and Noakhali, and 5% from Cox's Bazar [Nuruzzaman, 2002]. It is further noted that shrimp culture is more intensive in the western region.

The abundance and distribution of shrimp fry also varies in time along the coast. The seasonal variation for three coastal zones is shown in Table 3

Fry collectors use many different types of nets and gears to catch fries but most are modifications of four main gears: pull net, bag net and shooting net. The level of destructiveness of each gear is influenced by the mode of operation. The behind net (all types of set bag nets) is regarded as one of the most damaging gears in use for fry catching, The hand operated types of nets are less destructive. The capture of fry from rivers using push nets, usually operated by women and children, is not considered to be as harmful.

There is a strong contention that wild fry collection should be banned or regulated as biodiversity is being negatively impacted by the capture of fry and the destruction of by-catch.

Table 2. Distribution of shrimp fry collectors and catch per year. (Nuruzzaman, 2002)

District	Estimated number of fry collectors	Estimated total Number of fry Collected(in Million	Estimated catch per collector
Chittagong coast (Cittagong and Cox's Bazar)	61,000	1,100	18,000
Greater Noakhali (Feni, Noakhali, Laksmipur)	31,000	750	24,000
South-central (Pirojpur, Bhola, Patuakhali, Barguna)	207,000	820	4,000
Southwest (Khulna, Satkhira, Bagerhat)	133,000	270	2,000
Total	**432,000**	**3,000**	**6,700**

Table 3. Region wise availability of shrimp fry and peak collection months. (Nuruzzaman, 2002)

hrimp Fry	Khulna, Satkhira, Bagerhat		Barisal, Patuakhali, Bhol		Cox's Bazar	
	Availability	Peak	Availability	Peak	Availability	Peak
Bagda fry	Nov-June	Mar-April	Dec-April	Feb-Mar	Dec-Aug	Mar-April
Golda fry	April-July	May-June	Apr-June	mid Apr-mid May	na	na

na = Not available

Table 4. Current harvesting methods for different gears. (Nuruzzaman, 2002)

Type of gear	Areas	Unit pric (Tk.)	Operated by	Existing ishing period minutes	Recommende ishing period minutes	Remarks
Beach set bag net	CB	500-550	Adult male	20 – 30	10 – 15	Destructive
River set bag net (boat operated)	KSB	10,000 – 12,000	Adult male	20 – 40	10 – 20	Very Destructive
River set bag net (operated from rivers)	KSB	2,200-2,500	Adult male	30 – 60	15 – 25	Destructive
Hand push net	CB, KSB, BPB	150- 200	Adult men, women, Children	10 – 15	5 – 20	Less destructive
Pull net / box net	CB, KSB, BPB	250 – 300	Adult men & women	10 – 15	5 – 10	Less destructive
Boat operated push net	Sstkhira	8,500 – 9,000	Adult men & women	na	na	Not destructive

CB= Cox's Bazar; KSB= Khulna, Satkhira, Bagerhat; BPB= Barisal, Patuakhali, Bhola; na= not available

3.2.1.1.2 Hatcheries

There are currently around 45 bagda shrimp hatcheries; 39 of them located along the Cox's Bazar beach, the remainder inland. The overall production capacity of bagda hatcheries stands at 6,000 million hatchlings per year compared to a demand of 3,oo million.

There are 34 golda hatcheries spread throughout the country, of which 15 are in the Khulna district and 9 in the Chittagong district. 15 hatcheries are reported to be in operation, producing an average of 2.7 million PL per year (2001), each factory producing an average of 13% of its total production [Banks, 2002].

Bagda grows in brackish water and hatcheries require saline water all through the hatching process and accordingly farms are located along the coast. Golda hatcheries require saline water in their initial stages but shrimp grow out in fresh water. This implies that golda hatcheries do not require proximity to the sea because the required limited amounts of seawater can be transported to the hatchery and recycled over 3 to 4 cycles of operation.

In Bangladesh, hatcheries can be classified as "small scale" They are low cost operations, using combinations of live feeds, such as micro algae and brine shrimp nauplii *(Artemia)*, and prepared diets, either purchased commercially or prepared at the hatchery.

In hatcheries, gravid (ready-to-spawn) shrimp spawn in the dark (irrelevant whether they are captured in wild or matured in the hatchery), producing between 50,000 and 1,00,000 eggs. As in nature, it takes 40 to 50 days for bagda and 50 to 70 days for golda to become PL and ready to be stocked in the farm.

The average hatchery prices for bagda and golda PL were Tk 740/1,000 and Tk 2,200/1,000 respectively. The cost of golda PL was about 3 times that of the previous year [CARE, 1999]. In April 2002, the price of wild golda PL was Tk 3,000/1,000 PL, which was reported to be nearly 40% higher than the 2001 price [Banks, 2002].

