
Assessment of fish farmers' livelihood and poverty status in Delta State, Nigeria

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To cite this article:

James Asu Nandi, Patience Gunn, Glory Atim Adegboye, Tena Mongalaku Barnabas. Assessment of Fish Farmers' Livelihood and Poverty Status in Delta State, Nigeria. *Agriculture, Forestry and Fisheries*. Vol. 3, No. 5, 2014, pp. 427-433. doi: 10.11648/j.aff.20140305.26

Abstract: Despite the potentials of Nigeria in fish production, domestic fish production has failed to meet the national demand, making Nigeria a net importer of fish. Hence, this study assessed the livelihood and poverty status of fish farmers in Delta State, Nigeria. A multi-stage sampling technique was used to select 90 fish farmers across the State. Data were elicited through questionnaire and analyzed using descriptive statistics and poverty gap indices measures. Respondents' mean age was 42 years; with average household size of 5 people; 83% were literate; with 17 years of fishing experience. This indicates that fish farmers in the area were young, literate and experienced. Thus, they could withstand the drudgery and risk of the venture. It was observed that 42% of the farmers lived in rented apartments while 26% occupied their own apartments of single rooms (73%), with iron sheet roof (62%), floored with cement concrete (81%). The major source of water was borehole hand pump; with farmers using unauthorized refuse heaps and covered pit latrines. Farmers' annual income averaged ₦137,500 (881.41 USD) which is below the annual minimum income of an average Nigerian. Poverty index was 0.867, resulting to a poverty gap index of 0.629, implying high poverty incidence. Major constraints identified were insufficient fund, fluctuation in market prices and fish spoilage. It is recommended that soft loans should be granted to fish farmers on time; canning and processing industries should be established in the area; adequately funded extension agents should be deployed to the study area.

Keywords: Aquaculture, Fish Farming, Housing, Impact, Income, Livelihood, Poverty

1. Introduction

Aquaculture is the beneficial and sustainable use of water as a medium to farm organisms, such as finfish, shellfish and aquatic plants [1]. Aquaculture, the farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants, is often cited as one of the means of efficiently increasing food production in food-deficit countries [2]; and improving livelihood and poverty status among farming households. From ancient times, fishing has been a major source of food for humanity and a provider of employment and economic benefits to those engaged in this activity. Fish is an important source of dietary protein, micro-nutrients and essential fatty acids for millions of the world's poor and contributes to their caloric intake [3]. However, very little precise information about the real contribution of fishing activities to livelihoods and economies in developing countries (Nigeria inclusive) aiming at eradicating poverty are available. Although many fishing households are poor

and vulnerable, likely to be involve in small-scale fishing, it is widely acknowledged that small-scale fishing can generate significant profits, prove resilient to shocks and crises and make meaningful contributions to poverty alleviation (income) and food security [3]. Yet, the livelihood and poverty status of the fish farmers has not been known.

Livelihood comprises the capabilities, the assets (natural, physical, human, financial and social capital), the activities and the accesses to these (mediated by institutions and social relations), that together determine the living gained by the individual household [4]. The Nigeria economy is basically agrarian, with most of the people living in squalor and very poor standard of living which are attributed to poverty [5], commonly defined as the scarcity of human basic needs. In poor rural communities, aquaculture can be an integral component of development, contributing to sustainable livelihoods and enhancing social well-being. Aquaculture has, therefore, contributed significantly to food security, income

generation, trades and improved living standards in many developing countries [6]. A livelihood is sustainable when it can cope with, recover from stresses and shocks as well as maintain or enhance its capabilities and assets both now and in future, while not undermining the natural resource base [4]. On the other hand, poverty is a vicious cycle that keeps the poor in a state of destitution and utter disillusionment. Poverty is the main cause of hunger and malnutrition, which are aggravated by rapid population growth, policy inadequacies and inconsistencies or weak administrative capabilities, unhealthy food storage and processing techniques [7].

Poverty is an unacceptable deprivation in human well-being that can comprise both physiological and social deprivation. Physiological deprivation includes the non-fulfillment of basic material or biological needs, including inadequate nutrition, health, education and shelter [8]. According to Shackleton *et al.* [9] of the world's 6 billion people, 2.8 billion live on less than US\$ 2 a day, and 1.2 billion on less than US\$ 1 a day; with sub-Saharan Africa having the highest poverty rates in the world, Nigeria inclusive. The Human Development Report by UNDP [10] shows that Nigeria is one of the poorest among the poor countries of the world, with Human Poverty Index (HPI) value of 38.8%, ranking Nigeria 75th among 103 developing countries.

