Value Chain Analysis of Fish Caught in Lake Alau, Borno State, Nigeria

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ABSTRACT

The study analysed the value chain for fish catch in Lake Alau located in Konduga Local Government area, Borno state. Cluster sampling technique was used to select thirty (30) Fishermen, fifteen (15) fish processors and thirty (30) fish marketers, making a sample of seventy five (75) respondents. Structured questionnaire were administered to provide data for the survey. The results were analysed using descriptive statistical technique. The result revealed that all the Fishermen (100%) and fish processors (100%) and majority (57%) of the fish marketers (57%) were males, with age range of 20-30 years. Majority (83.3% Fishermen; 86.7% Processors and 70% fish marketers) had obtained Islamic education, spent above ten (10) years in formal education with majority (63.3 Fishermen; 66.7 fish marketers) being married with a household size of 6-12 people and been in fishing, fish processing and marketing respectively for above thirteen (13) years. The analysis revealed that the Fishermen were the main actors (being responsible for the quantum of fish catch), the fish processors were involved in processing and the fish marketers were responsible for transactions concerning the fish catches. In terms of profitability, the study indicates that the fishermen have the highest percentage profit (135%) valued at ₦332,660.00 per month and the fish marketers had a loss amounting to ₦94, 0200.00 or -38% percentage monthly. The constraints identified include insecurity due to Boko Haram crisis and labour scarcity. It was evident from the analysis that the fishers are the main actors along the chain as they are responsible for the fish catch with the marketers and processors relying on them for their activities. Analysis of value chain relations revealed that the actors share information and assists each other. It was recommended that Government should support the fisher folks, marketers and processors through capacity building, provision effective marketing extension services to the value chain actors and concerted effort to end lingering insurgency in the area.

Keywords: Value chain, Analysis, Freshwater fish, Lake Alau, Borno State

INTRODUCTION

The value chain concept is used to describe approaches aimed at improving market prospects for producers and scaling up profit margins. Value chain focuses on the actors (private and public, including service providers) and the sequence of value adding activities involved in bringing a product from production to the end consumer. In agriculture and fisheries they can be thought of as a 'farm to fork' set of inputs, processes and flows (Miller and da Silva, 2007). According to spore (2012) value chain refers to actors connected along a chain to produce and deliver goods and services through a sequenced and

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coordinated set of activities that adds value at all stages (production, processing, and distribution). Emphasis is placed on product innovation and on meeting consumer needs. Value chains approaches have been used to describe the interactions of variety of firms so as to examine the inter-relationship between different firms and actors involved in bringing products from its initial stage of production to final consumption through identifiable channels.

Value chain analysis is a versatile tool of economic analysis. As opined by Fries (2007) value chain analysis refers to the assessment of the actors and factors that influence the performance of an industry and relationships among participants to identify the main constraints to the increased efficiency, productivity and competitiveness of an industry and how these constraints can be overcome. Development interventions now utilise the value chain approach as an important entry point for engaging target groups, individually or collectively, in various interventions in marketing or poverty alleviation (GTZ, 2007). Value chains are networks of labour and production processes where the result is a finished commodity (Hopkins and Wallerstein, 1986).

Fisheries and aquaculture are seen as means to reinforce the food security of the local people, increase the geographical and economic integration of the communities concerned, mitigate the drift to urban areas and create demand for goods and services that stimulate investment, decentralization of economic activities, regional growth and social welfare (Al-oufi and Palfreman, 2000). Fish have aided in alleviating hunger in many part of the world. In Africa artisanal fisheries still dominate with 6.9% of the world fishermen engaged in the activity (FAO, 2008). Population growth, urbanization and rising consumer purchasing power had led to a high demand for fish especially in urban areas. In many countries, fishing is an essential or part time occupation peaking in months when riverine or coastal offshore resources are more abundantly available, leaving time in seasonal lows to other activities.

Fishing is a means of livelihood to most peoples in rural areas especially where bodies of water are found. This led people around the areas to optimize the opportunities and engage in fishing. The communities around Lake Alau, the fishers around Maiduguri and other surrounding local government areas patronize Lake Alau for fishing activities. Experience has shown that the rate of deterioration of fish catch by fishers from lake Alau has being on the increase over the years.