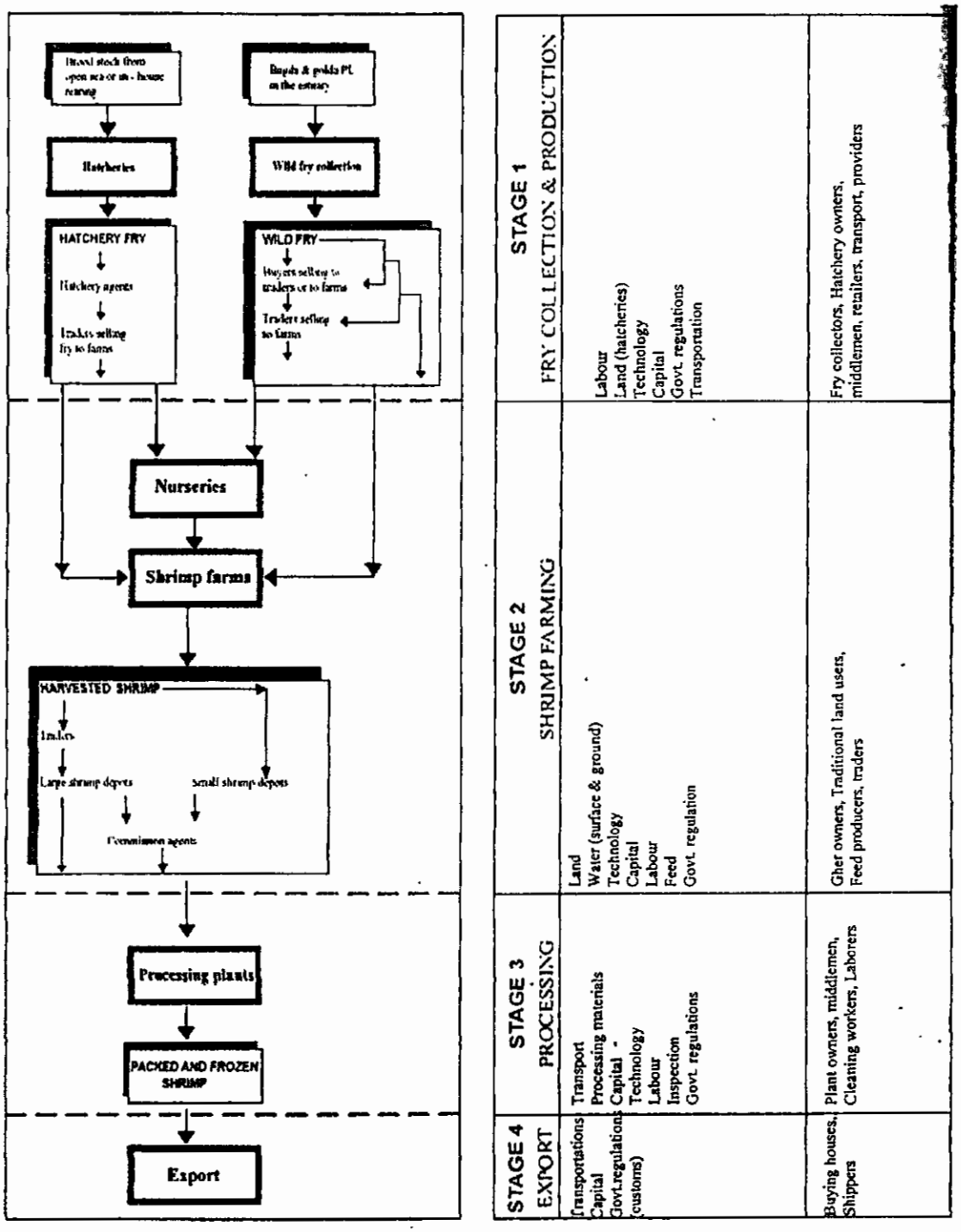


Figure 5. Main steps in shrimp activity.

3.2.1.2 Production and farming

The combined production from marine and brackish water ponds and from freshwater ghers is estimated to be around 43,000 tones (unprocessed weight), 76% coming from extensive aquaculture and 24% from inland farming (2001). The total area under production is estimated to be equivalent to 20,000 ha of which 170,000 ha (37,400 farms) is orientated towards the production of bagda culture, whilst the remaining 30,000 ha (105,000 farms) is orientated towards golda [Banks, 2002]. This compares with a total 52,000 ha and 3,500 ha in the mid 1980's respectively.

Almost all farms apply extensive farming practices, and use a one-phase shrimp production.

3.2.1.2.1 Bagda

There are around 37,400 bagda shrimp ghers in Bangladesh, producing total of 32,800 t shrimp out of which 25,000 t is bagda and 37,400t of finfish. The total production area was estimated in that year to be about 170,000 ha, of which about 135,000 ha were in the Khulna, Satkhira and Bagerhat districts, and 35,000 ha in the Chittagong District – Cox's Bazar [Banks, 2002].

Bagda shrimp farms are usually located inside coastal polders in a zone where the tidal range is between 1 and 2.5 meters. Ponds are surrounded by small dikes of 0.5 to 1 meter high and 0.3 to 0.6 meter wide, to retain at least a layer of 0.4 to 0.5 meter of water (as opposed to the recommended 1 meter). Water is mostly fed under gravity during high water levels through open channels with sluices, which are also used for drainage and flushing. Access to these open channels can present problems if the channels are closed, leased out or silted up. Only a small number of farms use Low Lift pumps (LLP).

The farms are mostly rice fields converted to shrimp ponds of size varying from some 0.4 to 200 ha [Banks, 2002]. The average size for the country as whole is 4.5 ha. This average has been reducing gradually with external leaseholders surrendering leases and small holders dividing large ponds into ghers. Most of the farms (80%) are operated by their

owners. The remaining 20% are tenant operators leasing in land from local as well as absentee owners of private shrimp land.

Shrimp farms use a one-phase or two-phase production process. In the two-phase process, juvenile shrimp are first stocked in nursery ponds before being transferred, several week later, to grow-out ponds. In the one-phase process nursery ponds are eliminated.