Fish availability in Nigeria is either by capture fishers, artisanal fish farming or by import. Capture fisheries involve the harvesting of naturally existing stocks of wild fish. This can be done either by small-scale/artisanal fishers or by industrial/commercial trawlers. In artisanal fisheries, production is achieved by individual or by small groups by the use of labour intensive gears. Characteristically artisanal fishers operate from dug out, wooden canoes that are more often than not unmotorized. At present, fish production by artisanal fishers dominates fish production in Nigeria [11]. Statistics indicate that Nigeria is one of the largest African fish producers, with production output of about 817,516 tonnes in 2010 (616,981 tonnes from capture and 200,535 tonnes from aquaculture) [12]. The aquaculture sub sector contributes between 0.5 and 1% to Nigeria's domestic fish production. The industry now contributes only 2.0% of the Gross Domestic Product (GDP) and accounts for 0.2% of the total global fish production [13].

Despite these considerably high potentials, domestic fish production which is mostly supplied by artisan fish-folk has failed to meet the national demand of about 1.4 million tonnes. This high demand makes Nigeria the largest single consumer of fish and fish products in the African region [14]. Since it is obvious that aquaculture has the potential to expand the resource base and reduce the pressure on conventional sources of fish, generate employment, foreign exchange and elevate socio-economy of the farmers [15]. Even at this, many small-scale fishing communities and fish farming households are still considered poor and vulnerable [3]; [16]. Therefore, the pressing challenge is to increase production and bridge the wide gap between fish demand and supply through aquaculture. The knowledge of the fish farmers' livelihood and poverty status can serve as inducement to the farmers to

enhance their livelihood status and alleviate poverty through increased fish output vis-a-vis income.

Engagement in fish farming is an important income generating activity among households in coastal communities of Nigeria. The rapidly increasing demand for fish and fish products nationally, particularly due to increasing population, increasing per capita income and rapid urbanization in the country, presents opportunities for the coastal poor fish farmers in these communities to participate in and benefit from such growth. This benefit is expected to manifest in the livelihood status of the fish farmers through obliteration of poverty. Therefore, assessing their present livelihood and poverty status could serve as a reference medium for improvement on livelihood of the people generally as well as motivate more farmers into the fishing industry.

Fish and fisheries are indispensable part in the life and livelihoods of the people of Delta State and it is part of the cultural heritage. In an effort to reduce the side ratio between fish demand and supply as well as improve the livelihood status and eradicate poverty among the farmers, programmers such as Fisheries Extension and Assistance to Fishermen, Fish Farming (Aquaculture), Coastal Fisheries, ECOWAS Fund Loan for Accelerated Fish Production and Fisheries Regulation [17], were executed in the State by various Organizations. Considering government effort to alleviate the financial hardship and other complexities of the rural fish farmers in the State, it is pertinent to assess their current livelihood and poverty status to guide policy makers, investors and farmers alike. Hence, this study was conducted to assess the livelihood and poverty status of the fish farmers and to identify the socio-economic problems/constraints facing the fish industry.

2. Materials and Methods

The research was conducted in Delta State of Nigeria. The State lies approximately between longitude 5° 00'E and 6° 45'E of the Greenwich Meridian and latitude 5° 00'N and 6° 30'N of the Equator. The State presently covers a landmass of about 18,050 Km² of which about 40% is water. The State has a wide coastal belt inter-lace with rivulets and streams, which form part of the Niger-Delta. Delta State ethnic groups comprise mainly Urhobo, Isoko, Delta Ibo (Anioma), Itsekiri and Ijaw [17] with a population of 4,112,445 people [18]; [19]. A multi-stage sampling technique was employed to select 90 fish farmers from three Local Government Areas (Ethiope West, Uvwie and Isoko South) based on their high level of fish production in the State. The study made use of primary data collected using structured questionnaire; processed and analyzed using descriptive statistics such as frequency, means and percentages and Poverty Gap Indices (PGI).

