A SURVEY ON SOCIO-ECONOMIC STATUS, TYPES OF FISH PROCESSED AND METHODS OF FISH PROCESSING ADOPTED BY FISH PROCESSORS ALONG RIVER TARABA, TARABA STATE, NIGERIA

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Abstract: A survey on socio-economic status, types of fish processed and methods of fish processing adopted by fish processors along River Taraba was conducted for the period of eighteen (18) months from November 2017 – April 2019. Data collected through structured questionnaire are collated and analyzed using simple descriptive statistics of frequency and percentages. Both men 13 (38.2%) and women 21(61.8%) were involved in fish processing business in River Taraba. The largest group fell within the age brackets 31-40 years, 17 (50.0%). Majority of fish processors (64.7%) were married while 35.3% are single. The highest western educational level was 14(41.2%) who had first school leaving certificate. The largest household sizes were 6 – 11 (44.1%) people in a family. Highest years of experience were 11-15 years (35.3%). Fish processors that were non-members of cooperative were the highest (58.8%) than cooperative members (41.2%). Fish processors engaged in farming were the highest (41.2%). Highest Source of capital for fish processing business was from personal saving (47.1%). Species of fish processed was *Clarias gariepinus* 8 (23.5%), *Bagrus* spp, *Auchenoglanis occidentalis* and *Hydrocynus* spp 5 (14.7%) each. *Citharinus citharinus* and *Tilapia* spp had 4(11.8%) each while *Lates niloticus* had least 3(8.8%). Smoking method accounts for 45.19% of the fish processing methods. 65.67% of fish processors used baskets for packaging fish. 44.4% of fish processors processed 30 kg of fish with ₦21,000 -₦50,000 capital base. Income earned per fish processing was highest among ₦6,000-₦9,000 (44.1%). Majority of fish processors in River Taraba belong to Jukun and Jibawa (17.6%) ethnic group each followed by Chento, Wurbawa and Tiv with 14.7% each, followed by Lakka with 11.8% and the least was Doro with 8.8%. It is recommended that fish processors should enroll in cooperatives like Fadama (World Health Project) that can assist them with cold storage facilities and soft loans. Government should provide electricity to the rural communities to enable them preserve fish for further processing.

Keywords: Socio-economic status, fish, processing methods, fish processors, River Taraba

Introduction

In the healthy live fish, all the complex biochemical reactions are balanced, and the fish flesh is sterile. After death, however, irreversible change that results in fish spoilage begins to occur. The resultant effect is the decomposition of the fish (Singh and Heldman, 2013; Pigott, 2015). A considerable effort has been directed to extend the shelflife of fish using preservation and processing techniques, such as refrigeration, freezing, canning, smoking, salting and drying (Okonta and Ekelemu, 2005). Presently in Nigeria, the mechanization level of fish processing is low which results from the overall limited production, seasonal availability of fish, poor information dissemination of the available improved technology to processors and lack of inexpensive equipment adaptable for processing (Davies and Davies, 2009). The production system is mainly artisanal, and fish are marketed mostly in five different forms; fresh, smoked, dried, salted and frozen (FAO, 1995).

In Nigeria, processing of fish either through smoking or drying is widely used in fish preservation. In the process, moisture content present in the fish is extracted through heating, thus inhibiting the action of micro-organisms and prolong shell life (Amoo *et al.*, 2007; Singh and Heldman, 2013; Pigott, 2015). It has been observed that the most prominent fish preservation method in Nigeria is smoke drying. This could be as a result of the fact that most of the coastal communities have no access to electricity to preserve and or process their products. Bolaji (2005) reported that despite the rudimentary nature of traditional processing methods, the lack of control over the drying rate, sometimes results to under- or over-drying and expose fish to wind, dust,

dirt, insect infestation and contaminants such as flies. These methods still remain predominant in Nigeria. Many fish species have very good preservation qualities after salting, sun drying and even smoking (Singh and Heldman, 2013; Pigott, 2015). Abowei and Tawari (2011) reported abundant fish catch in the dry season. During dry season, ponds, lakes and streams experience reduced water level, for easy harvest.

