Profiling of Bagoong Production

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Abstract **–** The fish catch in Lingayen Gulf decades ago were high-value species like groupers, snappers, sharks, and rays. Nowadays, the harvest of gulf comprises of rabbitfish, anchovies, slipmouth, and round scad because of overfishing and illegal fishing. The scarcity of fish needed in bagoong production and the different ordinances and administrative orders banning illegal fishing techniques affect the fish paste production in Lingayen. This study was conducted to describe the fish paste production. This descriptive study utilized a semi-structured questionnaire to generate data from the owners and workers of fish processing business. The producers in Lingayen are now sourcing out fishes for fermentation from as far as Navotas and Malabon in Metro Manila and the Bicol region. This kind of problem is beyond the control of the producers. The water resource and systematic issues like those of administrative orders are external factors. This problem generates more problem like the cost of fish, product price and transportation expense. Fish paste producers should concentrate on these internal factors because experience, expertise and technical assistance from the business and government sectors could be the best weapon to beat the challenges of nature.

Keywords **–** fish paste, production, anchovy, slipmouth fish, herring

INTRODUCTION

The Philippines is being an archipelagic country that has more water than land makes fish farming an opportunity [1]. It comprises of 421 principal rivers, 72 lakes, 18 major river basins and coastline of 36,289 kilometers [2]. The fishing industry contributed 1.8 percent and 1.5 percent to the country's gross domestic product in 2014 and 2015 [1] [3].

When it comes to fish catch, species like roundscad (255 tons or equivalent to 22.9%), Indian sardines (130 metric tons or MT, 11.7%), frigate tuna (115 MT, 10.3%), skipjack (114 MT, 10.3%), slipmouth (36 MT, 3.3%), Indian mackerel (32 MT, 2.9%), and anchovies (29 MT, 2.6%) were caught in 2003 in the Philippines [4]. In 2012, the species caught were Indian sardine (175 MT, 16.8%), round scad (167 MT, 16.0%), big-eyed scad (43 MT, 4.1%), Indian mackerel (36 MT, 3.5%), anchovies (27 MT, 2.6%), and slipmouth (18 MT, 1.7%) [5].

These common fish catches and their abundance convince people to preserve fishes using fermentation [6]. Fish is considered a perishable raw material. The goal of fish processing like fermentation is to produce a high product quality and to extend its shelf life [7].

Fermentation is one method of fish curing in which the development of a distinctive flavor in the final product is the principal objective. Fermentation alone as a curing process does not preserve fish because it results in the breakdown of fish muscle. For this reason, fermentation is often combined with salting and drying to reduce water activity and retard or eliminate the growth of proteolytical and putrefying bacteria. In Africa, however, fish fermentation lasts from a few hours to about two weeks. Fermentation is usually partial, and the muscle structure is not broken down completely [7].

Three main techniques have emerged as methods commonly practiced in many African countries. These are fermentation with salting and drying, fermentation and drying without salting, and fermentation with salting but without drying. The reasons for the use of salt are its availability, its cost, and traditional food habits of people. Salt supply in Chad is imported from Nigeria, and Cameroon and fermented salted fish is produced. Salted dried fermented fish in Uganda is produced in the western and north-western parts of the country, and these are exported to Zaire [7].

The fermented fish is heavily salted in these countries. In Cote d'Ivoire, most of the fermented fishery products are consumed locally especially in the rural communities. Small quantities are exported to Burkina Faso. In Cote d'Ivore, Ghana and Senegal, processors with low-grade frozen fish from cold sores for processing into fermented products. In Gambia, fermented and dried

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products are mainly for export to Cote d'Ivoire, Ghana, and Mali [7].

Fish sauce is known as mon-man in Cambodia and Vietnam, nam-pla in Thailand and Laos, kecap ikan in Indonesia, nga-pi in Burma and patis in the Philippines. Fish paste is called *trassi* in Indonesia and *belacan* in Malaysia [8]. In Ghana fermented fish is called momone, an Akan word which means stinking [7]. In the Philippines, fish paste is called *bagoong*, and fish sause is *patis*.