Poverty measurement among fish farmers was conducted using income-poverty measurement. This was specified using the [20] method of analyzing poverty status. The poverty level of the fishing households was measured based on their income level from fish farming. The World Bank and the Federal Office of Statistics (F.O.S) have established that an individual

is poor if income is less than \$1 per day. The Foster-Greer-Thorbecke indices used were: head count measure and poverty gap index. The head count method is specified as a fraction of the income received units which are below the poverty line in relation to the entire population which simply measures the proportion of the population that is counted as poor, denoted by P_0 :

$$P_0 = \frac{N_p}{N} \quad 1$$

Where N_p is the number of poor and N is the total population. Whereas, poverty gap index sums up the extent to which individuals on average fall below the poverty line, and is expressed as a percentage of the poverty line; hence, it lies between 0 and 100. Poverty gap index (PGI) is the poverty line (z) less actual income (y) for poor individuals (households whose daily income is above the poverty line are not considered); the gap is considered to be zero for everyone else. It is also a measure of average income increase needed to bring the poor in a nation out of relative poverty. Higher poverty gap index connotes severe poverty incidence. The index function was expressed as:

$$PGI = \int [(z - y)/z] \alpha dy \quad 2$$

Where $\alpha = 1$

3. Results and Discussion

3.1. Socio-Economic Characteristics of the Respondents

Table 1. Socio-economic characteristics of the respondents

Socio-economic characteristics	Frequency (N = 90)	Percentage
Gender		
Males	64	71.11
Females	26	28.89
Age (years)		
19 - 28	11	12.22
29 - 38	23	25.56
39 - 48	29	32.22
49 - 58	18	20.00
59 - 68	09	10.00
Mean	42	
Household size (No)		
3-Feb	17	18.89
5-Apr	41	45.56
≥6	32	35.56
Mean	05	
Marital Status		
Married	74	82.22
Single	16	17.78
Educational level		
No formal education	15	16.67
Primary	22	24.44
Secondary	37	41.11
Tertiary	09	10.00
Others	07	07.78
Farming experience (Years)		
1-5	06	06.67
6-10	16	17.78
11-15	24	26.67
16-20	18	20.00

Socio-economic characteristics	Frequency (N = 90)	Percentage
21 and above	26	28.89
Mean	17	
Main occupation		
Fishing	59	65.56
Others	31	34.44
Access to credit		
Yes	62	68.89
No	28	31.11
Extension contact		
Yes	27	30.00
No	63	70.00

Source, Field survey, 2012

Result presented in Table 1 revealed the socio-economic characteristics of the respondents. The result revealed 71% of the respondents were males, implying that fish farming is a male dominated enterprise in the study area. It was observed that age of the respondents ranged between 19 and 68 years with a mean of 42 years old. Respondents with age bracket of 29 to 58 years constitute about 78% of the sample. The implication of this is that fish farmers in the area were still young and energetic. Hence, they could withstand the drudgery and risk of the venture. The respondents were mostly (82%) married with average household size of 5 people. Households with 4-5 persons were 46% of the respondents while 36% comprise those with ≥6 people per household. This shows that the farmers had dependents to cater for.

Table 2. Housing condition of respondents

Variable	Frequency	Percentage
Type of tenure		
Normal rent	38	42.22
Free	29	32.22
Owner occupier	23	25.56
Housing Unit		
Single room	66	73.33
Flat	02	2.22
Duplex	-	-
Whole building	12	13.33
Others	10	11.11
Housing condition by roofing materials		
Mud/bricks	03	3.33
Thatch/grass	18	20.00
Wood bamboo	04	4.44
Iron sheet	56	62.22
Cement concrete	04	4.44
Roofing tiles	-	-
Others	05	5.56
Housing condition flooring material		
Earth/mud	16	17.78
Wood/tiles	-	-
Planks	01	1.11
Concrete	73	81.11
Dirt straw	-	-