Thus, period of fish scarcity is often encountered especially during the flood and raining seasons, during which fish are in short supply. Thus, it is imperative to process and preserve some of the fish caught in the period of abundance, so as to ensure an all year round supply. This will invariably reduce post-harvest losses, increase the shelf life of fish and guarantee a sustainable supply of fish during off season with concomitant increase in the profit of the fisher folks. Fish is a major source of protein and its harvesting, handling, processing and distribution provide livelihood for millions of people as well as providing foreign exchange earning to many countries (Al-Jufaili and Opara, 2006). Appropriate processing of fish enables maximal use of raw material and production of value-added products which is obviously the basis of processing profitability. Al-Jufaili and Opara (2006) reported high incidence of fish losses as a major impediment to the realization of government goal toward increasing the contribution of the sector to the overall national economy. The study aimed at determining the socio-economic status of fish processors, types of fish processed and method of fish processing adopted along River Taraba.

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Materials and Methods

Study area

River Taraba is a tributary of the Benue River. River Taraba is on latitude 8°34'0" N and longitude 10°15'0" E. River Taraba takes its source from the high altitude of the Alantica hills on the Nigeria-Cameroon border in the mid-eastern part of the State and flows westwards, covering a distance of about 265 km before entering the Benue basin (Akogun, 1992). River Taraba passes through Gashaka, Bali and Gassol LGAs before emptying into the Benue River (Fig. 1). The major economic activities on the river are fishing, farming of rice, maize, guinea corn, millet, yam, and groundnut. The major tribes on the river side are Jukun, Osobo, Wurbo and Tiv. Taraba State is well endowed with abundant surface water which includes ponds and rivers. These include River Benue, Taraba and Donga and their tributaries. The state has about 500, 000 hectares of water body and 142 natural ponds (TSEEDS, 2004).
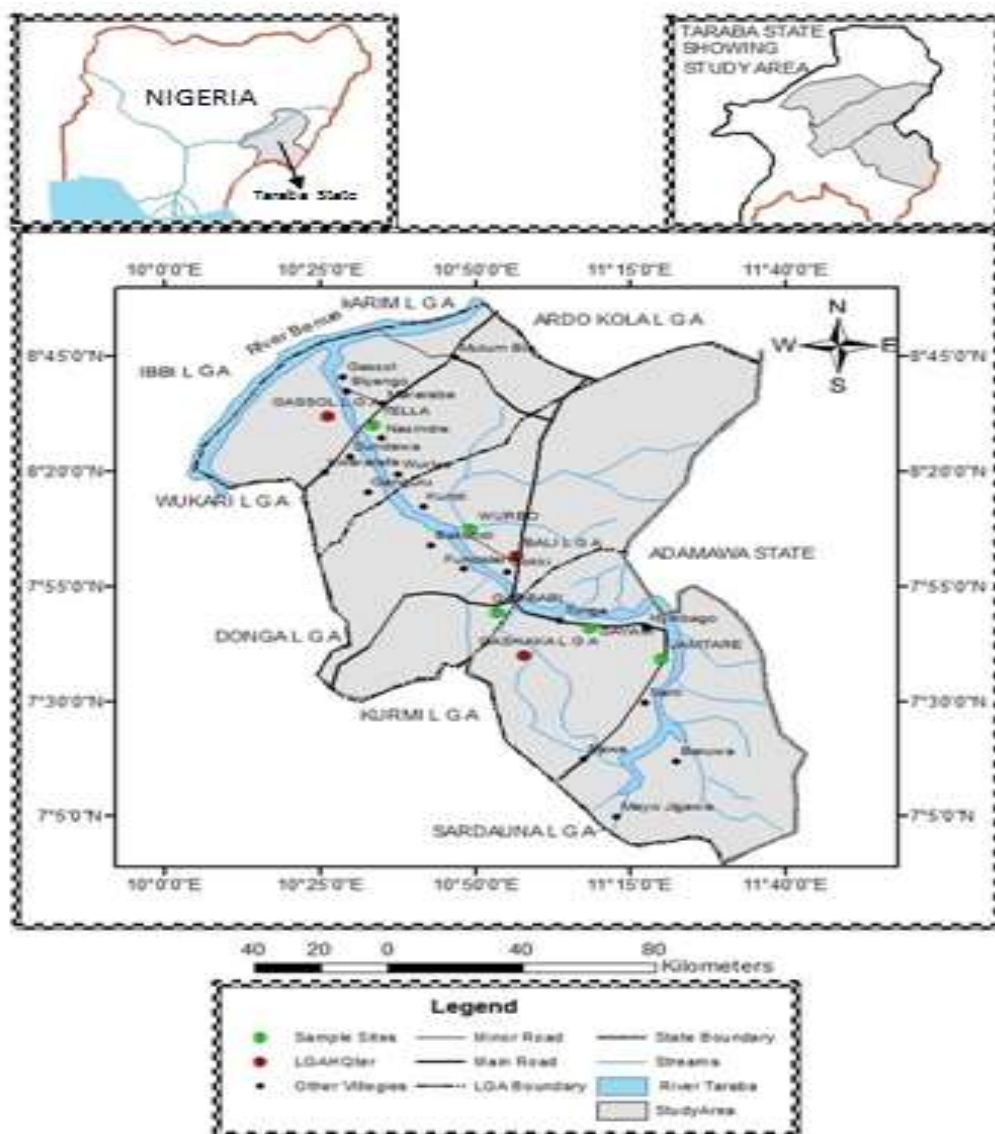

