

## A Study on Shrimp Processing Activities in Bangladesh

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**Abstract:** This study aims to sketch out various activities of shrimp processing plants in conformity with the food safety standards. Field surveys, interviews and discussion with different stakeholders in shrimp industry were done for this research. The results reveal that Bangladesh shrimp processing plants follow prescribed codes of conduct in all stages of processing and export of shrimp. International organizations named SGS, Lloyd's and Baltic Control are working as third party certification agency. However, it is recommended to implement HACCP 100% in all stages of production, distribution, processing and export of fish.

**Key words:** Food safety standards, HACCP, shrimp, processing plants, Bangladesh

### INTRODUCTION

Shrimp is the second largest foreign exchange earner after garments in Bangladesh. The country earned about US\$ 500 million by exporting shrimp to some 40 countries in the 2006-07 fiscal year (July 2006 to June 2007). It constitutes some 8.0% of the country's total exports. The government has fixed a target of earning US\$ 600 million from this sector in the current fiscal year of 2007-08. The sector employs nearly one million rural people. It has the highest potential for further development, enough to culture shrimps to earn US\$ 1.5 Billion (BFFEA, 2007).

Bangladesh is already among the top 10 exporters of shrimp in the world and accounts for some 3% of global production. The EU (45%), USA (35%) and Japan (4%) are the world's major importers of shrimp from Bangladesh. However, the export of shrimp to developed country markets is becoming increasingly difficult because of the emerging sets of food safety and agricultural health standards, along with buyers' changing requirements (Ito, 2005).

On the international level, buyers and consumers are increasingly demanding that shrimp is produced in compliance with recognized codes of conduct regarding food safety, human rights, fair labor practices and environmental protection. The quality of shrimp exported from Bangladesh continues to be appreciated for both taste and meeting health standards.

It is not an easy task for a country like Bangladesh where production processes are not organized and systematic to implement the management system intended to satisfy the safety standards and requirements of developed country consumers. The Government needs to take the lead role in introducing improved practices, but

the success of any program will depend on the commitment of the trading community (UNB, 2004). However, Bangladesh would be able to attract more investment and create additional jobs and export income in the shrimp industry if the quality problem is successfully addressed and solved. Therefore, this study assesses the activities of Bangladesh shrimp processors in order to comply with the food safety standards.

### MATERIALS AND METHODS

To identify the quality control performance, primary data were collected for three weeks in July 2007 from General Managers, Executive Directors of 17 processing plants in Khulna district following random sampling. Semi-structured interviews were also conducted with personnel of other stakeholder organizations such as Bangladesh Frozen Foods Exporters Association, Department of Fisheries and Export Promotion Bureau. Besides, Secondary information sources in the form of handouts, reports, publications, notifications, etc. having relevance with this study were also consulted. The data and information from all these field surveys, interviews and discussions were summarized and used to write this study.

**Bangladesh shrimp and the challenge of HACCP:** In order to supply safe fish and fish products to the importers and consumers, the government has undertaken stringent measures to improve quality assurance practices as well as management practices by strong compliances of HACCP (Hazard Analysis and Critical Control Point) guidelines (DoF, 2005-06). The government has strengthened the Fish Inspection and Quality Control

wing of the Department of Fisheries (DoF) to provide statutory support to the processing plants and to fulfill the HACCP requirements as well as achieve international reputation for Bangladesh fish.

The effort to impose uniform quality standards became necessary after the EU imposed a ban on Bangladesh shrimp imports in September 1997 and accused shrimp processing plants for their failure to comply with the European Union (EU) quality control regulations. In response, the government declared the HACCP as a new mandatory procedure for export-oriented shrimp processing plants in March 1998. This response by the government and processors resulted in the EU lifting its ban in July 1998.