The focus of this research is analysis of the activities of value chain actors in fresh water fish catch. This involves the assessment of the actors and socio-economic factors that influence fresh water fish catch and relationships among the participants and to identify the main constraints responsible for the continuing deterioration of fish catch in the lake over the years. This is based on the recognition that in the study area, there are various participants involved in the fish catch activities ranging from the Fishers who catches the fish; the Marketers who distribute and sell the catches and the Processors who transform the fish to different forms for consumption. The problem necessitating the study is the lack of understanding of the role of different actors in the fish catch value chain in the study area and their interrelationships and differential and varied contributions to the fresh fish business. The study is therefore aimed at identifying the actors along the freshwater fish catch value chain, analyse their contributions and determine the profitability of their activities, relationships and linkages. The need to study the value chain of fresh water fish is in order to provide the most effective extension delivery services for the various actors based on their context specific roles and challenges.

MATERIALS AND METHODS

The survey was conducted in Alau village of Konduga Local Government, Borno state and it is situated along Maiduguri Bama road. The village is eighteen (18) kilometres away from Maiduguri, the state capital. The Lake lies between latitude 14^0N and 15^0S and longitude $12º$ to $13ºE$. It is a natural storage of river from river Ngadda characterized by a charming undulating landscape which is further beautified by savannah vegetation with sparkling shores. Legion has it that the spot was the burial site of Mai Idrissa

Alooma, one of the rulers of Saifawa dynasty. The name 'Alau' was derived from Alooma. The Lake can be regarded as multipurpose, as it serves as fishing site for fishermen, water supply for irrigation farming and for human consumption to Maiduguri as well as a tourist attraction. Alau settlement has a population of 211,204 people (NPC, 2006) and spans an area of 482 square kilometers with a population density of 28 persons per square kilometre. Kanuri's are the dominant tribes and Shuwa Arabs and Hausa immigrants are also found in the area.

The population of the fish value chain actors were stratified based on their activities in the fish business. Stratified and random sampling was used to select thirty (30) fishermen and thirty (30) fish marketers and fifteen (15) processors from the study area. Total numbers of respondents were therefore seventy five (75) persons. The data for the study were mainly primary data. The data were collected by the use of questionnaires. In a situation where the respondents could not read or write, personal interviews were scheduled and then responses were accordingly entered into the questionnaires.

The data collected was analysed using descriptive statistics. Percentage (%) and Frequencies (*f*) distributions were utilized to summarise and organize the data collected. Value addition along the value chain was calculated using van den Berg *et al*., (2009) model presented in Table 1. The analysis framework depicts the cost analysis, revenue and profit for each actor along the value chain and as well as the value added margins.

Table 1: Computational procedure for value chain analysis

Value Chain Actors	Cost (N)	Revenue(N)	Profits	% Profit
Fishermen	A	D	G	J
Marketers	B	E	H	K
Processors	C	F	I	L

Source: Adapted and modified from (Van den Berg *et al*., 2009).
Key: A= Total cost incurred by Fishers, B= Total cost incurred by marketers, C=Total cost incurred by processors, D= Revenue accrued to Fishers, E=Revenue accrued to Marketers, F=Revenue accrued to Processors, G =Profit realized by Fishers, H=Profit realized by Marketers, I=Profit realized by Processor's, revenue = PQ (unit price x quantity sold), Profit =TR-TC (Total Revenue less total cost incurred),% profit= Profit realized by each category of actors/total profit x 100

RESULTS AND DISCUSSION
Socio-economic characteristics of the respondents

The socio-economic characteristic of the respondents examined were presented in Table 2. The variables considered include gender, age, educational level, number of years spent in formal school, marital status, household size and years of experience in fishing as a business.

The result in Table 2 showed that 100% of the fishers and the processors were male. It can therefore be inferred that all the fishers in the study area were all male. This could be because fishing activities in the northern part of Nigeria especially Borno state are considered or viewed as a man's job. Moreover religious and cultural practices of the people (Hausa's and Kanuri's) do not allow the women especially house wives engage in hard labour. The result also revealed that 57% and 45% of the marketers were male and female respectively.