FIG. 1: Map of River Taraba showing the study sites

Data collection

Data was collected for a period of eighteen (18) months from November 2017-April 2019. Primary data on the socio-economic features of fish processors were collected which include gender, age, educational level, marital status, household size, years of experience, member cooperative, equipment used for fish processing, type of fish processed, weight of fish processed, income per fish processing, capital base of fish processors, challenges encountered by fish processors via structured questionnaires. Secondary data was collected from journals.

Data analysis

Data collected via questionnaires are analyzed using descriptive statistical tool of frequency and simple percentages. Tables and bar chart were also used for data representation.

Results and Discussion

Table 1 shows the socio-economic features of fish processors along River Taraba. Both men 13 (38.2%) and women 21(61.8%) were involved in fish processing business. The largest group fell within the age brackets 31-40 years 17 (50.0%) followed by age brackets 41-50 had 9 (26.5%) followed>50 which was represented by 5 (14.7%) while the least was represented by younger age groups of 21-30 years were 3 (8.8%). Majority of fish processors (64.7%) were married while 35.3% were single. With respect to western education, 41.2% had first school leaving certificate, followed

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by 26.5% had Senior School Certificate on Education followed by those without formal education 23.5% and the least were 8.8% of fish processors that had Tertiary Education. The largest households size of the fish processors ranged between 6 - 11 people in a family (44.1%), followed by 5-10 (41.2%), followed by 11-15 (11.8%) and the least were>20 (2.9%). The highest years of experience was 11-15 years (35.3) followed by 6-10 years (29.4%) followed by 16-20 years (14.7%) and the least was >20 years (11.8%). Fish processors who were non-members of cooperative were the highest (58.8%) than cooperative members (41.2%). Fish processors that engaged in farming were highest (41.2%), followed by those in petty trading (32.4%) and the least were those that processed fish only (26.5%). Source of capital for fish processing varies, the highest were from personal saving (47.1%) followed by spouse/relative (38.2%) and the least were cooperative (14.7%). Majority of fish processors along River Taraba belong to the Jukun and Jibawa (17.6%) ethnic group each followed by Chento, Wurbawa and Tiv with 14.7% each, followed by Lakka with 11.8% and the least was Doro with 8.8%.