The earliest known reports of fish sauce are from ancient Greece between 4-3rd century B.C. The fish paste or bagoong production in the municipality of Lingayen started in the 1940s [6]. During the pre-Spanish colonization, Lingayen was the primary center of commerce because of the existence of Chinese community. It was also the center for the construction of boats used in the internal trade. The people produced salt, wine from nipa palms, and nipa leaves for roofing houses and traded their products for rice generated by the inland communities. At the time of the conquest, traders from the towns of the Ilocos, upper Pampanga, Nueva Ecija and Cagayan regularly came to Pangasinan to secure their provisions of salt, bagoong, coconut oil, sugar and dried fish. Also, products from Lingayen were loaded on boats and carried as far as Camiling as exchange for rice grain. Lingayen Gulf is known for its bountiful harvest of high-value species like groupers, snappers, sharks, and rays in 1949. At present, the gulf is in a state of degradation with fish catches of low value like slipmouths and hairtails [9].

World fisheries catches had increased since 1950 when the Food and Agriculture Organization of the United Nations began reporting global figures. The fish caught was highest in the 1960s. Global catches increased more slowly after the 1972 collapse of the Peruvian anchoveta fishery, the first fishery collapse that had repercussions on global supply and prices of fish meal. By the early 1990s the numbers of northern cod had declined by 99.9% relative to their abundance in the early 1960s, a rate of decline almost unmatched among living aquatic species [10].

FAO classified more than 70% of major marine fisheries worldwide as fully or over-exploited. Many populations such as the North Atlantic cod have already crashed [10]. The technological revolution in the course of time brought more advanced and effective techniques into the fisheries. The change from sail to steam, gasoline, and diesel engines gave increased power and ability to trawlers to move into deep fishing [11]. On the other hand, historical catch record suggests climatic variability has had basin-wide effects on the northern Pacific and its fish population, such as salmon, sardines, and anchovies [10].

When it comes to fish caught in the municipality of Lingayen, records, show that motorized fishing produced 26 MT, 31 MT, 28.4 MT and 28.7 MT in 2005, 2010, 2012 and 2013 [12] [13 [14] [15]. Moreover, Lingayen Gulf reached its maximum sustainable yield more than 30 years ago. Catch rates are only one-fifth of what they were 25 years ago [4].

This decline in fish catch is happening in the whole country. The country has reached the maximum economic yield from its fish stocks in the 1960s, except in Palawan, Southern Sulu Sea and central part of Pacific coast. Nowadays, there is an observed change in species composition and an indication of the slow collapse of exploited species [4]. The collapse is the result of unsustainable fisheries [16], and destructive fishing practices [17] [18] like dynamite fishing, cyanide fishing, Danish seine and trawl [5]. In Pangasinan, there was even a point where the Department of Agriculture issued an official statement in 1998 regarding the moratorium on commercial fishing in Lingayen Gulf [19]. Recently, the Bureau of Fisheries and Aquatic Resources issued an order about gulf patrolling because of some reports that it looks like New Year's Eve in Lingayen Gulf with 20 blasts being heard in a day [15]. As a result of this patrolling, yellowfin tuna was again sighted as anchovy and mullet serve as food for the tuna. However, yellowfin tunas are migratory. Fish paste producers in Lingayen need sustainable fish production.

The town of Lingayen bears gulf in its name. This body of water is known for several fish harvests like, but not limited to, rabbit fish, anchovies, slipmouth and round scad. With these fish catches, together with the presence of salt industries in the province of Pangasinan and the claims of salinity of air, the town naturally gets its recognition as fermented fish center of the country. The municipality adopted fish paste as the official one town, one product and celebrated the bagoong festival since based on the Municipal Ordinance No. 6, series of 2012 or the ordinance adopting bagoong of fish paste as the capital town's official one town, one product and making an annual town celebration of the bagoong

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festival. There were issues on fish catches as production of fish paste relies on fish as the main ingredient. There were also reports on banning of several illegal fishing techniques by the authorities that lessen the volume of fish catch that goes along with bagoong production.

Since the commercial fish stocks in the Lingayen Gulf had reached its peak in the 1960s [15] [4], the dwindling municipal and commercial fish production in Lingayen affected the producers. Even Lingayen has a gulf bearing its name, the body of water cannot sustain the needed volume of fish by the fish paste producers.
Along these issues evolved the planning and executing research on profiling of bagoong production. It attempted to ask questions from the producers about adjustments they made to address problems on the scarcity of fish. Lingayen fish processing should continue to grow in spite of environmental and systematic issues that come along the way. Thus, this study was conducted to find out how the fish fermented producers adjust to this condition.