Before stocking hatchlings in either nursery or grown-out ponds, all types need acclimation. This is usually done in an improvised way at the expense of high mortality rates. In the western hemisphere, acclimation tanks are now developing that combine the acclimation and nursery processes.

One a grow-out operation is started, it takes from three to six months to produce a crop of market-sized shrimp. As the production process is highly dependent on temperatures, the number crops per year varies from 1 crop/year in northern China and the United States to 3 crops/year in tropical climates within 10 degrees of the equator. In Bangladesh only one crop is produced, the main reason being the lack of saline water during part of the year.

Grow-out operations come in many shapes and sizes. They are classified by overall management (stocking density, feed, water exchange and intensity of care, etc., and called extensive, semi-intensive, intensive and super-intensive, as densities increase from lowest (25,000 PL/ha) to highest (300,000 PL/ha). As density increases: farms get smaller; technology gets more sophisticated; capital costs go up; and production per unit of space increases.

Typically, extensive shrimp farming is conducted in the tropics, in low-lying impoundment's (ranging in size from a few hectares to over a hundred hectares) along bays and tidal rivers, often in conjunction with herbivorous fish. Semi-intensive shrimp farming is usually conducted above the high tide line, in carefully laid out ponds of 2 to 30 hectares and applying feeding and pumping. Intensive shrimp farming uses small enclosures of 0.1 to 1.5 hectares, in combination with round-the-clock management, heavy feeding, waste removal and aeration. Super- intensive shrimp farming takes even greater control of the environment and can produce yields of 20,000 to 100,000 kg/ha of shrimps per year.

Construction costs of intensive shrimp farms range from $25,000 to $250,000 per hectare. Under conditions of year-round production in tropical climates, yields are obtained of 5,000 to 20,000 kg/ha/yr (head-on). Production costs range from $4.00 to $8.00 per kilogram of live shrimp. Intensive farming frequently causes environmental problems.

Farm management practices in Bangladesh are of two types: extensive and improved extensive culture system. There are presently no semi-intensive farms in operation. Total stocking density varies from about 10,000 to 20,000 PL per ha, averaging 1.6 PL/m^2 [FFP, 2002]. The majority of the farmers interviewed in the FFP survey (2001) stocked PL directly to the grow-out pond without any acclimation and nursing. This, along with high stocking ratios, results in very high mortality rates of in some cases, more than 80%.
Many of the farmers start stocking little by little from the wild source during winter months from November to February. After mid February, when the weather becomes warmer, hatchery PL is also used and the willingness to pay a premium for wild fry diminishes.

Shrimp farmers usually use very little input for their shrimp farming. The FFP sample survey (2001) results suggest that 64% of the farmers use a small amount of pre-stocking inputs while 41% of them use some post-stocking input. Among the inputs, lime, urea, TSP (mentioned by a minority of farmers), cow dung, rice or wheat bran, fishmeal and oil cake are used [FFP, 2002].

Most farmers use screens at the water inlets but these are largely ineffective with significant amount of predators like sea bass, bele and tengra.

The shrimp's farms in coastal areas, particularly in the Cox's Bazar region are subject to large variations in temperature (20-35°C). The impact of this is significant, given the shallow water depths. Temperatures are highest in late April and May.

Shrimp are harvested during the full moon: in the evening and morning. The shrimp caught in the evening are landed and laid on the ground until the second harvest is taken in the mourning. Ice is seldomly used and the shrimp are taken to the depots in bamboo baskets, or occasionally in insulated boxes.

Bagda takes 3 months (Jan/Feb to March/ April) to be ready to harvest. Yields vary from place to place. [Nuruzzaman, 2002] reports highest yields in Satkhira of 147 kg/ha and lowest in Cox's Bazar 76 kg/ha. In Khulna yields were reported of about 100 kg/ha. DOF reports much higher yields, ranging from 159 (Khulna) to 216 kg/ha (Cox's Bazar).

3.2.1.2.2 Golda

Golda farming has increased rapidly in recent years. The [FFP, 2002] estimates that about 30,000 ha are currently under golda farming (ranging from 0.15 ha to 2 ha).

Golda shrimps are cultured in ponds (about 25% of all golda farms) and in ghers (about 75% of all golda farms). The average size of these golda farms is 0.29 ha [Ahmed, 2001] including both ponds and ghers. The ponds cover small areas and are constructed on cropland or in beels (e.g., Beel Dakatia) and are usually filled with rainwater during the monsoon. Small dikes may be provided to accumulate the recommended I m of water. Ghers on the other hand are bigger areas in flooded lands, using natural depressions, and are usually embanked. Ghers could be single owned of multiple owned (gonogher).

Integrated farming of prawn with rice, fish and vegetables in a modified rice field is spreading, particularly among small-scale farmers. Integrated gher farming provides a year round supply of crops for family subsistence, which is supplemented with a valuable cash crop (golda). Improvements in low costs supplementary feed and reduced stocking rates and credit costs have made gher farming more accessible to poor farmers. Most of the farmers stock PL directly of 10,000 – 20,000 PL/ha without rearing them in nursery systems. This is 1 to 2 PL/M^2.

Golda takes 4 to 5 months (June/July to Nov/Dec) to be ready to harvest. Production is equal to 80-108 kg/gher [CARE, 1999]-averaging 336 kg/ha [Banks, 2002].
After harvesting, the prawns are cleaned first using gher water and subsequently tube well water. They are kept in aluminum pots with clean water or bamboo baskets until they are de-headed and sold. Unlike bagda, golda shrimps are always de-headed before selling as the heads form part of the diet of farm households. Ice is rarely applied.