Table 1: Socio-economic features of fish processors along River Taraba

| Variables	Category	Frequency	%
Gender	Male	13	38.24
	Female	21	61.76
	Total	**34**	**100.0**
Age	21-30	3	8.8
	31-40	17	50.0
	41-50	9	26.5
	>50	5	14.7
	Total	**34**	**100.0**
Marital status	Married	22	64.7
	Single	12	35.3
	Total	**34**	**100.0**
Educational level	NFE	8	23.5
	FSLC	14	41.2
	SSCE	9	26.5
	T.Edu	3	8.8
	Total	**34**	**100.0**
House hold size	5-10	14	41.2
	6-11	15	44.1
	11-15	4	11.8
	>20	1	2.9
	Total	**34**	**100.0**
Years of experience in fish processing	1-5	3	8.8
	6-10	10	29.4
	11-15	12	35.3
	16-20	5	14.7
	>20	4	11.8
	Total	**34**	**100.0**
Members of cooperative	Members	14	41.2
	Non-Members	20	58.8
	Total	**34**	**100.0**
Occupation	Processing & farming	14	41.2
	Processing&Petty trading	11	32.4
	Processing only	9	26.5
	Total	**34**	**100.0**
Source of Capital	Spouse/relatives	13	38.2
	Cooperative	5	14.7
	personal Savings	16	47.1
	Total	**34**	**100.0**
Tribe	Jukun	6	17.6
	Jibawa	6	17.6
	Chento	5	14.7
	Wurbawa	5	14.7
	Tiv	5	14.7
	Lakka	4	11.8
	Doro	3	8.8
	Total	**34**	**100.0**
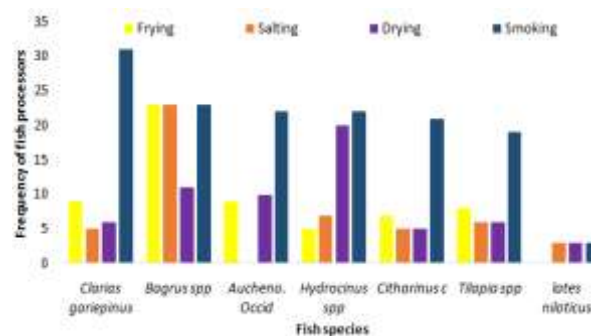
Figure 2: Fish processing methods adopted for fish species along River Taraba

Figure 2 presents fish processors adopting several methods of fish processing for the species of fish processed. Fish processors that smoked *Clarias gariepinus* were 60.78%, followed by those that fry (17.65%), followed by those that dry (11.76%) and the least were those that salt (9.81%). Fish processors that smoked *Bagrus* spp were 28.75%, followed by those that fry (28.75%), followed by those that salt (28.75%) and the least were those that dry (13.75%). Fish processors that smoke *Auchenoglanis occidentalis* were 54.76% followed by those that dry (23.81%) while the least were those that fry (21.43%). Fish processors that smoked *Hydrocynus* spp were 40.74%, followed by those that dry (37.04%), followed by those that salt (12.96%) and the least were those that fry (9.26%). Fish processors that smoked *Citharinus citharinus* were 55.26%, followed by those that fry (18.52%) and the least were those that salt and dry (13.16%) each. Fish processors that smoked *Tilapia* spp were 48.72%, followed by those that dry (20.51%) while the least were those that salt and dry (15.38%) each. Fish processors that smoked *Lates niloticus* are 33.34%, those that salt (33.33%) and those that dry (33.33%), respectively.

Table 2 present the frequency and percentages of the species of fish processed, methods of fish processing and income generated per fish processing along River Taraba. Species of fish processed was *Clarias gariepinus* 8 (23.5%), *Bagrus* spp, *Auchenoglanis occidentalis* and *Hydrocynus spp* 5 (14.7%) each. *Citharinus citharinus* and *Tilapia* spp had 11.8% each while *Lates niloticus* had least 3(8.8%). The smoking methods accounts for 15 (44.1%), followed by frying 11 (32.3%) and the least was drying and salting which accounts 4 (11.8%) each. Income earned per fishing processing was highest between ₦6,000 - ₦9,000 (44.1%) followed by ₦3,000 - ₦5,000 (32.3%) and least was ₦10,000- ₦12,000 (11.8%) and >₦12, 000 (11.8%).

Table 2: Frequency and percentages of fish species processed, methods of fish processing and income per fish processing

Species of fish processed	Frequency	Percentage
Clarias gariepinus	8	23.5
Bagrus spp	5	14.7
Auchenoglanis occidentalis	5	14.7
Hydrocinus spp	5	14.7
Citharinus citharinus	4	11.8
Tilapia spp	4	11.8
Lates niloticus	3	8.8
Methods of fish processing		
Frying	11	32.3
Drying	4	11.8
Salting	4	11.8
Smoking	15	44.1
Income per fish processing		
₦3,000–₦5,000	11	32.3
₦6,000–₦9,000	15	44.1
₦10,000 - ₦12,000	4	11.8
₦>12,000	4	11.8