The result shown in Table 2 reveals that most (57%) of the fishers are between the age range of 20-30 years and processors (73%) were less than 20 years old. The result shows high level of participation of youths in fish processing activities in the study area. The implication being that the fish industry provided job opportunity for the teeming unemployed youth in the study area and may have minimized rural – urban migration especially due the proximity of the area to Maiduguri, the Borno state capital. Most of the processors were adolescents, whom after attending Islamic schools return to the landing site of the lake to work. Fish processing in the area is considered as adolescent job.

The result on Table 2 depicts the level of education among the respondents. Majority (83.3%) of the fisher-folks and processors (86.7%) had Qur'anic education as their highest educational qualification. Among the fish marketers, 70% had Islamic education, 6.7% had primary school education while 13.3% and 10% of the marketers attended secondary and tertiary education respectively.

This result shows that majority of the respondents had no formal but Islamic education (*makaratan* alo, in Hausa or *Sangaya* in Kanuri). In the study area, Islamic education is a common practice as the dominant religion in the area is Islam.

Table 2: Distribution of respondents based on their socio-economic characteristics (n=75)

Variable	Frequency (%)		
	Fishers	**Processors**	**Marketers**
Gender			
Male	30 (100)	15(100)	17 (57)
Female	00(00)	00(00)	13(43)
Age			
Less than 20	2(7)	11(73)	7 (23)
20-30	17(57)	2(14)	10(33)
31-40	10(33)	2(13)	11(37)
Above 40	1(3)	0(0)	2(7)
Mean	**26**	**19.5**	**29.2**
Educational Level			
Quaranic Education	25(83.3)	13(86.7)	21(70)
Primary	4(13.3)	1(6.7)	2(6.7)
Secondary	0(0)	1(6.6)	4(0)
Tertiary	1(3.4)	0(0)	3(10)
No. of years spent in formal Education			
1-6	20 (66.7)	11(73.3)	12(16.7)
7-10	3(10)	1(6.7)	5(16.7)
Above 10	7(23.3)	3 (23.3)	13(44.3)
Mean	30	15	30
Marital Status			
Married	19(63.3)	1(6.7)	20(66.7)
Single	11(37.7)	14(93.3)	9(30)
Household Size			
1-5	14(46.7)	3(20)	7(23.3)
6-12	14	6	16
13 and above	2	6	7
Mean	**16.4**	**12.3**	**10.8**
Experience with Fishing activity			
1-5	2(6.7)	9(60)	9(30)
6-12	11(36.7)	4(26.7)	7(23.3)
Above 12	17(56.7)	2(13.3)	14(46.7)
Mean	**15.2**	**4.5**	**11.1**

Source: Field survey, 2013

The inability to acquire formal education makes it difficult for the people to adopt modern technology, especially the fisher folks who still use the traditional fishing equipment such as fishing nets and canoes as well as laborious and time consuming methods of processing.

Table 2 also revealed the number of years spent in formal school. Most (46.7%) of the fishers spent between 1-3years in formal education. Among the processors the result revealed that majority (53.3%)

spent 4-6 years in formal education while the marketers had 43.3% of them that spent above 10 years. This result indicated that the highest percentage of the fishers (46.7%), processors (53.3%) and marketers (43.3%) spent the range of 1-3years, 4-6years and above 10 years informal education. The number of years spent in formal education enhances the knowledge ability to adopt modern technology in improving their fishing activities, method of processing and efficient marketing strategies. The need to encourage the respondents to embrace formal education cannot therefore be overemphasized.

Table 2 also revealed that 63.3% of the fisher folks were married while the remaining (37.3%) were single. Furthermore, majority of the processors (93.3%) were single and 6.7% married. However, among marketers, 66.7% were married. 30% were single and 3.3% were divorced. This result showed majority of the fishers and the marketer were married. This will help to explain why most of the respondents are involved in fishing activity because they have to maintain their families, hence the need for a considerable amount of income. In the study area, the local culture especially religious belief (Islam) encourages early marriage for both males and females.

As shown in Table 2, 46.7% and 46.6% of the fishers had a range of 1-5 and 6-12 household size, respectively while 40% of the processors had 6-12 and above 13 household size and above 13 household size. However, 53.3% of the marketers had the household size range of 6-12. The mean household size for the Fishers, Processors and Marketers was 16, 12 and 11 persons, respectively. This indicates a large family size of more than six persons (comprising of four children and two parents). This is perhaps due to the practice of polygamy and extended family system in the area.