3.2.1.2.3 Farm economics

In 2001, sales from bagda farms was estimated at about Tk 13.9 million. This included Tk. 11.4 million for 32,800 t of shrimp (out of which 25,000 t bagda and 2,000 t golda) and 2.5 million for white fish. In the same year sales from golda ghers was estimated at about Tk. 3.3 million. This referred to Tk. 2.5 million for 10,000 t of golda and Tk. 0.8 million for white fish [Banks, 2002].

Table 5 estimates give an impression of the production revenues and costs of bagda and golda farming. It appears that turn over per ha of golda farming is almost twice that of bagda farming, while profit is roughly the same. Input cost for golda farming is substantially higher (fry and other inputs).

Table 5. Estimates of bagda and golda farm economics (estimated from [Banks, 2002] and BCAS, 2001)

Types	Gross income per ha	Fry cost per ha	Land rent per ha	Labour per ha	Other inputs feed, fertilizers per ha	Profit per ha
Bagda	81,519	16,733	18,765	7,557	898	37,567
		25%	25%	8%	2%	40%
Golda	110,000 (20,000 finfish)	31,200	15,000	5,000	30,500	28,300
		28%	14%	5%	27%	26%

Land rent is often not paid for and should be considered an opportunity cost. A total of 50% of bagda fries come from wild sources and 50% from hatchery. On other hand, 10% of golda fries come from hatchery while 90% come from wild.

Labor costs include earth works (for maintenance but not for construction), guarding, pond cleaning, harvesting and preliminary processing, as for various supporting or unspecified activities such as cooking. Men do the majority of the work, though women dominate the initial processing (sorting and grading for local market) of the shrimp. It is noted that 50% of all paid employment is in guarding and to avoid conflicts of loyalty, men are frequently brought in from other localities to do this.

Input costs include feed and fertilizer, such as lime, cow dung, urea, TSP, oil cake (khail) and other commercial shrimp food such as fish meal. General practice is that bagda farmers, in contract to golda farmers, do not apply feed or fertilizers.

3.2.1.3 Transport and processing

Once harvested, the flow of shrimps from gher to factory takes place within 24-36 hours. The post-harvest 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. Farias generally trade with the smaller bagda farmers and all small-scale golda producers. 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. They exert influence at both ends of the scale. The commission agents largely fix the prices.

Processing includes de-heading (bagda) and cleaning of the shrimps, freezing and packing. There are 124 processing factories in Bangladesh with a capacity for processing of 825 t per day. Of these, 35 are presently operational in Khulna (mostly located along the Rupsha River), 38 are operational in the Chittagong district and 51 plats have either closed down or are awaiting approval for a quality inspection license. Khulna accounts for around 60-75 % of the total production capacity. Only around 20% of the total factory capacity is utilized.

Quality control is a crucial element at this stage. DOF has recently amended the Fish Inspection and Quality Control Act to incorporate Hazard Analysis Critical Control Point (HACCP) standards and principles and EU requirements. Moreover, the Upazila Fisheries Officers have been instructed officially to enforce the Fish Inspection and Quality Control act under which they can visit shrimp depots and take action on defaulters.

License allocation is directly linked to HACCP. All plants are subject to a quality audit by DOF. A significant number of plants have failed to receive approval. The increased rigidity in inspection follows the ban imports of shrimp into the EU in 1997.

3.2.1.4 Export and marketing

Values of total shrimp exports of Bangladesh (accounts for more than 5% of the total export earnings. Almost all of bagda and golda shrimp produced in Bangladesh are exported [BCAS, 2001]. As these shrimps are produced by the extensive culture method without any use of chemicals such as antibiotics, they are of high quality in terms of size, color and muscle texture and highly in demand on the international market. However, due to lack of proper post-harvest care and quality control, major buyers from the EU stopped importing shrimp from Bangladesh in 1997. Drastic measures to maintain quality in compliance with HACCP standard helped to regain the international market by 2000.

USA, Japan and the EU are the main buyers of Bangladeshi shrimp. Over the last 6 years (1995-2000), the value of their total shrimp imports was quite stable at US$ 10 billion. Worldwide, however, the consumption of shrimp, including these giants, is steadily increasing. The Republic of Korea, Singapore and Hong Kong emerged as new shrimp markets. [INFOFISH, 2001], expected further expansion of the US and European shrimp market following the outbreaks of foot and mouth disease and mad cow disease.

The average annual price increase of shrimp from 1991 to 1998 was about 13% while the total price increase in 10 years was about 140 percent. In 2001-2002, Bangladesh achieved its ever-highest export earnings from the fisheries sector (Tk. 18,851M or US$ 325M) by exporting almost 30,000 tons of shrimps, which constituted 90% of the frozen fish export.

The Export promotion Bureau deals with the processes of finding buyers for the processed shrimps and arranging for the required Govt. export licenses and Govt. quality certificates (required by buyers). This process done through private companies or individuals. Processing plants may export directly or decide to go through specialized exporters or exporting companies. Quality certificates are issued by DOF. There are three laboratories

(Khulna, Dhaka and Chittagong) to test the quality (intending to comply with HACCP standards) and issue certificates.

Most processors and exporters are organized in associations that look after their common interests and represent them in different forums. The Bangladesh Frozen Food Exporters Association and the Shrimp Hatcheries Association are the most important ones with lot of influence in the formulation of government policies.