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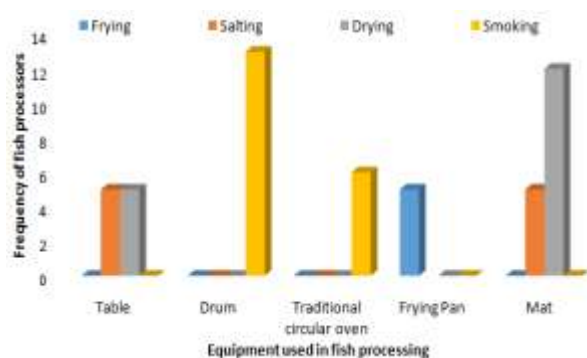
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Fig. 3: Equipment used in fish processing along River Taraba

Figure 3 presents equipment used for fish processing. 50.0% of the tables was used for salting and drying, respectively. 100% of drums was used for smoking. 100% of Traditional circular oven was used for smoking. 100% of frying pans was used for frying. 29.41% of Mats was used for salting while 70.59% used it for drying. Fig. 4 presents weight of fish processed by fish processors. Fish processors that smoked 15 kg of fish were 27.50%, followed by those that salt (25.0%); followed by those that dry (25%) and the least were those that fry (22.50%). Among fish processors that smoked up to 30 kg were (28.85%), those that dry fish (28.85%), those that salt fish (28.45%) and the least were those that fry (13.45%). 45 kg fish processors that smoke fish were (30.77%) and those that dry fish (30.77%) were the highest, followed by those that fry (23.78%) while the least were those that salt (15.38%). Fish processors that smoked, salt and dry fish >45 kg were 28.57%, respectively while the least were those that fry fish (14.29%).
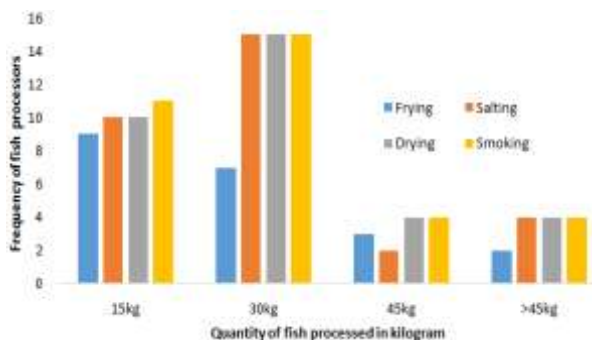

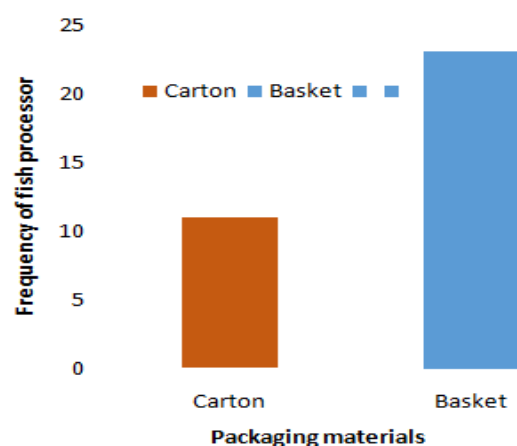**Fig. 4: Quantity of fish processed in kilogram along River Taraba**

Fig. 5: Packaging materials used for packaging processed fish in the study area

Figure 5 present packaging materials used by fish processors. The packaging material used by fish processors to package processed fish was baskets 67.65% while 32.55% used carton. Figure 6 shows the capital base of fish processors. The capital base of fish processors <₦20,000 that smoked fish were 27.50% followed by fish processors that salt fish (25.0%), followed fish processors that dry fish (25.0%) and the least were fish processors that fry fish (22.50%). Capital base of fish processors ₦21,000 – ₦50,000 that smoked fish were (28.85%), followed by fish processors that dry fish (28.85%), followed by fish processors that salt fish (28.85%) and the least were fish processors that fry fish (13.45%). Fish processors with capital base ₦51,000 – ₦100,000 that smoked fish were 30.77%, followed by fish processors that dry fish (30.77%), followed by fish processors that fry fish (23.78%) and the least were fish processors that salt fish (15.38%). Fish processors with capital base >₦100,000 that smoked fish were 28.57%, followed fish processors that dry fish (28.57%), followed by fish processors that salt fish (28.57%) while the least were fish processors that fry fish (14.29%).
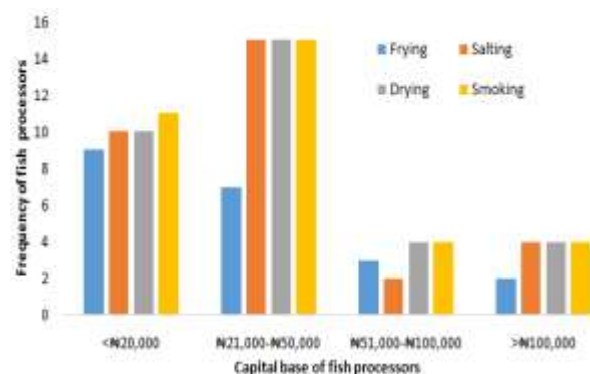

