



BASELINE STUDY ON THE DEVELOPMENT OF FEED STUFF USED BY MAJOR FISH FEED MANUFACTURERS AND FISH FARMERS IN OYO STATE, NIGERIA

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ABSTRACT

The soaring cost of fish feed necessitated research into the production of cheap and affordable feeds. Knowledge of the composition of feeds used by fish feed manufacturers is imperative to enhance fish production. This study was carried out in Oyo State, Nigeria, to determine the fundamental factors affecting the fish feed industry. The major livestock bagged feed industries in the state comprising 115 were visited; while a total of sixty three (63) fish farming industries were randomly sampled. Structured questionnaires were used to collect information. Data obtained were analyzed using descriptive and inferential statistical analyses. Results showed that the fish industries (34.48%) were established between the ages of 0 – 5 years. Greater percentages (51.7%) were within the ages of 6-10years. The fish industries were owned by individuals (93.65%), companies (4.76%) and state government (1.58%). Fish meal (14.10%), blood meal (14.10%) and palm kernel waste (16.18%) are mostly used. About 21.93% of the fish industry used brewery waste as their major feedstuff, while rice bran (0.88%), corn bran (0.88%), beef/chicken offal (0.88%), blood meal (2.63%) and fish meal (2.63%) are the least employed. Majority (60.87%) of the fish industries produce pelleted feeds while 26.09% and 13.4% produce paste and un-pelletized feed respectively. The pelletized feeds cost N7,500 - N8,500 per 15kg more than the un-pelletized feed which cost N4000. Fish price has been found to be uneconomical to fish industries and the farmers as well, because of the soaring cost of ingredients and fish feed generally. Steps should be taken by governments to sustain the fish feed industries and fish farmers from abandonments, by making sure that feeds are readily available to fish farmers at affordable or subsidized rate.

Key words: Assessment, Feedstuff, Fish Feed, Feed Manufacturers and Fish farmers.

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INTRODUCTION

Fish feeds are either complete (containing all the required nutrients) or supplemental which is meant to provide additional protein, carbohydrate, and fat to the animal receiving the food. But supplementary diets are not fortified with vitamins and minerals. However,

artificial feeding of fish allows high stocking rate and better use of natural food (Hasting, 2006). According to Harry and Lovell (2004), fish require protein, lipids, energy, vitamins and minerals in their diet to meet the physiological needs of growth and reproduction.

The successful fish producer also recognizes the importance of proper feeding practices, since uneaten feed, or feed that is eaten after it is water – leached, does not contribute fully to profitable production. However, Dupree and Huner (2004) stated that the fish producer who understands the role of the various nutrients and the contribution of various nutrients and the contribution of various dietary ingredients can use a variety of feeds in the profitable production of high quality fish.

Smith and Rumsey (1977) reported that fish is among the most efficient animals in converting feed energy into edible protein. But in most animal husbandry enterprises in Nigeria, fish culture inclusive, the most expensive aspect of the operation is feed purchases; that is the cost of providing such as efficient fish feed, and this has been responsible for the slow development of many a viable fish farm.

According to Bard *et al.*, (2004), most artificial feedstuffs are eaten by fish and at the same time are involved in the development of planktons. Hence, feed promote and contribute to the growth of fish both in a direct and indirect way. Artificial feeding is one of the principal methods of increasing production in fish cultivation. However, Huet (2005), stated that the importance of feeding varies according to the intensity of cultivation. This can be extensive, semi-intensive or intensive fish culture. For instance, in traditional cyprinid cultivation, it is generally considered best that natural food should represent about half of the diet and artificial food is only used as an addition diet. Comparing the yield of fish under purely natural feeds and supplemental feeds, the fish yield from pond receiving supplemental diets is greater

than that from the pond that solely depends on the natural and organisms for growth and survival. Thus, level of fish production (kg/ha) is greater when supplemental feeds is applied into the pond. This was evident by the work done by Sivalingam (1997) on fish production when he compared the yield with feeding and without feeding supplemental feed and found that feeding was profitable and this shows the importance of feed in an organism. According to Moses (2003), feedstuff commonly thrown away as waste materials a decade ago, now sell at high prices due to rapid increase in number of fish industry and further demand from poultry industry.

Feed no doubt, is one of the essential factors needed to promote and develop modern fish culture. According to Tiamiyu (1997), there have not been proper researches on the selection of suitable nutritious and cheap feed material for mass production of different types of feed for different types of culturable fish species in Nigeria. He pointed further, that, this has consequently affected aquaculture in the country, and that different feed formulae are currently in use for small scale fish culture experiments, but the production of these feeds on a commercial and cheaper scale has not been very successful in Nigeria.

It is noteworthy to point out that despite the efforts of various governments in Nigeria in promoting the much needed demand for fish through fish farming a major constraint to all concerned, is the provision of high grade fish feed and cost of raw materials which has caused many projects in aquaculture to be abandoned or dwindling (FAO/UNDP, 2000). In Nigeria, the level of technology available to most

fish farmers in respect of fish feed is still developing. This observation agrees with Stickney (1997), who reported similar finding that fish feed is the relatively young in terms of accumulated knowledge and level of sophistication when compared to poultry industry.