Food processors can use HACCP to identify hazards, harmful microorganisms or chemical and/or physical contaminants in food. The use of the HACCP concept for food has its origin in the United States Space Program in the early 1960s. In order to provide safe food during space flights, it was determined that a preventative system was the best to minimize the risk of food safety hazards, rather than end product testing. The United States Food and Drug Administration (USFDA) first required HACCP controls for food processing in 1973 for canned foods and recently has been required for seafood in the United States.

HACCP is a systematic study of the ingredients, the food product, the conditions of processing, handling, storage, packaging, distribution and consumer use. Most of the standards involved the use of HACCP standards for ensuring food safety—a standard that has been approved by the Codex Alimentarius Commission (IISD, 2004). It has also been endorsed worldwide by the European Union and by several other countries including Canada, Australia, New Zealand and Japan.

**Monitoring activities by DoF:** The Department of Fisheries (DoF) conducts a series of following monitoring activities started at the collection of brood shrimp to shipment of final product (BFFEA, 2007).

**Brood shrimp collection:** Brood (mother) shrimp is caught from the deep sea by specialized trawlers. At monitoring marine surveillance check-post, a number of things are monitored: trawler fitness certificate, net size, turtle excluding device, number of crews, other types of trawling equipment from harvesting devices to essentials for life saving such as life-jackets. Shrimp/fish/squid is processed in the trawler, while brood shrimp is collected.

**Brood shrimp checking centre:** At this centre, brood freshness is checked, in particular, whether the brood is infected with virus or other diseases. Certificate by DoF is ensured after proper checking.

**Hatchery:** To feed up the aquaculture farm, shrimp fry is produced in the hatchery. The brood shrimp is put in hatchery tank for induction of egg hatching. Breeding is done with hormone injection. About 20-30 ppt salinity is needed for hatchery. After breeding, shrimp fries are carried within Oxygen bag and sent to the nursery by air cargo. DoF monitors the hygiene and sanitation condition of hatchery, its infrastructure, workers' health condition and feed condition—whether unapproved drugs or toxic elements have been used, water quality management, packing system, materials and so on.

**Nursery:** Nursing area, closer to the culture farm is used to acclimatize fries with the local water environment and water chemistry like salinity. Then those are carried to the farm area by pick up vans. Similar checks are made by DoF at the nursery also.

**Shrimp farm:** In the shrimp farm/gher, almost 100% of black tiger farmers follow natural and extensive aquaculture method without putting any supplementary feed in their farm. A little portion of farmers follows supplementary feeding inside their farms. Black tiger shrimp (i.e., bagda) rearing period is between 60-90 days. But all the farmers follow supplementary feeding for fresh water shrimps (i.e., golda). Major portion of farmers prepare shrimp feed themselves procuring components like wheat polish, rice polish, maize powder, fish meal or bone meal, vitamin, pre-mix, broken rice or wheat, etc. Some farmers also purchase ready feed from market.

Fresh water shrimp rearing period is 6 months to 1 year. There are some checks made at shrimp farming on: source of PL (Post Larvae), water quality management, environment condition, hygiene and sanitation, feeding system and feed quality, water exchanging system, shrimp landing and preservation, transportation vehicles, farmers' health condition, aquaculture residue monitoring, ice quality, hormone, trapping system, netting system and so on.

At harvesting, some more checks are carried out on: ice quality, chill water facility, plastic basket, harvesting equipment, farmers and region code (to track source of farming) and tags for recording when farmers began to culture and when they harvested. Main harvesting is done during full moon and black moon high tide using natural water current. Some casting and pulling net is used for harvesting. Farmers put their shrimp into ice in plastic baskets immediately after harvesting. Then those shrimps are carried into processing plants through service center. Covered or refrigerated van is used to carry shrimps from farm area to the plant premises.

**Shrimp landing centre:** At the landing centre, DoF monitors facilities, hygiene and sanitation, landing position, supply code, regional code, time of primary received, time of delivery to the processing plants, ice condition, water supply condition, utensils used, health condition of workers and so on. During handling and transportation, all types of precaution are taken.