3.2.2 Quality of shrimp in Bangladesh

3.2.2.1 Safety and quality problems

As in other developing countries, the major constrains in Bangladesh include a lack of sufficient funds to invest in expensive mechanical equipment, fishing boats, pond grow-out facilities, buildings, and trained personnel. Insufficient and irregular supplies of electricity, high quality water and ice and poor transportation facilities also hinder modem sanitary practices. Most of the safety problems begin mainly in "pre-processing operations," including the handling of raw shrimp in small plants, sheds, houses, or available open spaces, often under conditions and in facilities unsuitable for food handling. Such -pre-processed" raw shrimp is used as raw material for industrial processing. Additional problems incurred during the actual processing at the plant level also often contribute to the final safety and quality of processed shrimp that is traded in world markets.

By the end of the 1970's, the Bangladesh seafood processing industry began to expand rapidly, but the use of new technology, sanitary facilities and processes and trained manpower at all levels did not match rapid growth. As a result, the export of frozen seafood suffered considerable loss in rejection from 1975 to 1978 and resulting in seafood imports from Bangladesh being placed under automatic detention by the US Food and Drug Administration (USFDA). International aid agencies, including the Food and Agriculture Organization of the United Nations (FAO) have recognized the potential for the expansion of the Bangladesh seafood industry for a number of years. FAO has also recognized the need for improvements in Bangladesh seafood safety and quality, with missions there in the early 1980's to assist Bangladesh in the development of national fishery product standards and regulations and fish inspection schemes. In 1983 the

Bangladesh government created a Fish and Fish Product Ordinance (Inspection and Quality Control) and in 1985 the quality control laboratory was updated and additional personnel hired. Additional investments and improvements were made in 1997 and 1998 as discussed later in this paper.

More recently, FAO has initiated in Bangladesh a project to assist the development of the seafood industry. The project began in April 1996, focusing directly on the preparation of a HACCP-based seafood safely and quality assurance program. It is also to train key persons in the private and public sectors to design and implement HACCP-based safety assurance programs, assist the government and shrimp industry in developing the HACCP concept, and to inform Bangladesh industry and government personnel about the new sanitary and quality requirements of major importing countries, in particular those that relate to the application of HACCP principles (FAO, 1995). The project covers a wide range of aspects, from regulatory review (aiming at achieving the necessary "equivalence" with the rules-in-force in the chief importing markets, i.e. US & EU), up to the physical structure, lay-out and finishing of seafood processing establishments. Strong emphasis is given to the introduction of a HACCP-based preventive approach at industry and government levels.

A parallel project carried out by INFOFISH with Common Fund for Commodities (CFC) funding focuses on the export promotion of value-added products and their sustainable development. This project began in mid-1996 and includes such activities as market feasibility studies; identify potential exporters, cost analyses, visits to target markets, pilot production, assessing consumer acceptability, exporting value-added products and monitoring the export activity, providing production manuals and industry training, and organizing investment seminars. A final objective includes improving the quality and sustainability of the processed products.

3.2.2.2 Shrimp safely and quality in major markets

These assistance programs to Bangladesh are extremely important and timely. Bangladesh frozen shrimp exporters continue to have both real and perceived problems with buyers in the US, the EU and Japan, concerning the safety and quality of its products. Bangladesh also continues to experience major problems in the reputation of its products with government import programs in the US and the EU while exporters experienced major

problems during 1997 with seafood safety assurance and inspection programs in the two markets for frozen shrimp. These are summarized below.

European Union. On 30 July 1997, the European Commission banned imports of fishery product from Bangladesh into the EU (EEC 1997) as a result of European Commission inspections of seafood processing plants in Bangladesh. The concern resulted from serious deficiencies in the infrastructure and hygiene in processing establishments and insufficient guarantees by the competent authorities (Bangladesh govern inspectors). The European commission determined that it is of potential high risk for public health with regard to the importing and consumption of fishery products processed in Bangladesh.

Subsequent inspections and decisions recognized the Bangladesh department of fisheries. Fish Inspection and quality Control, Ministry of Fisheries and Livestock as the competent authority in Bangladesh. It indicated that Bangladesh quality assurance legislation was equivalent to that of the EU and subject to certain provisions lifted the ban on seafood products from the country's six approved establishments for products prepared and processed after 31 December 1997 (EEC 1998). Other processing plants are now being inspected for approval.

United States. The US Food and Drug Administration (USFDA) enforces US laws which mandate that imported goods meet the same standards as domestic goods. Imported goods must be pure, wholesome, safe to eat, and produced under sanitary conditions. Products may be detained when imported into the US without physical examination based on past history and/or other information indicating the product may be contaminated. Once a product is places on automatic detention, normal entry may not resume until the shipper or importer proves that the product meets USFDA standards. During 1997, a total of 143 shipments of frozen shrimp from Bangladesh into the US were automatically detained without examination. Eighty seven percent of the shipments were detained between September and December, when most Bangladesh shrimp are imported. The reasons for the 143 detentions were as follows: filthy, *Salmonella* (53); soaked, wet, filthy, *Salmonella* (28); *Salmonella*, decomposed (21); *Salmonella* (14); filthy, insanitary manufacturing, processing or packing (8); filthy (8); soaked, wet, *Salmonella* (5); filthy, Listeria, insanitary manufacturing, processing or packing (3); soaked, wet, filthy (1); filthy, label not bearing nutrition information (1); soaked, wet (1). Automatic detention does not mean

that the product is rejected. It means that each shipment is inspected and then allowed into United States if the product is safe and meets minimum safety standards.