OBJECTIVES OF THE STUDY

The town of Lingayen bears gulf in its name. This body of water is known for several fish harvests like, but not limited to, padas (rabbit fish of siganid family, dilis (anchovies), sapsap (slipmouth) and galunggong (round scad). With these fish catches, together with the presence of salt production in the province of Pangasinan and the claims of salinity of air, the town naturally gets its recognition as bagoong center of the country. The town adopted bagoong as the official one town, one product and celebrated the bagoong festival since 2012 [20]. As production of bagoong relies on fish as main ingredient, issues on fish catch were reported. There were also reports on banning of several illegal fishing techniques by the authorities that lessen the volume of fish catch that goes along with bagoong production. This study attempted to get information from the bagoong producers about the profile of their business, the types of fishes they utilized, the purchase of fish and salt, the process of bagoong production, and problems they encountered in bagoong production. Lingayen bagoong should continue to grow no matter big environmental and systematic issues that come along the way.

MATERIALS AND METHODS

There are 27 registered fish paste businesses in the Municipality of Lingayen in 2016. These businesses are mostly situated in the barangays of Pangapisan North, Maniboc, and Poblacion. The semi-structured interview guide was used to generate information from the owner and workers of fish processing businesses. It has questions about the business, the fish fermentation process and the problems met on fish paste making. The gathering of data was conducted from October to November 2016 with the approval of the local chief executive of Lingayen and the Research Committee of Pangasinan State University. The researcher looked around the area, searched for the subjects, and asked their approval and available time. The actual respondents were trimmed down to 21 because some of the owners are not around during the survey and others do not participate. Their answers were jotted down on a piece of paper and kept it for data analysis.

The grouping of answers was done since the research instrument have open-ended items. For variables where respondents need to have a single response, the presentation used frequency and percentage. Rank was used for multiple-response items. The qualitative form was used for frequency and mode of purchase of salt and fish and process of making bagoong.

RESULTS AND DISCUSSION

The data gathered from the respondents were analyzed and presented using a table. These data and their interpretation are presented in succeeding parts. In years of existence of fish paste business in Lingayen, Pangasinan, 44 percent of the businesses exist for 11 to 30 years, 33 percent for 31 to 50 years, and 19 percent for 51 to 76 years. On the average, the business is existing in the area for four decades. On capitalization, 86 percent of the business owners use Php300,000 to Php700,000 as capital, 10 percent with Php701,000 to Php 1 million, and four percent with Php1 million to Php1.5 million. Majority of the bagoong producers utilized half million as capital. For the average yearly profit, 57 percent has Php300,000 to Php600,000 profit, 38 percent with Php601,000 to Php1.5 million profit, and five percent with PhpP3.5 million profit. The data revealed that the majority of the bagoong producers have more than half a million income.

With regards to the number of employees, 48 percent of the business owners have 9 to 20 workers, 43 percent with 21 to 40 workers and 9 percent with 41 - 65 workers. These owners employ between 20 to 30

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workers. For the production area, 53 percent has a production area of 200 m^2 and below, 33 percent with 201 m^2 to 300 m^2, and 14 percent with 301 m^2 to 470 $m^{2.}$ This production area includes a storage facility where old earthen jars are kept. Fish fermented producers in Lingayen claimed that the secret of Pangasinan fish paste is the use of old storage for fish fermentation [21].

Table 1. Profile of bagoong industry
N=21

Profile variables		**f**	**%**
Years of existence	11-30 years & below	10	48
	31-50 years	7	33
	51-76 years	4	19
Capitalization	Php300,000-700,000	18	86
	Php701,000-Php1M	2	10
	Php1M-Php1.5M	1	4
Average yearly profit	Php300,000-600,000	12	57
	Php601,000-1.5M	8	38
	Php3.5 million	1	5
Number of workers	9-20	10	48
	21-40	9	43
	41-65	2	9
Production area (in m^2)	200 m^2 and below	11	53
	201 m^2-300 m^2	7	33
	301 m^2-470 m^2	3	14
Number of trucks	1-3	17	81
	4-6	3	14
	7-10	1	5
Average number of bottles of fish paste produced per month (320ml)	400-800 bottles	11	53
	801-1200 bottles	6	28
	1201-1500 bottles	4	19

Eighty-one percent of the bagoong producers have one to three trucks, 14 percent has four to six, and one percent with seven to ten trucks. They have an average number of three few trucks. Regarding the average number of bottles of fish sauce and fish paste produced per month, 53 percent produced 800, 28 percent with 801 to 1200, and 19 per cent with 1201 to 1500 bottles. On the average, the owners are producing more or less a thousand bottles of fish sauce and fish paste per month.