**Processing plant:** The following activities are inspected at the processing plant: grading, washing, weighing, panning, freezing, packing, storing, lab testing (microbiology), internal monitoring by quality assurance, all steps of processing from shrimps receiving to final product.

**Competent authority:** This authority inspects the plant and products. This includes documents (related to HACCP) inspection from harvesting to final product, organoleptic test in processing plant, checking weight and grade, freshness and hygiene, date of production, expiry date, labeling and doing sample collection for laboratory test and aquaculture residue monitoring.

**Shipment:** Certified shrimp is exported by ship or plain.

**Illustration of shrimp processing in the plant:** The activities of plant start exactly after harvesting and receiving of raw materials shrimps. Shrimp is received after checking the traceability documents and physical quality (organoleptic). Then it is de-headed and washed with chilled chlorinated water in the processing plant. If the de-headed and washed quantity of shrimp is too high, then one part is preserved in the chill room and another part is passed to the processing hall.

The shrimp is then graded and washed with potable chilled pressurized water. After washing, it is weighted and panned. If more time is required at the stand by condition of panning, crushed ice is used to cool down the temperature of the pan. The pan is then placed in the freezer. The shrimp is frozen at -40°C temperature until the core temperature of the product comes down to -18°C. After completion of freezing it is unloaded, de-panned and glazed. Then the product is packed and labeled according to specification and stored in the frozen store at -18-22°C. Finished products are carried from plants to the seaport by refrigerated van container at proper temperature. Products loading from plant premises and stuffing into the refrigerated container at port area is done usually at night.

All the processing activities in the plant are strictly controlled under Good Manufacturing Practices (GMP). Processing and quality assurance monitoring activities are

pre-fixed with pre-set parameters. A written HACCP manual is prepared for all following activities: receiving, weighing, washing, chill storing, beheading, export grading, pressurized washing, weighing, panning, labeling, freezing, packing, cold storing, plant cleanliness activity, shipment and distribution of shrimp, quality assurance and laboratory activities.

It is found during plants visit that process line activities are done about 90% in compliance of HACCP principles. However, plants need to give attention on improvement in receiving and grading section as these are done manually. It is also observed that most of the plants are equipped with boots, gloves, dress, mask and health check up kits for workers, plastic containers, fish washing units, hand washing facilities, ice producing units, freezing and chilling units, physicians, chemical laboratory, water treatment plants, etc. which are the basic requirements for HACCP compliance.

**Fish inspection and laboratory test:** Regular inspection is done by the trained inspectors from the Fish Inspection and Quality Control (FIQC) department under the Ministry of Fisheries, Government of Bangladesh. FIQC carries out routine inspection of hygiene and sanitation of plant premises, processing activities and verify HACCP related documents and records. These inspections and verifications are based on the Codex guidelines, code of practice, standards and directives of EU, USFDA, HACCP regulations and requirements of other import countries. Every lot of finished product is declared to the FIQC for health certificate. After getting certificate, the product is exported. Samples are drawn from raw material receiving section, process line and finished product according to analysis schedule. All laboratory works are performed under FIQC department and the laboratories are equipped with sophisticated equipments for microbiological and antibiotics test. Besides, Bangladesh Atomic Energy Commission and SSOQ funded laboratory at Cox's Bazar do the heavy metal and virus test, respectively.

**Activities of SSOQ:** In 2002, the concept of Shrimp Seal of Quality (SSOQ) was introduced through the Agro-based Technology Development Program (ATDP), a project funded by the United States Agency for International Development (USAID). Although initially it was perceived as exclusively a certification program, it also included the agenda of production improvement through the use of virus free larvae and improved pond management. The SSOQ program established a viral DNA identifying protocol laboratory through Polymerase Chain Reaction (PCR) technology at Cox's Bazar to get rid of a widespread viral disease. The disease known as White

Spot Syndrome Virus (WSSV) is detected through tests in the laboratory set up by the SSOQ program. The physical facilities available in the laboratory are enough to carry out the expected number of tests for certification of virus free supply of seeds in line with the demand. The ATDP was ended in December 2005 (Talukder and Shah, 2005).