Japan. In contract to the EU and US, government authorities in Japan have not recorded any recent problems at the time of import of shrimp from Bangladesh, although industry representatives have expressed concern as noted above. For the three year period 1995 to 1997, no violations of Japan's food sanitation laws were recorded for shrimp imported from Bangladesh.

3.2.2.3 Shrimp processing plants

Seafood processing plants in Bangladesh have made serious attempts to implement HACCP plans. Out of 120 plants (not all process shrimp), the Bangladesh government indicates that 48%have been remodeled spending from US$100,000 to US$220,000each, 34% have prepared HACCP based quality assurance manuals and five percent have implemented HACCP principles since mid-1997. Fifty-eight plants have been approved by the Bangladesh Department of Fisheries as meeting minimum quality standards, and six have been listed by the European Commission to export products to the European Union. Results of industry efforts are reflected through rapid changes that have been observed in the physical conditions of shrimp processing plants since July 1997. Today most of the problems reported by European Commission inspectors in terms of plant and personnel hygiene, processing facilities, lay-out, fabrics and finishing are solved. At the same time, the industry is trying to solve problems linked to raw materials and all operations up to the factory deck. New strategies to eliminate unnecessary steps and to upgrade raw material quality are being attempted. The main change being implemented is the incorporation of de-heading and peeling operations in the exporter processing line to avoid preprocessing under unsatisfactory hygienic conditions.

Survey data from the 19 plants provided excellent cost information on the status of upgrading to meet he standards and of HACCP plan implementation. Eighteen of the 19 plants have HACCP plans in place. With initiation of the plans beginning from August 1997 to March 1998. As of April 1998, the average plant had spend US$ 239,630 to upgrade to adequate technical and sanitary standards. And additional US$ 37,525 in expenditures is anticipated per plant to complete the upgrading, to be fully in compliance

with minimum (basic) technical and sanitary standards. This compares reasonably with the US$100,000 to US$220,000 per plant estimate from the report of the Government of Bangladesh. Of the total expenditures plant repair and modifications represented 70%, lab installation was 13% and added equipment cleaning, 10%. The average plant expects to spend US$34,875 each year to maintain the HACCP plan and to ensure the HACCP plan is in effect.

The total cost of industry upgrading, including some HACCP implementation for the 19 plants is US$5,265,945. These plants represent 30% of the industry volume. Assuming an identical distribution of plants in size and characteristics across the remaining 70% of the industry, the total one-time cost to the Bangladesh frozen shrimp processing industry to upgrade is US$17 553 150. The annual cost to maintain the HACCP plan is estimated at US$662 625 for the 19 plants, resulting in an industry-wide total cost of US$2 208 750.

For the 18 plants, based on the reported volume and value data, the average export value received in 1997 for shrimp was US$10.62 per kilogram. On a per kilogram (per pound) basis, the total onetime cost, mostly during 1997 and early 1998, for upgrading the average plant was US$0.7141 per kilogram (US$0.3239 per pound). This represents 6.72% of average price received in 1997. The cost to maintain the HACCP plan in future years represents US$0.0899 per kilogram (US$0.0408 per pound). This represents 0.85% of the average price received in 1997. Since the 19 plants are those that received higher value than the industry average, the remaining and more marginal plants would have higher costs per kilogram to implement and maintain a HACCP plan.

This should also be considered a maximum estimate for Bangladesh shrimp plants, since cost maintenance estimates for the HACCP plan include plant repair/ modification which may be necessary even if a HACCP plan is not effect. Without plan/repair modification costs included, the lower estimate for annual HACCP plan maintenance is US$0.0327 per kilogram (US$0.0148 per pound) or 0.31% of 1997 price. Only one prior study on the cost of HACCP in shrimp plants is available. This study covered plants which processed breaded, cooked and raw shrimp in the United States, and estimated the cost to maintain HACCP plans to be US$0.0009 per pound (National Fisheries Education and Research Foundation Undated). This cost per pound estimate is for plants with high technical and sanitary standards in place and which produce a more valuable per pound product. The

cost per pound for the Bangladesh frozen shrimp processing industry of US$0.0408 per pound is much higher as expected due to the processing conditions and lower value product per pound.

Each plant's response to the questionnaire also provided insight into the attitudes of Bangladesh shrimp processors regarding HACCP plans. Comments included, (a) 100% indicated that HACCP will ensure shrimp buyers to be more confident in their frozen shrimp products; (b) 35% indicated HACCP will lower production costs per kilogram; (c) 67% indicated that HACCP will lower marketing and sales cost per kilogram of shrimp; (d) 100% indicated that HACCP will reduce product loss and detention at the importing country; (e) 94% indicated that HACCP will improve the quality of shrimp produced in their plant's. Firms were also asked whether shrimp buyers from Japan, the US and the EU enquired them whether a HACCP plan was in place, during trade negotiations. As for the Japanese buyers, 22% always asked if a HACCP plan was in place, and 17% asked more than 50% of the time, and 61% asked less than 50% of the time. For the US, 84% always asked if a HACCP plan was in place, and 11% asked more than 50% of the time, and 5% asked less than 50% of the time. For the EU, 83% always asked if a HACCP plan was in place and 17% asked more than 50% of the time.