Table 2. Fish utilized in fermentation

Kind and source of fish		**f**	**Rank**
Kinds of fish used	Combination of…		
	Anchovies, slipmouth, and herring	13	1
	Round scad and squirrelfish	4	5
	Round scad and anchovy	5	3.5
	Anchovy, slipmouth, herring, round scad, and squirrel fish	8	2
	Anchovy, slipmouth, herring, round scad, squirrel fish, and redbait	5	3.5
Sources of Fish	Quezon Province	8	3
	Navotas	17	1
	Malabon	12	2
	Mindoro	2	4

*Multiple responses

Based on the data gathered, the kind of fish utilized in fish paste production is the combination of anchovy, slipmouth, and herring. This is followed by the combination of anchovy, slipmouth, herring, round scad and, siga. The owners utilized assorted species of fish like anchovy, slipmouth, and herrings. According to the respondents, these are the usual kinds of fishes that are available at the source. Mixed fishes are placed in big basin and this costs Php700 per basin. For herring, it costs Php400 per basin. But the owners need more fish that is why buying assorted fish is better than buying only one kind of fish.

Fish processing depends on the availability of raw materials. An alternative was identified to address the issue of scarcity of fish in the municipal waters of Lingayen. The fishes as raw material are coming from Navotas followed by Malabon, Quezon Province and Mindoro for fish paste production. Navotas is 210 kilometers away from Pangasinan. In Manila, it is known as the "Fishing Capital of the Philippines." Common fishes found in Navotas are milkfish, tilapia, sardines, bighead carp, ponyfishes, and tuna. Since Navotas has a large volume of fish catch like sardines and ponyfishes, the city is also known for their fermented fishes [22]. As to fishes in Malabon, these are coming from different provinces like Bicol, Palawan, and Mindoro. The Bicol province is 660 kilometers away from Pangasinan.

In case of fish caught in Lingayen Gulf, the volume of fish catch for municipal and commercial fishing is not enough to sustain the demand of fish

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processing industry in the municipality. Records show that the Lingayen Gulf reaches its maximum fish production more than 30 years ago. The causes of this phenomenon are unsustainable fisheries and dynamite fishing. Depletion of fish caught in Pangasinan is further aggravated by trawl fishing made by foreign commercial fish vessels in Labrador and Sual during the early years. There are also ordinances that hinder the fishermen in Pangasinan to catch fish needed for fish paste production. Some of these are the prohibition of fishing using nets with a mesh size smaller than 3.0 cm. and the use of Danish seine.

Purchase of fish and salt

There are eight producers who purchase fishes every month and every week, but thirteen prefer to buy fishes after a month and a week or every month from their supplier. They usually stock raw materials in March. They said that fishes are cheap during March and April and it gets costly in November and December. Fish has micro-floral in the slime on its body, in its gut and its gills. The micro-organisms bring about putrefactive changes in fish when it dies. The micro-organisms present in the salt used for fermentation and salting also contribute to the changes in the fish [7].

On purchase of salt, the respondents purchase salt directly from the producers every six months. Their sources are the municipalities of Bolinao, Dasol, and Anda. The respondents revealed that salt is cheap every March and April and expensive from July to December.

Fish fermented producers in Pangasinan claimed that salt and salinity of air in the province are the factors in making fish fermenting ideal in the province [20]. Many attempts have been made to ferment fish outside Pangasinan, but the output is a putrified fish, not a fermented fish [6].

The process of making bagoong

These are usually family-run businesses. While others are preserving more than old business, some separated from their family-run business after marriage and established another fish paste business using the generation-old techniques. The commonality of their fish process is preserved. The use of fish and container are the difference in the production.