Source: field survey, 2012

Table 3. Respondents household amenities and living conditions

Facility	Frequency	Percentage
Source of water for cooking and drinking		
Treated pipe borne water	02	2.22
Untreated pipe borne water	-	-
Borehole hand pump	39	43.33
Well spring protected	18	20.00
Well spring unprotected	13	14.44
Rain water	01	1.11
Stream/pond/river/rain water	17	18.89
Tanker/truck/vendors	-	-
Refuse disposal facility		
Bin collected by agency	06	6.67
Government bin	02	2.22
Disposal within compound	24	26.67
Unauthorized refuse heap	53	58.89
Others	05	5.55
Toilet facility		
No toilet	07	7.78
Toilet on water	21	23.33
Flush to sewage	11	12.22
Flush to septic tanks	-	-
Covered pit latrine	27	30.00
Uncovered pit latrine	09	10.00
Others	15	16.67
Cooking fuel		
Electricity	02	2.22
Gas	-	-
Kerosene	33	36.67
Wood	55	61.11
Coal	-	-
Electricity supply		
No electricity	28	31.11
Power Holding Company of Nigeria (PHCN) only	51	56.67
Private generators only	03	3.33
Power Holding Company of Nigeria (PHCN)/Generator	08	8.89

Source: field survey, 2012

Majority (83%) of the fish farmers had one form of formal education or the other. Those with secondary school level education were 41%, while 24% had primary education, 10% had tertiary education while about 17% of the farmers were illiterate. The mean farming experience was 17 years with farmers who have practiced the occupation for more than 10 years constituting 76% of the respondents. Fish farming serve as main occupation to 66% of the respondents while 34% of the respondents take fishing as part-time occupation. This confirms that fish farming is a way of life of the people. Timely access to production credit can boost output as well as serve as a motivator to the farmers. Fish farmers who had access to credit from various sources comprise 69% of the respondents. It can be adjudged that fish farming is receiving encouragement by concern individuals and organizations. Extension service facilitates adoption of innovation. Contact with extension agents was noticed to be minimal, 70% of the sampled fish farmers declined having contact with extension agents with respect to fish farming. This agrees with the work of Adewuyi *et al.* [13] who reported poor extension visits to fish farmers in Ogun State, Nigeria.

3.2. Housing Condition

The result presented in Table 2 revealed the housing condition of respondents. The tenure system in the area show that majority (42%) of the respondents lives in rented apartments while 32% stays in free apartments which may be family owned. Only 26% of the farmers occupied their own apartments. Most (73%) of the respondents housing units were single rooms, 13% occupies a whole building while 2% stays in flats. The implication is that the households may be sharing some of the amenities such as toilet and bathroom with neighbours. The housing condition by roofing sheet revealed that 62% of the respondents live in houses with Iron sheet roof, while none of the respondents live in roofing tiles accommodation. On the other hand, 81% of the houses occupied by the respondents were floored with cement concrete, 18% of the floors were earth/mud while 1% of the respondents' houses were floored with planks. The result depicts that respondents with assets in form of houses were few. Thus, they may not be able to indulge in large scale fishing due to their low savings emanating from poor earnings. It can be adjudged that the respondents' level of living based on housing condition is poor.

3.3. Household Amenities and Living Conditions

Table 3 show that the sampled fish farmers' major source of water was borehole hand pump constituting 43% of the respondents; water from well springs was used by 34% of the respondents, while respondents depending on water from open sources (stream/pond/river/rain water) were 19%. The implication of this result is that any water borne diseases epidemic could be serious and prevalent because the farmers depends on untreated water from various sources. It was observed that farmers' sanitary conditions were very poor as 59% of the respondents stated that they dispose refuse on unauthorized refuse heaps, while 27% of the respondents used disposals within the compound. Lack of good sanitary facilities could result to loss of labour emanating from diseases such as diarrhea, cholera and malaria which are common ailments of dirty environment. Toilet is a necessity for every home or household. The study observed that 8% of the respondents had no toilet facility in their residence. Therefore, these households may not have choice of a defecating place. Sampled fish farmers mostly (30%) used covered pit latrine as their toilet facility while 23% toilet on water; 10% used the uncovered pit toilet. This indicates that the toilets facilities in the area were poor; hence, they could harbour pathogens. The result revealed that 61% of respondents mainly used wood as cooking fuel, while 37 and 2% used kerosene and electricity respectively. It was found from the study that 69% of the surveyed fish farmers have electricity facilities, whereas, 31% had no electricity facilities of any kind at their residence. Respondents who depend on only Power Holding Company of Nigeria (PHCN) were 57% while 3% operates with private generators only. The erratic nature of the PHCN could impede the fish farmers from indulging into other economic activities which might bring about livelihood diversification.