Table 2 further revealed that majority of the fishers had 13 years of fishing experience while 46.7% of the marketers had experience of 13 years and above. Sixty (60%) of the processors had experience of between 1-5 years. This indicates that the fishers had more years of experience compared to the other actors. It needs to be noted that the more the years of experience the more the knowledge of a particular aspect of the fishing business.

The roles of value chain actors

The activities of a total of seventy five value chain actors were analyzed for their activities in the fish value chain in the study area. The main value chain actors in the fisheries activities consist of the Fishers (40%), Marketers (40%) and Processors (20%) in the study area. All these actors play important and varied roles in the fish value chain.

The fishers

Analysis of activity of the respondents revealed that the fishers were the main actors along the fish value chain in the study area. They are known as artisanal fishers whose production scale is low. They are associated with the use of simple fishing gear technology and labour intensive, characterized by low-catch per unit effort and low income. Some of the artisanal fishers sell their catches to intermediaries; however in the case of Alau landing site, majority sell their catches to the owner of the canoe on which the fishing was carried out. This is an agreement which had been made between the two parties (canoe owner and the fisher). The agreement between the workers and the owner can be that- fish will be sold directly to him and some return will be paid at the end of the month usually between ₦500- ₦700. It can also be that, there will be some return at the end of the month usually ₦2000-₦2500 without selling the catches to the canoe owner, or their catches will be sold after every day catches. This relationship is a mutual one. The fishers earn some income and cater for their families and the owner of the canoe also earn some income.

The fish marketers

The fish marketers buy fishes either directly from the artisanal fishers or from the owners of the canoe, who then sell to the next buyer. They are responsible for the distribution and handling activities. They add

value to the fish business by making it available at the place and time required by processors and consumers. The fish marketing system is traditional, complex and less competitive but play a vital role in connecting the fishers and consumers, thus contributing significantly by adding value to the whole process.

The Processors

The processors play the role of maintaining the quality standards of catches on the Lake along the chain. The processors tend to be third-party players who are paid to process fish but are not directly connected to the sale of fish. They are paid between ₦100- ₦200 per box container after processing by degutting and descaling. Some buyers prefer doing the processing themselves or employing the labour of family members.

Value chain analysis

Value chain analysis with respect to prices of local and common names and prices of fish species in the area, activity of the actors along the value chain and their relationships are described in this section of the paper. Table 3 provides information on the local and common names as well as the price of some fish species caught on the lake per unit of their measurement. Tables 4 and 5 depicts the contribution of the value chain actors and their relationships respectively.

Table 4.depicts clearly the cost associated with the activity of each of the actors, the revenue accrued and profit derived. The Fishers cost of production or cost incurred in catching are ₦178,900, with a profit of ₦3,505,500 and percentage profit of 135% (above 100%). However, the Marketers with the highest (₦6,242,100) expenses incurred and revenue of ₦5,301,900 had a loss of 38%. The processors with no expenses had revenue of ₦82500 with a profit of 3%. The revenue and price computation is based on the price regime of the common fish species obtained in the study area (Table 4). Table 4 depicts the price of some common species caught on the lake per unit of their measurement. The study was conducted during the dry season. Price of fish during this period was often higher compared with the rainy season when the price of fish usually declined. The price of *Clarias* species was between the ranges of ₦13000-₦14000 during the dry season which often declined during the rainy season to the range of ₦5000-₦7000. Tilapia was between the price range of ₦800-₦1000 with little decline in price during the rainy season. The price of *Schilbe*species, Alestes, Labeo species, Syodontis and Mazo ranges between ₦2000-₦2200, ₦1500-₦2000. There were certain species which were not affected by seasonality such as Tilapia (*Karfasa*), lulu, Kawara, and Dangashau. The price of some species such as Propterus (*Gawa*), Heterotis (*Bargi*), Satonomous (*Tola*) and Synodontis (*Kurungu*) varied with sizes, as the bigger the species, the higher their prices, and vice-versa.

Relationships between value chain actors

Table 5 shows how the different value chain actors in the study area relate with one another. Majority of the fishers (60.7%), processors (66.7%) and marketers (72%) share information among each other especially on price, quality of fish, demand, supply, seasonality and fish availability. Also 10.7%, 16.7% and 16% of the fishers, processors and marketers respectively get information from one another and this could be on price of fish, demand and fish availability while 28.6% of the fishers, 16.7% of the processors and 12% of marketers assist each other one way or the other such as giving out loans and lending of fishing canoes.

