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Analysis of Cost and Challenges affecting the Profitability of Frozen Fish Enterprise in Sunyani Municipality of Ghana

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Abstract
One of the greatest problems facing the small-scale frozen fish enterprises in Sunyani is their vulnerability to losses due to high operational cost and uncertainty of their income. This study was conducted to investigate the socio-economic analysis of small-scale frozen fish enterprises in the Sunyani Municipality. A descriptive research design was employed where 25 survey questionnaires were administered to frozen fish sellers to achieve the study objectives. The result of the descriptive analysis showed that *Scomber japonicas* (Saman) had the highest average cost (GH¢ 518.25) among the fish species with *Trachurus trachurus* (Kpanla) being the least (GH¢ 257.13). It was also known from the study that, the average cost of electricity (GH¢ 119.80), packaging (GH¢ 58.80), and transportation (GH¢ 53.13) per month were the various additional costs to frozen fish business and increases the price of the fish species. Also, the highest total average profit of the fish species was recorded for *Oreochromis niloticus* (GH¢ 310.77). The least average profit of the fish species was recorded for *Pagellus bellotti* (Wiriwiriwa)of (GH¢ 51.6636). The perishable nature of the fish was a severe barrier to the frozen fish business. This could be attributed to poor electricity supply usually experienced in the study area which is highly needed for preserving frozen fish. Frozen fish could only be stored for a few hours in which case must be sold even when the price is not favorable, this account for the severe losses suffered by fish sellers in the study area. There should be reduction of electricity cost and constant supply of electricity as these key issues influence the cost and pricing of frozen fish in the study area. It is therefore recommended that the regulations be put in place to mitigate erratic power supply.

Keywords
Frozen Fish; Socio-Economic; Sunyani Municipality; Risk Analysis;

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Contents

1. Introduction

The fisheries sector in Ghana is one of many sectors constituting an important sector in national socio-economic development. Fish and other seafood products account for about US$ 1 billion in revenue annually and contribute about 5% and 3% to agricultural GDP and national GDP respectively (Atta-Mills et al., 2004). The small- scale alone also contributes 3.5% (GSS, 2011). Additionally, the sector supports the livelihood of over 2.6 million Ghanaians and consequently, aids in poverty reduction across the country (FAO, 2016). Ghana has a lot of fisheries resources due to an abundance of water resources such as the sea, lagoons, rivers, lakes, and dams. For decades, fish has been the most important, preferred, and affordable source of animal protein for both the poor and rich in Ghana. Local consumption constitutes around 75% of total domestic fish capture (a reliable source of food security). The per capita consumption of fish is estimated at 25 kg/annum, representing 60% of animal protein intake by Ghanaians, which is higher than the estimated averages of 18.9kg and 10.5 kg for the World and Africa respectively (Atta-Mills et al., 2004; FAO, 2016; Onumah et al., 2018). To maintain the current per capita levels of consumption, Ghana imports around 191,000 metric tons of fish annually from other countries since it is only able to satisfy about 50% (about 420,000 metric tons) of its

total national fish requirement (Frimpong and Adwani, 2015).

In Ghana, the commonly consumed fish types include Sardinella (called Amane or εban in the local language), Anchovy (Keta school boys), mackerel (salmon), horse mackerel, chub mackerel, and tuna. The sea bream, cassava fish, red snapper, and tilapia are also consumed by a segment of the population and are also patronized by hotels and restaurants (Quaye, 2018). Nutritionists have argued that fish is a major and richest source of essential fatty acids such as LC-PUFAs and bioavailable micro-nutrients such as vitamins (D and B) and minerals (calcium, iron, zinc, etc.). The rich nutritional properties of fish make their consumption beneficial to the health and development of millions of low-income consumers (HLPE Report, 2014). Therefore, experts have concluded that consumption of a certain quantity of fish especially fatty fishes (e.g. sardines) can reduce the risk of coronary heart diseases and stroke problems and can contribute to improved brain development (FAO, 2011). Moreover, researches over the years have shown that consuming fish can help prevent high blood pressure, cholesterol, and cancer (Psaltopoulou et al., 2004).

Fish constitutes an important component in the diet of most Ghanaian households. It is worthy of note that fish has become so expensive due to declining fish capture, increased demand due to exponential growth and increase in the cost of living. The high cost of transportation, high cost of transaction and power inconsistency affect the frozen fish enterprise, especially among the small-scale operators (Godfray et al., 2010). Nonetheless, the fishing sector is dynamic in its gender distribution. Men are engaged in fish harvesting, they are involved in the fishing activities in the artisanal, semi-industrial and industrial sectors while women are predominantly engaged in onshore post-harvest activities which include fish processing, storage and trade activities. Women are also involved in sales of frozen fish both for exportation and domestic transaction (Nunoo and Asiedu, 2013).