3.2.2.4 Bangladesh Fisheries Department in HACCP implementation

The Department of Fisheries (DOF), Bangladesh has adopted the HACCP as "the principal program used to monitor the seafood processing industry for safety and quality. HACCP was implemented nation-wide in December 1997. According to DOF, the quality of seafood products has improved and systematic hygienic operational systems are being followed by the seafood processing plants. DOF has spent US$201,483 through December 1997 to upgrade its laboratories, hire additional employees and train employees in order to achieve acceptable levels of technical and sanitary capabilities in its monitoring program. The main costs are for new equipment and laboratories. An estimated US$180,676 will be spent in 1998, principally for new employees and laboratory chemicals and glassware. An estimated US$225, 039 will be spent annually each year, principally for new employee salaries. This annual cost closely approximates the additional costs to use HACCP as the principal monitoring program after facilities and personnel are upgraded. Finally, the DOF

proposes a major investment program of US$ 14.9 million to full implement the highest levels of seafood HACCP programs within the government sector in Bangladesh.

During 1996 and 1997, the FAO project in Bangladesh conducted four workshops on the design and implementation of HACCP-based quality assurance programs, training a total of 100 persons. Subsequently, the Bangladesh Department of Fisheries trained trainers (to qualify them to teach HACCP in-country) and organized five additional workshops training 120 persons. Fish inspectors were also send for training outside the country.

The FAO project prepared a special training manual on HACCP and training materials on basic HACCP concepts and principles. Guidelines for the design and implementation of HACCP-based programs were developed by the Department of Fisheries in Bengali and distribute to the industry. Some processing plants developed HACCP training programs for their own workers including a training program organized by the industry in Khulna for shrimp producers, brokers and transporters. The objective was to improve the quality and safety of shrimp raw material. Training materials on HACCP published in the United Kingdom were purchased and distributed to the industry. The FAO project has spent approximately US$ 72,000 for HACCP training programs in Bangladesh.

3.2.2.5. SOQ program in Bangladesh

The SOQ program has already started and is legally registered non-profit company with a registered seal. It was initially developed by ATDP-II after extensive discussions with all sectors of the shrimp industry within Bangladesh and with buyers, consumers, and international shrimp related organizations outside of Bangladesh. A series of workshops and seminars using international and local consultants were held with individuals in the shrimp supply chain. Meetings were held with buyers at the European Seafood Exposition and on special trips to the UK, the Netherlands and Germany. The Global Aquaculture Alliance and the World Wildlife Fund were visited and extensive dialogue has taken place with these organizations. A trip to visit the Thai shrimp industry was arranged by the Network of Aquaculture Centers in Asia-Pacific (NACA). Several meetings were held with all the donors involved in funding shrimp industry related projects and an agreement was reached by the donors to work together and to approach the industry with one unified voice. Based on these discussions and activities, the primary problem of the industry was

identified. This primary problem serves as the basis for a range of secondary problems facing the industry. The primary problem is the failure of the industry to take complete responsibility for it self, to self-regulate, to self-police and to assert the necessary to fully organize itself. While separate processor, supplier, and farmer organizations exist, there is no all- industry association composed of all the key players in the supply chain as exist in competing countries. An initial SOQ team and office has been operating for the last six months. A team of seven local staff is working full time on putting together codes of conduct, developing operational plans, geographic mapping of the shrimp industry, developing extension and training material, meeting with the government and hosting meetings with all segments of the industry.

3.2.2.6. Role of Bangladesh government in relation to SOQ

The Government of Bangladesh (GOB) has a major role to play in a Seal of Quality program. SOQ presents an ideal opportunity for public sector- private sector cooperation. Among the responsibilities of the government under the Seal of Quality are the following:

- Restrict the participation in the shrimp export industry by entrepreneurs who do not meet SOQ standards and international certification standards. Such uncertified entrepreneurs jeopardize and threaten the existence of the entire industry.
- Transfer the responsibility from the government to the private sector Seal of Quality Organization for certifying shrimp exports and for operating the extension service.
- For the next ten years, utilize the money saved from transferring responsibility for certification and extension to the private sector to co-fund with the private sector an international branding program to brand shrimp as a Bangladeshi product.
- Ensure that shrimp producers can own the land on which they farm shrimp. Without ownership of the land, entrepreneurs have little incentive to invest and thus increase production.
- Enforce law and order in the shrimp producing areas, especially in regards to human rights and fair labor practices.
- Assist the private sector and NGO's in the development of alternative employment opportunities for poor communities for whom the shrimp industry is no longer viable.

- Based upon verifiable market information supplied by the industry on the global competition, provide appropriate economic support to the shrimp industry to ensure that it can compete fairly with competing countries.
- Supporting a system to place a levy on each kilo of shrimp exported from Bangladesh to pay for the private certification and extension program.

3.2.2.7. Profit of Bangladesh government from SOQ program

If an internationally credible private sector SOQ program is implemented the government and hence the taxpayer benefits by the following

- Production and export volume will increase from approximately $300 million to $500 million with improvements in technical management.
- Export prices will increase to levels similar to what other producing countries are receiving with improved international market confidence in Bangladesh shrimp products and acceptance of the SOQ.
- Increased production will allow Bangladesh to participate in the labor intensive value added market. Employment will increase with increased production, and wages will increase with the increase in demand for skilled labor.
- The social climate will improve and social abuses will decrease with adherence to the codes of conduct.
- The environmental impact of the industry will improve with technical changes and restoration of past abuses.
- The international perception or image of Bangladesh and its shrimp products will change as a result of the branding campaign. The country and its citizens will have something positive to be proud of. Such a positive image will have a multiplier effect on the image of the country in other areas.