3.4. Household Income

Table 4. Annual household incomes of the respondents (Mean income = ₦137,500 (881.41 USD)); \$1 = ₦156

Amount of Household income per annum in Naira (₦)	Frequency	Percentage
₦10,000 (64.10 USD) - ₦50,000 (320.51 USD)	02	02.22
₦51,000 (326.92 USD) - ₦100,000 (641.03 USD)	10	09.00
₦101,000 (647.44 USD) - ₦150,000 (961.54 USD)	31	34.44
₦151,000 (967.95 USD) - ₦200,000 (1,282.85 USD)	29	32.22
₦201,000 (1,288.46 USD) - ₦250,000 (1,602.56 USD)	13	14.44
₦251,000 (1,608.97 USD) and above	05	05.06

Source: Field survey, 2012

The respondents were categorized based on the level of their annual income. Fish farmers who earned between ₦10,000 (64.10 USD) - ₦50,000 (320.51 USD) were categorized as the 1st group. The 2nd group annual income ranges from ₦51,000 (326.92 USD) - ₦100,000 (641.03 USD). The 3rd, 4th and 5th categories had annual income levels of ₦101,000 (647.44 USD) - ₦150,000 (961.54 USD), ₦151,000 (967.95 USD) - ₦200,000 (1,282.85 USD) and ₦201,000 (1,288.46 USD) - ₦250,000 (1,602.56 USD) respectively (Table 4). It was observed that majority of the respondents belonged to 3rd category with 34% of the respondents falling into this category. This was followed by respondents in the 4th category with the proportion of 32% while the lowest proportions of farmers (9%) were in the 1st category. The mean annual income was ₦137,500.00 (881.41 USD). The result shows that the fish farmers are living below the minimum annual income of an average Nigerian which is ₦220,000.00 (1,410.26 USD). Therefore, output vis-à-vis income need to be improved upon.

3.5. Impact of Fish Farming on Livelihood Status of Respondents

Impact of fish farming on livelihood status of respondents was found to be positive despite the poor resources of the farmers. Similar result of positive livelihood outcomes was recorded by Ali *et al.* [21]. Most of the fish farmers in the study area increased their income and basic needs as a result of fish farming. The survey observed that 19% of fish farmers spend their earnings on improving their socio-economic conditions. Fishing activities dividends were experienced in the fish farmers' household through better food (17%), improved housing conditions (15%), cloths (12%) and children education (11%) (Table 5). Impact of fish farming activities as stated by the respondents reflected in the farmers' investment and savings with 10 and 9% respectively highlighting using their income on these items as well as increasing their purchasing power by 9%.

3.6. Household Expenditure

Household expenditure expresses consumption and savings levels. The result revealed that majority of the respondents save some of their income as not all was shown to be consumed. The highest expenditure recorded per year was ₦313,012, (\$2,006.49) with a minimum of ₦34,300 (\$219.87) and average of ₦129,454 (\$829.83) annually (Table 6).

Respondents that spend between ₦100,000 and ₦150,000 (\$641.025 and \$961.54) constitute 46% of the sample. Conversely, 31% spend ₦100,000 and below; while 20% consumed between ₦150,001 and ₦250,000 (\$1000.00 and \$1602.56) per annum.

Table 5. Impact of fish farming on livelihood status of respondents

Indices	*Frequency	Percentage
Socio-economic condition	53	18.86
Better food	48	17.08
Cloths	33	11.74
Housing conditions	41	14.59
Children education	32	11.39
Increased saving	22	07.83
Investment	28	09.96
Purchasing capacity	24	08.54

Source: field survey, 2012; *multiple responses

Table 6. Distribution of respondents according to expenditure level

Expenditure class	Frequency	Percentage
≤ ₦50,000 (≤ \$320.51)	11	12.22
₦50,001 (\$320.52) - ₦100,000 (\$641.03)	17	18.89
₦100,001 (\$641.03) - ₦150,000 (\$961.54)	41	45.56
₦150,001 (\$961.54) - ₦200,000 (\$1,282.05)	13	14.44
₦200,001 (\$1,282.06) - ₦250,000 (\$1,602.56)	05	05.56
₦250,001 (\$1,602.57) - ₦300,000 (\$1,923.07)	02	02.22
≥ ₦300,001 (≥ \$1,923.06)	01	01.11
Mean	₦129,454 (\$829.83)	