Table 3: Price of some common species caught on the lake per unit of measurement (plastic trough)

Common name	Local name	Price/container(₦)
Catfish	*Tarwada*	13,000-14,000
Tilapia	*Karpasa*	800-1000
Schilbe	*Lulu*	2,000-2200
Alestes	*Kawara*	7,500-2000
Synodontis	*Dangashau*	1500
	Mazo	1600

Source: Field survey, 2013

Table 4: Summary of cost, revenue and profit of fish value chain actors in the study area

	Cost (₦)	Revenue (₦)	Profit (₦)	% Profit
Fishermen	178,900	3,505,500	3,326,600	135
Marketers	6,242,100	5,301,900	-940,200	-38
Processors	00	82,500	82,500	3
Total	6,421,000	8,889,900	2,468,900	100

Source: Field survey, 2013

Table 5: Relationship among the value chain actors

Variable	Frequency (%)		
Relationship	Fishermen	Processors	Marketers
Share information	17(60.7)	8(66.7)	18(72)
Get information	3(10.7)	2(16.7)	4(16)
Assist each other	8(28.6)	2(16.7)	3(12)

Source: Field survey, 2013

Constraints faced by the respondents

The problems associated with fishing, its processing and marketing as perceived by the respondents in the study area were presented in Table 6. The result indicated that seasonality (16%), transport (13.3%) and insecurity (13.3%) were cited and ranked as the 1st 2nd and 3rd constraints limiting activities of fresh water fish catch in the study area. Catches tend to be high during the rainy season while during the dry season there was concomitant increase in the price of the little quantity of fish usually caught during such a season. The 2nd ranked problem of transportation was mostly experienced by the marketers who after buying their product had to transport them to their various location of sale. The result further shows that third (3rd) constraint on the list is due to the lingering security crisis in the state due to the *Boko Haram* insurgency. People from the metropolitan council and other parts of the state find it difficult to travel to the lake site due to the state insecurity therefore limiting market prospects for the fish caught.

Table 6: Perceived constraints to fishing, marketing and processing in the study area

S/No.	Constraints	Frequently (f)	Percentage (%)	Rank
1.	Effect of seasonality on markets	12	16	1
2.	Transport	10	13.3	2
3.	Effect of crisis on market	10	13.3	3
4.	High cost of investment	9	12	4
5.	Market outlet	8	10.6.	5
6.	Lack of credit	7	9.3	6
7.	Storage facilities	7	9.3	7
8.	Lack of bargaining power	6	8	8
9.	Lack of awareness of extension workers	4	5.3	9
10.	Labour scarcity	3	4	10

Field survey: 2013

Conclusion and recommendations

Analysis of the socio-economic characteristics revealed that most of the respondents are male indicating that fishing business in the study area is mainly a male occupation. The fishers are the main actors along the chain as they are responsible for the fish catch sell to the marketers who make their sale on the lake or transport it to their various units of sale, while the processors have little or no impact along the chain with little earnings and profit. The value chain analysis depicted that fishers had the highest percentage profit or 62.8% of the total profit. The marketers experienced a loss. Analysis of value chain relations revealed that the actors share information and assists each other with mutual benefit accruing to each of them. Effect of seasonality on markets ranked first with labour scarcity being ranked as the least and last constraint affecting fresh water fish catch. In order to improve the value chain of freshwater fish in the study area, the following are recommended:

1) Concerted effort and action should be made by Governments in collaboration and cooperation with all stakeholders to address the prevailing and lingering security challenges in the state and study area. This is to provide the enabling environment for the thriving of the fish bushiness and other value chain activities.

2) Governments should also provide subsidized fishing materials to the fishers as well as basic fisheries infrastructure such as fish storage and processing facilities, and good accessible road for ease of transportation

3) Government should provide regular extension service to the study area to enlighten the people and create awareness on the effective method of fishing, processing and marketing and training on value addition and entrepreneurship.

4) The fishing community should form cooperatives. By doing this, government and NGO can render them the required assistance.

5) Capacity building of all value chain actors is necessary. With low level of formal education, the competency of the fishers, marketers and processors need to be enhanced to enable perform their expected roles in the value chain.

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