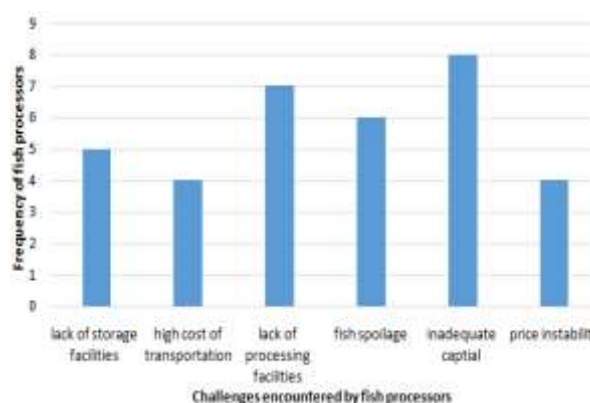**Fig. 6: Capital base of fish processors along River Taraba**

Fig. 7: Challenges encountered by fish processors along River Taraba

Figure 7 present the challenges encountered by fish processors. The most important challenge identified by fish processors was inadequate capital (23.53%) to run their business, followed by lack of modern processing facilities (20.59%), fish spoilage accounted to 17.65%, lack of storage facilities (14.71%) while the least was price instability (11.76%) and high cost of transport (11.76%).

Fish processors along River Taraba were both male and female. Female constituted 61.8%. The result is similar to the findings of Abolagba and Chukwu (2008) which revealed that majority of the fish processors were women. The active age

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range of the fish processors were 31 to 40 years which constituted the highest percentage (50%). The result agree with the findings of Omoruyi and Eronmhonbor (2017) who reported that the age group of fish processors were 30-40 years (55.0%), at Ovia North East Local Government Area of Edo State, Nigeria. By implication this age group is considered as the most active stage of production in human development. Similarly, this age group has the capacity to provide the energy needed for processing more quantity of fish per period. The group had acquired some experience over the years they put in the enterprise. Married people constituted the majority 64.7%. The result is in consonance with the findings of Abolagba and Chukwu (2008) which revealed that majority of the fish processors were married. The reason that most of the women were married could be attributed to the fact that their husbands were fishermen and they have the obligation to help their husbands. Fish processors along River Taraba had western education, majority (41.2%) with first school leaving certificate. The result agrees with Abolagba and Akise (2011) who stated that majority of the fish processors had primary education. The highest household sizes were 6 to 11 (44.1%) persons. The result corroborates with the findings of Oyediran *et al.* (2016) who reported 5 to 10 persons in a household. Experiences acquired by fish processors revealed 35.3% had 11-15 years, in fish processing business. This result corroborates with the findings of Abolagba and Chukwu (2008) which revealed that majority of the fish processors had been in the business for more than 10 years. Fish processors that were not members of cooperative were 58.8%, this shows that the cooperative have not supporting its members as it should be, or it could be due to negligence of members towards joining a union. Fish processors engage themselves in other occupation like farming and petty trading. Engaging in other occupations was necessary in order to augment income especially during the period of low catch and unsteady market prices. It could also be attributed to the fact that fish processing business could be conveniently done alongside with other domestic activities. The result conforms the survey of Abolagba and Odiko (2005) who categorized fish processing as female business dominated by economically active ages. The source of capital for fish processors along River Taraba was commonly from personal savings (47.1%). This result differs with Omoruyi and Eronmhonbor (2017) who reported that 60% of fish processors got their capital from their spouse at Ovia North East Local Government Area of Edo State, Nigeria.