Source: computed from field survey, 2012

3.7. Poverty Status

Poverty headcount ratio expressed as the percentage of population that is below the poverty line. Table 7 results depict that respondents living below the poverty line constitute 87% of the sampled fish farmers in the State. This implies that poverty incidence is very high among the respondents. With this low daily expenditure pattern in the area, households are bound to have much deficiencies in their standard of living due to inability to afford basic needed facilities for a comfortable lifestyle. Poverty gap index provides a clearer perspective on the depth of poverty and overall assessment of a region's movement in purging poverty as well as evaluation of specific public policies or private initiatives. The findings established poverty gap index of 0.629, (62.9%); implying that the difference between the relatively poor and the poverty

line of ₦156 per day was 62.9%. Therefore, fish farmers in the area require an average increase of ₦94 per household per day to jettison relative poverty.

Table 7. Distribution of respondents according to poverty status

Amount (₦)	Frequency
Poverty Index based on ₦156 per day	
Number of poor households	78
Total Number	90
Poverty index	0.867
Poverty gap	
Sum of Index	56.65
Total No	90
Gap	0.629

Source: computed from field survey, 2012

3.8. Constraints Recorded by the Respondents

Table 8. Constraints of fish farming in the study area

Constraint	Frequency*	Percentage	Rank
Insufficient fund	81	25.96	1 st
Fluctuation in market prices	59	18.91	2 nd
Lack of improved vessels for fish storage	28	08.97	6 th
High input prices	35	11.22	5 th
Seasonality of availability of fish	26	08.33	7 th
Inadequate technical knowledge	41	13.14	4 th
Fish spoilage due to postharvest handling	42	13.46	3 rd

Source: Field survey, 2012: *Multiple responses

A number of constraints were reported by the respondents and ranked according to severity in Table 8. Insufficient fund was ranked 1st with 26% of the respondents identifying it as a problem. This is an indication that the credit granted to the farmers has not met their desire for maximum output. The duration of the credit may be short, thereby compelling the farmers to sell their produce in order to pay back the credit. Untimely credit could be diverted resulting to shortage in production credit. Fluctuation in market prices was ranked 2nd among the constraints recorded. Inputs and output prices affects production as well as profit; if farmers cannot ascertain the prices of their products, investment into the enterprise could be affected. Fish are aquatic organisms delicate if not in water; hence, ranked 3rd among the constraints was fish spoilage due to postharvest handling (13%). Postharvest handling may include transportation, marketing and preservation. Various methods of fish preservation are labourious and time consuming to small-scale farmers. Inadequate technical knowledge recorded 13% and was ranked 4th by the respondents. Fish farming requires technicality in terms of management of the enterprise in form of resource use efficiency. Therefore, technical assistance is necessary to improve output. High input prices, lack of improved vessels for fish storage, and seasonality of availability ranked 5th, 6th and 7th respectively.

4. Conclusion

Fish farming in Nigeria seem not to have impacted much in the lives of the farmers. Although, the findings of this study suggest that the livelihood status of the farmers has improved in terms of socio-economic condition, quality of food consumed, housing condition and savings among others, yet, the farmers are relatively poor. The positive social and environmental attributes of aquaculture makes it an attractive entry point to improve the livelihoods and exterminate poverty among the poor rural fishing households. Adequate fishing can ease under-nutrition, improve income status and serve as a means of agricultural diversification to alleviate poverty and ameliorate standard of living. Even though, the study found that improvement in the livelihood status of fishing households was recorded, their livelihood status is still below the annual minimum income of an average Nigerian, with a high poverty gap. It is adjudged that the poverty alleviation programmes targeting fish farmers have not impacted positively on the livelihood status of fish farmers. With the high level of petroleum exploration in the State, the government and other organizations has not provided much basic facilities to enhance livelihood status and expunge poverty in the area.

It is recommended that government and private organizations concerned should establish industries for canning and processing of excess fish produced to reduce spoilage. Extension agents knowledgeable on fish farming should be deployed to the study area by the government as well as adequately funded as a strategy of strengthening awareness campaign/sensitization exercise on aquaculture. Incentives on aquaculture inputs should be made available to the farmers. More poverty reduction agencies should be established by international, national and local authorities with focus on fish farmers' household.

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