Irrespective of the importance of the fisheries sector in Ghana, like other African countries, this sector is often exempted from most national policies. This might be caused by a wrong perception that small-scale fisheries have low potential in relation to economic contributions though; it has contributed largely to employment, rural and social development. However, its marginalization has a negative impact on the socio-economic development of the nation (Nunoo and Asiedu, 2013). In addition, there has been a disproportionate increase in fish price which affects low-income households negatively particularly in cities (FAO, 2011). This phenomenon is characterized by changes in the diets and consumption attitude of urban poor dwellers who cannot afford fishes with exorbitant prices (Nunoo et al., 2015). The contribution to the Fisheries sector to Ghana's economy is 1.5% of the GDP. More so, fish is regarded as one of the most traded food items globally (FAO, 2016). In relation to foreign exchange earnings, Ghana's exports on fish are among the first three most important non-conventional exports. As regards employment, it has been documented that over 150,000 fishers are engaged in marine capture fisheries. Moreso, an estimation of aver 1.5-200,000 people depend on/or give support to fishers (FAO, 2016).

In 2004, Aquaculture fish production for human consumption was estimated at 950 tonnes, (FAO, 2000,2009). Most prominent among the fish species produced are North African catfish (*Clarias gariepinus*) and Nile Tilapia (*Oreochromis niloticus*). In Accra, the nation's capital, most cage culture farms sell tilapia fish per kilogram at about 4 dollars while catfish is sold at about 6 dollars per kilogram. Whereas in Kumasi, the second largest city in Ghana, both catfish and tilapia are sold for about 2 dollars respectively. This is largely due to the high consumer preferences and demand for each species at these two geographical locations in Ghana (FAO, 2000, 2009).

The lack of information and the false myths have a wrong image of frozen fish, attributing a series of deficiencies and prejudices that have nothing to do with reality. The main difference between fresh and frozen food is that the second has been subjected to a decrease in the temperature, causing the freezing of its main component. With this process, its shelf life increases, as well as its microbiological quality is assured, without altering its organoleptic qualities. That is, most times the frozen natural products may contain more vitamins and minerals than freshly chilled because they are frozen on board recently caught, at the moment of higher nutritional value. ("Benefits of frozen fish", 2017). Within frozen fishes, nutritionists point out of the highest quality to the deep-frozen foods. When the fish is caught offshore, it is processed and frozen immediately, at a temperature of -40º in a few hours. This procedure reduces the natural oxidation and preserves the freshness, preventing microbial growth and the loss of nutrients. The present study seeks to analyze the socio-economic benefits of small scale frozen enterprise in the Sunyani Municipality, to contribute to the sustainable management of fishery resources in Ghana. .

2. Materials and Methods

2.1 Study Area

The study was conducted in the Sunyani Municipality, which lies between Latitude 70 20ºN and Longitude 20 30ºW. The municipality shares boundaries with Sunyani West District to the north, Dormaa East District to the west, Asutifi District to the south, and Tano North District to the east. It has a mean annual temperature of 29ºC in the hottest months and about 24ºC in the coolest months contributing to a total annual mean rainfall between 120 cm and 200 cm. The area falls in the semi-deciduous forest zone. The people are more into co-

coa and mining activities which are resulting in very little of the original forest available and most of what is left are secondary forests. (GSS, 2014). The Municipality lies in the Semi-equatorial climatic zone and experiences double maxima rainfall regime, from April-June and September-November. The period between December and March is the dry season characterized by harsh harmattan conditions. The mean annual rainfall of the Municipality is between 125 cm and 180 cm, and the mean monthly temperature ranges between 26°C (mainly in August) and 30°C (in March). The geology of the Municipality is basically of the Middle Precambrian Formation (GSS, 2014).

Figure 1. Study area map

2.2 Data Collection

A random sampling technique was used to select the respondents as it gives respondents equal chance of being selected. The selection criteria for the respondents were i) 18 years and above, and ii) having one (1) year or more working experience. Interview guides which comprised of both open and closed ended questionnaires were administered to obtain information on demographics of respondents, socio-economic analysis of small-scale frozen fish enterprise, and challenges in the frozen fish enterprise. Responses were recorded for future references with the consent of the respondents. A Sample size of thirty (30) respondents was calculated using the Cochran formula given below:

$$no = \frac{Z^2 p(1-p)}{e^2} \quad (1)$$

where: e is the desired level of precision (i.e. the margin of error) = 0.05

p is the (estimated) proportion of the population which has the attribute in question = 0.02

Z is the value corresponding to level of confidence required = 1.96.