4. CONCLUSION AND RECOMMENDATIONS

In the case of Bangladesh shrimp processing plants and government laboratories and inspection program have not meet minimum technical and sanitary standard until recently. A significant number of plants have failed to receive approval of several importing countries. Now the processing industries have completely adopted HACCP as per the requirement of European Commission and other importing countries in order to compete in the international market. Most processors and exporters e.g. The Bangladesh Frozen Food Exporters Association and the Shrimp Hatcheries Association are organized into associations that look after their common interest and represent them in different forums. The overall hygienic conditions, quality maintenance of the products, processing systems, packaging and frozen storage are improved. As set of recommendations has been proposed to improve the quality standard as well as to increase export earning:

- International Quality Assurance approaches should be strictly followed in the shrimp industry Bangladesh.
- Effective quality control measures should be ensured for high quality products from the shrimp industry.
- Farmers should have access to appropriate technologies to improve extensive production systems and reduce the risk of disease through a self funding, privatized extension service.
- Improved water management regimes in shrimp polders should be provided for optimum integrated shrimp cultivation (rice/shrimp/fish) and minimum impacts on water resources.
- An effective local government that should include the active participation of women, able to respond to the priorities of coastal communities and facilitate successful integrated community based management of shrimp polders through public/private partnerships.
- Bangladesh shrimp should be recognized internationally as a leading brand produce in socially responsible and sustainable manner. A secure shrimp industry that will contribute to equitable rural development and poverty alleviation generating employment and rising regional incomes for coastal communities.
- An administrative and legal framework that will facilitate the development of responsible shrimp aqua-culture.

- A participatory development strategy and plan that will ensure the sustainable and rational use of resources.
- Environmental and social welfare that will safeguard to ensure the sustainable use of resources in the coastal zone and a secure environment for shrimp production with protected rights for all.
- A sustainable shrimp industry that will generate in excess of $800 million in foreign exchange every year.

5. REFERENCES

Ahmed, N, 2001, Socio economic aspect of freshwater prawn culture development in Bangladesh. PhD Thesis, University of Stirling,UK. pp 320

Banks, Richard, 2002. Brackish and marine water aquaculture. Report from the Fisheries Sector Review, DFID. July 2002.

Basu, S. International standards for food- Products-The Codex Alimentarius Commission and food Hygiene In: Training course on "Quality management in Export of seafood products" sponsored by Indian council of Agricultural Research, New Delhi (19th December, 2000 to 8th January, 2001).CAS in fishery science .Division of post Harvest Technology. Central Institute of fisheries Education (Deemed University) versova, Mumbai – 400 061Pp- 18-24

Basu, S. Quality Assurance in seafood – The HACCP Concept In: Training course on "Quality management in Export of seafood products" sponsored by Indian council of Agricultural Research, New Delhi (19th December, 2000 to 8th January, 2001).CAS in fishery science. Division of post Harvest Technology. Central Institute of fisheries Education (Deemed University) versova, Mumbai – 400 061 Pp – 1-17

BCAS, 2002. The costs and Benefits of Bagda shrimp farming in Bangladesh: an economic, financial and livelihood assessment. Prepared as part of the Fourteen fisheries project Bangladesh Center for Advanced studies (BCAS), Dhaka, Bangladesh, August 2001.

CARE, 1999. Report on training needs assessment of golda gher farmers. Golda Project, CARE- Bangladesh. (Cited from Banks, 2002).

Cato, J.C. and Santos, C.A.L.D., 1999, Bangladesh shrimp processing sector-economic cost of implementing HACCP. INFOSIFH International 3/99. pp 49-57.

FFP, 2002. Status of the shrimp hatchery and nursery operations in Bangladesh. Fourth fisheries project, Department of fisheries, Dhaka, Bangladesh. October 2002.

Frankenberger, Timothy R., 2002. A likelihood analysis of shrimp fry collectors in Bangladesh, future prospects in relation to a wild fry Collection ban. Tango International Inc, For Department of International Development, Dhaka, Bangladesh. August 2002.

Hoq, M.M. and G. Halder, 1995. Socio-economic Impact & Constraint of Shrimp Culture in Bangladesh. FRI Technical Report 11. Fisheries Research Institute, Mymensingh, Bangladesh. Cited from Frankenberger, 2002.

ICZMP 2002. The system of shrimp production In: A system Analysis of shrimp production working Paper WPO14.Program Development Office For Integrated coastal zone management plan (PDO – ICZMP), Saimon centre, Road 22, House 4/4, 5th floor Gulshan 1, Dhaka 1212. Pp. 5-10

INFOFISH, 2001. Intergovernmental organization for marketing information and technical advisory services for fishery products in the Asia Pacific Kualalumpur, Malaysia. International no 3/2001 May/June. www.infofish.org.

Iyer, T.G.S. 2002. General Aspects of Seafood Quality In: "Quality Assurance in seafood processing" (ed. By Iyer, T.G.S, kandoran, M.K., Thomas, M. Mathew, P.T.) published by: Central Institute of Fisheries Technology Matsyapuri P.O., Cochim – 682029 & Society of Fisheries Technologists (India). Matsyapuri P.O., Cochin – 682029 Pp – 1-10

Nuruzzaman, Md., 2002. Status of the shrimp hatchery and nursery operations in Bangladesh. An output form the Shrimp Action Plan, sponsored by DFID Bangladesh through the Fourth Fisheries Project and the Global Environment Facility. Departmetn of Fisheries, Dhaka, Bangladesh. October 2002.

SOQ, 2003. Shrimp farming upazilas in the south western region, shrimp farming upazilas in the south eastern region; www.atdpsoq.biz, Seal of quality, Agrobased Industries and Technology Development Project, Phase II (ATDPII), Dhaka, May 2003.