**Certification by international quality assurance organizations:** As third party certification agency, three international independent companies namely SGS (Societe Generale de Surveillance own by France), Lloyd's (United Kingdom) and Baltic Control (Denmark) offer comprehensive inspection and superintendence to both at the company and at shipping ports as per instruction of the import countries. The core services offered by these companies can be divided into four categories.

**Inspection services:** Inspect and verify the quantity, weight and quality of traded goods.

**Testing services:** Test product quality, safety performance and regulatory standards.

**Certification services:** certify that products meet the requirements of standards set by client customers.

**Verification services:** verification services ensure that products and services comply with global standards and local regulations.

**Role of BFFEA:** The processors-cum-exporters of seafood are united under Bangladesh Frozen Foods Exporters Association (BFFEA) which is engaged to look after the interest of seafood process and export business and further promotion of this sector. BFFEA has own monitoring within their members regarding relevant matters of seafood process and export. Also this association plays the role of vital link between plants and different government and private agencies.

The BFFEA has charted a vision to raise the earning from frozen foods export to US\$ 1.5 billion by 2010 through increasing shrimp production, utilizing the processing capacity of the plants to the fullest extent and marketing vigorously across the globe. It developed an action plan to achieve the target of producing 250,000 metric tons of raw shrimp from 270,000 ha of land by introducing modern and eco-friendly culture technology. However, the industry grapples with some grave concerns like shortage of raw materials, unhealthy competition in the procurement of shrimp, illegal grabbing of khas land fit for shrimp cultivation by non-farmers, imposition of turn over tax, natural

calamities, poor communication, insufficient transport and marketing facilities, high prices of inputs and low prices of outputs, etc.

Currently, the shrimp farmers are cultivating in nearly 0.17 million ha of lands in the coastal area. Another 0.10 million ha of khas lands, that are suitable for shrimp cultivation, are under the occupation of land grabbers. Such land grabbers are cultivating shrimp in a traditional way as they are not directly involved with the industry. There are some 140,000 shrimp farms producing an average output of 53,000 metric tons annually. Bangladesh exported 38,000 metric tons shrimps. But the country's shrimp processing factories have a combined production capacity of about 265,000 tones (DoF, 2005-2006). The country might receive significant foreign and domestic investment in the shrimp industry if the government is able to distribute the land to the real farmers and exporters.

## RESULTS AND DISCUSSION

It is appeared that Bangladesh shrimp industry practices standard in compliance of HACCP to produce safe and quality products. In response to the emerging food safety, the government and processors-cum-exporters took joint initiatives to upgrade processing plants, standardize quality control system, implement buyers' requirements, maintain constant monitoring, renovate government laboratories and provide training for officials and workers in shrimp industry. Strict measures and monitoring are taken for all steps in production, processing, quality control, food hygiene and sanitary standards to comply with the EU food safety directives. Positive report on reliability and quality standards of shrimp processors after the visit of the EU investigation team in 2005 had brightened the image of Bangladesh frozen foods in global market and attracted more buyers. However, the kinds of opportunities and constraints that Bangladesh shrimp processors face have also varied in time in relation to changing international trade regimes and global business strategies.

## CONCLUSION

This study indicates that sanitary and food safety measures are applied to all of the shrimp processing activities and all of the stakeholders are fully aware of the food safety requirements. Recovering the illegally occupied government land and utilizing the fullest

capacity of the processing plants, Bangladesh would be able to earn substantially by exporting quality shrimp in

the global market. The Government needs to take the lead role in introducing more improved practices, technological and communication development, so that exporters could fulfill with the standard starting from production at the farm level and to the requirements of the buyers following the norms of the sanitary and health related issues. It is recommended to implement HACCP 100% in all stages of production, distribution, processing and export of fish.

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