However, upon completion, only twenty-five (25) of the questionnaires were retrieved.

3. Data Analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS 25.0). Descriptive analyses (frequencies and percentages); the frequencies and percentages were transferred to Microsoft Excel (2010). Graphs were generated to determine the profit and loss incurred by frozen fish operators.

4. Results

4.1 Demographic Characteristics of Respondents

As shown in (Table 1), the results from the interview indicated that the majority of the respondents (56.0%) were females and 44.0% of the respondents were males. The frozen fish business in Ghana appears not to be gender induced as both sexes can run the enterprise successfully. The age representation of respondents interviewed with the highest percentages of 32% falling within the ages of 25-29 years, and the least percentage was 12% with the age range of 40 and above (Table 1). The result from the ethnicity indicates that the majority (56%) of the respondents were Bono. This was followed by the Ewe (16%) and Ashanti (16%), whiles the least (12%) of the respondents being Fantes (Table 1). From the interview, only 8% of the respondents had no formal education, with the majority (52%) having a secondary educational background. This indicated that the majority of the respondents were literate, which was expected because managing the frozen fish business requires the ability to complete certain documentations. The few illiterate respondents were known to be those who undertake the laborious work in the frozen fish business such as removing frozen fish slates from the Coldstore for customers and others. From the table below (Table 1), the majority (40%) of the respondents have working experience ranging from 1-4 years and were followed by 36% and 16% ranging from 5-8 years and 9-12 years respectively. The least 4% of the respondents had their working experience ranging from 13-16 years and 17-20years.

In table 1, the potential costs of ecosystem services were identified from the ecosystem services providers in the BFMS. In quantifying these services and disservices as a component of Ecosystem valuation, some of these services do not have direct market value, that is to add a monetary value on them. Reliance on monetary value to justify conservation is risky, because the markets can change due to economic forces, (Porter, 2000). The aesthetic nature of birds and its economic value as far as bird watching is concerned can give a holistic approach to their conservation rather than as mere pawn of economic cost-benefit assessment, (Naidoo and Ricketts, 2006). In the light of modern approach to conservation and ecology,

the ecological function and ecosystem services deserve a broader focus. The need for reliable study into the potential disservices of functional groups in BFMS, like, crop damage, invasive species, plant damage in breeding colonies and spread of diseases, will help add aesthetic value, which are often ignored because they do not have traditional assessment for market evaluation (Whelan et al. 2015). BFMS is an agrarian landscape and so the potential ecosystem services of the functional group of animals in the ecosystem will help us to reduce resource value of them and help assess the risk in their agricultural production of crops. Ecosystem services like pollination by birds and insects, waste removal by scavengers, dispersal of fruits are not documented and are very useful in the BFMS ecosystem.

4.2 Average Cost of Fish Species (One Carton)

As shown in (Figure 1) below, the results from the interview showed that *Scomber japonicas* (Saman) is the most expensive fish among all the fish species (GH¢ 286.52) whiles *Trachurus trachurus* (Kpanla) had the lowest cost (GH¢ 25.4) based on the average cost of fish species per carton. This indicated that various fish farmers were mostly into the *Scomber japonicas* (Saman) services so its cost is high averagely and very few engage in the purchase of *Trachurus trachurus* (Kpanla) as compared to the other fish species per the average cost of a carton.

4.3 Additional Cost Incurred in the Fish Business

Based on the result of the study, additional cost incurred in the frozen fish business was examined; it was known from the study that, the cost of electricity was at the peak level (GH¢119.8) this was followed by the cost of packaging (GH¢ 58.8) and the least was the cost of transportation (GH¢ 53.1) as shown in (Figure 3). Fish farmers in the frozen fish business do spend a huge amount of money on electricity bills thereby not having enough profits after-sales. This is shown in figure 3 below which revealed the additional cost incurred in the fish business.