The species of fish processed was *Clarias gariepinus, Bagrus* spp, *Auchenoglanis occidentalis, Hydrocynus* spp, *Citharinus citharinus, Tilapia* spp and *Lates niloticus*, the result is similar with Omoruyi and Eronmhonbor (2017) who reported *Clarias gariepinus*, Mackerel and *Oreochromis niloticus.*

The fish processing methods observed along River Taraba was smoking, (44.1%), frying (32.3%), drying (11.8%) and salting (11.8%) mostly done by women (61.76%) of Jukun, Jibawa, Chento, Wurbawa and Tiv people. The result supports the findings of Abiodun and John (2017) who observed smoking (72.8%) as the most important method of fish processing. Magawata *et al.* (2014) reported smoking (25.0%) as the most adopted method of fish processing in Kebbi State. Nickelson *et al.* (2001) also reported that various food preservation techniques including smoking have been utilized to improve the microbial safety and extend the shell life of fish in general. Hence up to 70% of the total fish caught in developing countries is preserved by smoking (Abolagba and Nuntah 2011).

Income generated by fish processors from the various fish processing methods adopted along River Taraba ranged between ₦3,000- >₦12,000 per fish processing. The result

agrees with Magawata *et al.*, (2014) who reported an income of ₦7,600 - ₦8,950.

The equipment used for processing of fish revealed that mats (34.38%) was the important equipment followed by tables (28.16%), and drums (20.31%). This result conforms to what was reported by Magawata *et al* (2014) at Argungu Local Government Area, Kebbi State, Nigeria, that fishes are spread on tables (55.0%) and mats (36%) during fish processing. The reason for the use of mat is because it is cheap to purchase and quickly drains water when fish are spread on it and easily get dried.

The packaging materials used was baskets and cartons. Baskets (67.65%) are mostly used because it is durable compared with carton. The result agrees with Abolagba and Akise (2011) who revealed that majority of the fish processors used baskets to package fish for protection and preservation. This confirmed the findings of King (2001) who stated that packaging forms an important part of food processing because it facilitates handling during storage and distribution within the market chain. Baskets are traditional way of packaging fish and it allows air drying the fish but usually allow insect infestation. Carton does not allow air to dry the fish and when left for long period can cause bacterial and fungal infestation.

The quantity of fish processed ranged between 15 to >45 kg, with the majority processing 30 kg (43.84%) followed by those processing 15 kg (32.19%). This result is in consonance with what was reported by Magawata *et al.* (2014) that the quantity of fish processed ranged between 20 kg to above 50 kg at Argungu Local Government Area, Kebbi State, Nigeria. The reason why this quantity is mostly processed is because of the financial constraint to process larger quantities coupled with lack of adequate storage facilities. Fish processors also expressed that processing small quantities is safer to handle as fish easily get spoil.

The capital base of fish processors revealed greater percentage (43.69%) among those with ₦21,000 – ₦50,000 from the sales of 30 kg of fish, this is because the fish processors had inadequate funds to run large fish processing business. Only 11.76% of fish processors processed fish>₦100,000. The findings of this study reflects what was reported by Magawata *et al.* (2014) that the capital base of processors ranges from <₦20,000 – >₦100,000.

A basket of smoked fish was sold at ₦12,000 – ₦30,000 depending on the species of fish and its quality. The finding support Magawata *et al.* (2014) who reported ₦12,500 and ₦15,000 fora basket of about 15 kg of smoked fish and fried fish. Fish processors earned ₦3000 - >₦12,000 per fish processing along River Taraba. The result support what was reported by Magawata *et al.* (2014) that fish processors net farm income was ₦7,600 – ₦8,950. The problems encountered by fish processors in River Taraba agrees with the reports of Magawata *et al.* (2014) and Omoruyi and Eronmhonbor (2017) but the most worrisome problem was inadequate capital that discouraged fish processing business along River Taraba.

Conclusion

It can be concluded that the socio-economic status of fish processors along River Taraba is good. Fish processors earned ₦3,000 – >₦12,000 per fish processing. The species of fish processed was *Clarias gariepinus, Bagrus* spp, *Auchenoglanis occidentalis, Hydrocynus spp, Citharinus citharinus, Tialapia* spp and *Lates niloticus*. The fish processing methods adopted along River Taraba are smoking, frying, drying and salting.

Conflict of Interest

Authors declare that there is no conflict of interest reported in this work.
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