The first process in fish fermentation is the selection of good fishes and removal all seaweeds, sticks and other extraneous materials. Owners used fishes like anchovy, slipmouth, round scad, and herring. The second step is more on washing the fish thoroughly with clean, fresh water. The next step is mixing of fishes thoroughly with salt at the rate of 1 to 3 or 2 to 7 parts by weight and placing this mixture in sealed clay or glass jars, wooden barrels or vets to undergo fermentation. The salt added to the fish (usually 1 part course salt to 3 parts small fish) is sufficient to saturate the flesh and prevents spoilage during fermentation [8].

This fermentation takes place from three months to one year to develop the distinct aroma and flavor bought about by the breakdown of fish proteins. Once in a while, the mixture is stirred to allow the salt to spread evenly. The last step is removing the top layer or fish sauce and placing the bottom layer or fish paste in a separate container.

Table 3. Problems of fish paste producers

Problems	f	Rank
High cost of fish in November and December	8	1
Inability to increase product price	16	2
Demand for the bagoong products	10	3
Cost of transportation	7	4
Productivity of workers	6	5

The depletion of fish caught in Pangasinan is seen as a problem for fish paste producers. Since fish is the primary ingredient in the fermentation, the demand for fishes is high. However, this demand could not be met by the fish supply in the province because of the scarcity of fish in the area due to climatic variability [11] and some local fishery management regulations. The Bureau of Fisheries and Aquatic Resources Fishery Ordinance No. 246 in September 2013 prohibits fishers to catch small fishes and other species except for anchovy, rabbitfish (or *padas*), and krill using fine mesh nets and Danish seine. The prohibition on using fine mesh nets is based on the Municipality of Bani Ordinance No. 94-02 or the ordinance regulating fishing and fisheries in the Municipality of Bani. The ban on the adoption of Danish seine is promulgated by Alaminos City Ordinance No. 2005-18 or the ordinance banning the operation of Danish seine in the city water of Alaminos, Pangasinan. As a result, the producers purchase fishes as far as in Bicol province. These raw materials are expensive

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during the months of November and December. The transportation cost also increases as distance of fish supplier becomes farther.

CONCLUSION AND RECOMMENDATION

Bagoong production in the Municipality of Lingayen is soon to be a century-old business. Fish is an important raw material for fish processing. However, the supply of fish in Pangasinan is not enough to cover the demand of fish paste producers due to a low volume of fish needed for fermentation and the local ordinances in Pangasinan. As a result, the producers made an adjustment and utilize assorted species of fish like anchovy, slipmouth, and herrings in bagoong production. These fishes came from Navotas, Malabon, Quezon Province and Mindoro.

The proliferation of fish in Lingayen has been reported because of the banning of Danish seine, fishing with fine mesh and the patrolling of Bantay Dagat volunteers, Bureau of Fisheries and Aquatic Resources seaborne patrol and the Philippine Navy against illegal fishing. Continued implementation of ordinances against illegal fishing is needed to increase the fish caught in the province. This is also in conformance to local and national policies. In the future, it is hoped that there will be an increase in quantity of fish catch needed in bagoong production in order to lift the fishing ban and bagoong producers will not go to other provinces to buy fish.

The producers should purchase fishes in bulk to address the problem of the scarcity of fish, cost of fish, and product pricing. Since Lingayen is known for its quality fish paste, the change in process and formulation in fermentation should not be compromised to maintain the price. A less content volume could be an option. But the ideal is bulk purchasing based on demand and inventory to get a discount from the supplier and get savings from transportation.

Also, bagoong producers should continue the production of padas bagoong and padas alamang. Rabbitfish or *padas* is allowed to catch in Pangasinan based in the Bureau of Fisheries and Aquatic Resources Ordinance No. 246 in September 2013.

Rabbitfish is abundant in the province and caught year-round. Reports in the 1970s show that padas are large in volume especially in Bolinao and the Tagaporo Island was known for its bagoong making. Aside from rabbitfish paste and shrimp paste as an additional line of bagoong product the consumers could choose from, these can help bagoong producers maintain their profit in times of the high cost of fishes in Navotas and Malabon. However, there should be a time series study about the farm price, wholesale price, and supply chain of different fish needed for bagoong making. There are usually differences in the fish prices at the source. There is also a need to study about fish stocking and generation in the province to increase the volume of fishes needed in bagoong production like rabbitfish, anchovy, slipmouth, and round scad.

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