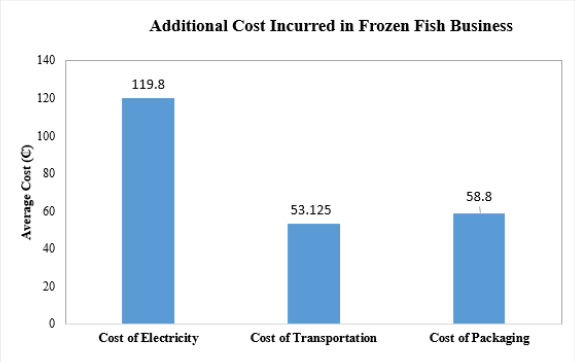

Figure 2. Additional Cost Incurred in Frozen Fish Business

Table 1. Demographic Characteristics of Respondents.

Demographic Characteristics		Percentage (%)
Gender		
	Male	44
	Female	56
Age		
	20-24	16
	25-29	32
	30-34	20
	35-39	20
	40+	12
Marital Status		
	Single	32
	Married	52
	Divorced	16
Educational level		
	Primary	12
	Junior High School (JHS)	24
	Senior High School (SHS)	52
	Tertiary	4
	None	8
Number in Household		
	2-Jan	4
	4-Mar	12
	6-May	60
	8-Jul	24
Work Experience		
	4-Jan	40
	8-May	36
	12-Sep	16
	13-16	4
	17-20	4
Ethnicity		
	Bono	56
	Ashanti	16
	Fante	12
	Ewe	16

Table 2. Average cost of fish species

Fish Species	Average Cost (GHC)
Pseudotolithus senegalensis (Ekan)	118.6
Scomber japonicas (Saman)	286.52
Trachurus trachurus (Kpanla)	25.4
Oreochromis niloticus (Apatre)	108.4
Sardinella aurita (Eban)	168
Pagellus bellotti (Wiriwiriwa)	262.2

4.4 Total Average Cost Involved in Frozen Fish Business

According to the respondents, *Scomber japonicas* (Saman) is the most expensive (GH¢ 518.24) fish species to be sold in the frozen fish business whiles *Trachurus trachurus* (Kpanla) less expensive (GH¢ 257.12) based on the total average cost involved to venture into its marketing as compared to the other fish species in the frozen fish business (Figure 4).

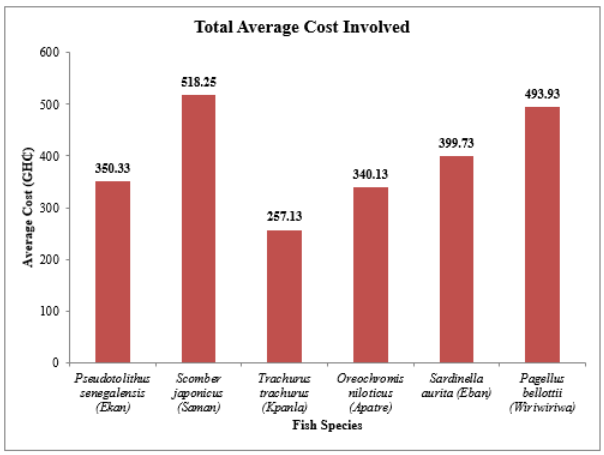

Figure 3. Total Average Cost involved in Frozen Fish Business (one carton).

4.5 Total Average Profit of Fish Species (One Carton)

The total average profit on fish species in the frozen fish enterprise was assessed; the highest profit (GH¢ 310.7667) of the fish species was recorded on *Oreochromis niloticus* (Nile Tilapia). The least average profit (GH¢ 51.6636) of the fish species was recorded on *Pagellus bellotti* (Wiriwiriwa). Though the total average cost of the fish species was recorded in the *Scomber japonicas* (Saman), less amount of profit (GH¢ 56.0038) as shown in (Figure 5).

Table 3. Average profit of fish species

Fish Species	Average Profit (GHC)
Pseudotolithus senegalensis (Ekan)	144.95
Scomber japonicas (Saman)	56
Trachurus trachurus (Kpanla)	292.1
Oreochromis niloticus (Apatre)	310.77
Sardinella aurita (Eban)	144.65
Pagellus bellotti (Wiriwiriwa)	51.67

4.6 Challenges in frozen fish business

The study examined the risk factors involved in the frozen fish business; as shown in (Figure 6) there were various challenges in the frozen fish business, and among them, 11 respondents indicated that fluctuation in fish price is the major risk in the frozen fish enterprise. It was further indicated that by 3 respondents that change in fish size is a hindrance in the frozen fish industry (Figure 6).

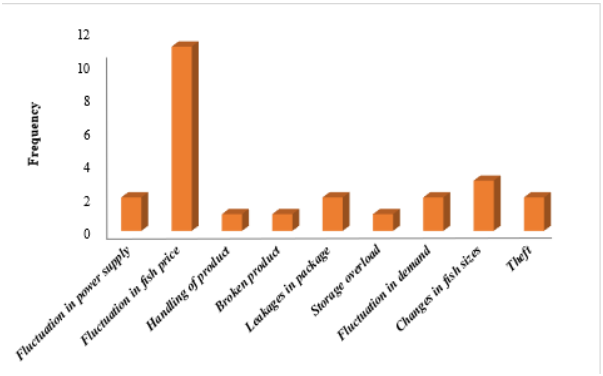

Figure 4. Challenge analysis

4.7 Discussion

The results from the interview indicated that the majority of the respondents (56.0%) were females and 44.0% of the respondents were males. The result conforms to observation by Lawal and Idega (2004) that highlighted that 90% of females are involved in fish marketing. The age representation of respondents interviewed with the highest percentages of 32% falling within the ages of 25-29 years, and the least percentage was12% with the age range of 40 and above. The findings are in agreement with Agbebi (2018) who identified that those involved in economic activities like fish marketers in the fisheries enterprise are in their economic active age. From the study, only 8% of the respondents had no formal education, with the majority (52%) having a secondary educational background. The result of the study conforms to Albert and Tasie (2016) who stated that 36% of the respondent had secondary education and ones that had tertiary education. They further explained that the respondents have acquired formal education and can read and write. In concordance to the result of this study, Asche (2011) observed that *Scomber japonicas* is a very-highly-in-demand fish.

Salmon is a fleshy fish that is very nutritious and it requires less energy to cook. According to Fox et al., (2018), the absence of *Scomber japonicas* in Ghana calls out for the importation of the fish type and contributes to the higher cost of the fish species. The additional cost incurred in the frozen fish business, it was known from the study that, the cost of electricity was at the peak level followed by the cost of packing; this is in conforms with the findings of Adewuyi et al., (2010) who recorded additional cost in electricity and other expenses when operating a fish business. The total average cost of selling a particular species was assessed; it was observed that the cost of electricity, packing, and transportation had much influence on the total average cost involved in the frozen fish business. According to the respondents they buy

some of the fish species from fish importers so they factor the cost of transportation, packaging, and preservation by freezing into the selling price of the fish. According to Paul et al., (2016) who highlighted that fish sellers incur other costs (cost of electricity, cost of transportation, and cost of packaging) in supplying fishes to consumers.

The total average profit in selling each of the fish species identified was examined; *Oreochromis niloticus* recorded the highest average profit (GH¢ 310.7667) among all the other fish species identified in the frozen fish business. This finding conforms to Asamoah (2019) who stated that there is a major profit in the tilapia business as compared to other fish species because of the high demand for tilapia in Ghana at various food vendors across the country. According to the respondents, there are various challenges in the frozen fish business and fluctuation in fish price is the most challenging factor. The finding was contrary to the finding by Esiobu and Onubuogu (2014) on the Socio-economic analysis of frozen fish marketing in Owerri municipal council area, Imo State, Nigeria. They highlighted that inadequate storage facilities were the most serious constrain in the frozen fish business in Nigeria. They further explained that the perishable nature of the fish was a severe barrier to the frozen fish business.

4.8 Conclusion

The main aim of this study was to investigate the socio-economic analysis of small-scale frozen fish enterprises, determine the major profit gain in the frozen fish business, and to identify the cost and challenges involved in the frozen fish business. The results from the study revealed that the frozen fish business is largely in the hands of females with the majority of the respondents being literates. The study also showed that *Scomber japonicas* (Saman) had the highest average cost among the fish species with *Trachurus trachurus* (Kpanla) being the least. It was also known from the studies that, the cost of electricity, packaging, and transportation were the various additional costs to the frozen fish business and increases the price of the fish species. The current study revealed that though the total average cost of the fish species was recorded in the *Scomber japonicas*, less amount of profit (GH¢ 56.0038) was made as compare to *Oreochromis niloticus*. The least average profit of the fish species was recorded for *Pagellus bellotti* (Wiriwiriwa) of (GH¢ 51.6636). Even though the total average cost of the fish species was recorded in the *Pagellus bellotti* (Wiriwiriwa), less amount of profit. Succinctly, the perishable nature of the fish was a severe barrier to the frozen fish business. This could be attributed to poor electricity supply usually experienced in the study area which is highly needed for preserving frozen fish. There should be reduction of electricity cost and constant supply of electricity as these key issues influence the cost and pricing of frozen fish in the study area. It is therefore recommended that the regulations be put in place to mitigate erratic power supply.

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