Hence a method of supplying the necessary feed at the minimum cost has to be evolved using the locally available materials such as corn bran, rice bran, cotton seed cake, blood meal, to mention a few. This has been extensively exploited. However, the proximity of supplies of these by-products to the location of fish farms should be considered, because they are perishable with time. According to NFDC (1979), some fish feeds were compounded by the Oyo State Fisheries Department, using fish meal, groundnut cake, palm kernel cake, brewer's waste and shark liver oil, in the ratio of 6:8:4:2:1. On analysis, it was shown to contain 41% protein and 11% fat. The other one formulated and compounded contains fish meal; shrimp head meal, brewer's waste and shark liver oil, in the ratio of 6:13:1:2. These feeds were neither fortified with vitamin nor mineral. No pelleting was involved and it was used as experimental feed for mullet at the Agodi Fish Farm, in Oyo State. The outcome effect was that the resultant growth and yield was not satisfactory.

Similarly, six isocaloric diets were also prepared by Oloniruha (2000) from conventional livestock ingredients such as yellow maize, groundnut meal, fish meal, blood meal, palm oil, brewer's waste, bone meal, oyster shell, A to D vitamin and salt. The diet were pelleted and the efficiency of the diets were evident from the performance of the fish used (*Tilapia galilee*), for the project. Also the study carried out two decades

ago by Faturoti *et al.*, (1989) on the nutrient utilization by *Clarias lazera* has demonstrated the importance of protein in the diet of the fish thereby arriving at 40% crude protein diet as optimum.

The small scale feed production by individuals for experimental purposes, has accounted for the inadequacy of fish feed in the country. But efforts has turn this into a commercial scale operation across the country, as could be seen by such industries as Pfizer livestock feeds, Global feed mill, such efforts also, is the provision of a fish feed plant two decades ago, for producing and pelleting compounded feeds which are formulated from locally available feed materials like fish meal, soybean meal, corn bran and groundnut cakes, into different shapes for feeding fish at different developmental stages. This fish feed plant is located at the Nigerian Institute for Oceanography and Marine Research (NIOMR) in Lagos, Nigeria, to achieve economies of scale in the production of fish feed (FDF, 1995). However, this has stopped working and has been abandoned.

In essence, the development of fish feed in Nigeria is of great importance to both aquaculture and the aquaculturist. To aquaculture, the quality of feed determines the quality of the product, that is, fish. To the aquaculturist, it is important to know the cost and cheaper ways of providing such an efficient feed to culture fish. The cost of fish feed has been found to be a disincentive to most fish farmers especially those in small scale ventures. It was also noted as being the most varied item of operating input with its cost varying to the same degree. This is because feed alone accounts for 40 - 60% of the total operating cost in

intensive aquaculture. According to Kolawole (2004), by using less expensive feed, that is cheap, feed formulation and cost of production will progressively reduce. But since the main aim of fish farming is profit maximization, therefore, it is imperative to look at the state of fish feed industry in Oyo State.

Since the main aim of fish farming is profit maximization, this study will provide answers to the following research questions:

- What are the different feed stuffs used by both the fish feed and the fish industry?
- How available are the feed stuff?
- What are the effects of soaring prices of raw materials on the production of fish feed?

RESEARCH METHODOLOGY

The study area is Oyo State, Nigeria. It is located in the Southwest of Nigeria. The study area comprises the 33 Local government areas that were divided into four zones according to the Oyo State Agricultural Development Programme (OYSADEP). These are Ibadan/Ibarapa, Oyo, Ogbomoso and Saki zones. Structured questionnaires were the major tools for the survey. It was designed to record responses to specific questions in all the feed mill industries and fish industries visited within Oyo State of Nigeria. Purposive sampling method was used to obtain data from all the 63 fish feed manufacturers while simple random sampling technique was employed in selecting 115 fish industries from a total of 345 across the state Agricultural development programme and Ministry of Agriculture and Natural Resources areas. This was obtained from the list of both fish feed industries and fish farmers obtained

from the Fisheries Division and the Ministry of Commerce and Industry. A total of one hundred and seventy-eight (178) questionnaires were used to obtain information from the respondents. Descriptive statistics such as frequency counts and percentages were used to analyze the data.

RESULTS

The distribution of the fish production industry by year of establishment is as shown in Table 1 below. Most of the fish industries (34.48%) were established between the ages of 0 – 5 years old. Greater percent (51.72%) were within the ages of 6-10 years old. The table also revealed that there were only one industry (3.44%) sited between ages of 16-20 years. The oldest fish industry (3.44%) falls above 20 years old. The data showed that fish industries in the state are relatively new. This observation agrees with Stickney (2007), who reported similar findings that fish industry is relatively young in terms of accumulated knowledge and level of sophistication when compared to poultry industry.

Ownership of fish production industry in Oyo state: The ownership of fish production industry in Oyo state is as shown in Table 2 below. Only three groups of fish industries can be identified. These are State government, company ownership and individual ownership, which are fish farmers. It became obvious that no Federal government ownership of fish feed industry exist in Oyo State. The results revealed that the main fish industries are mainly individuals (93.65%) with only a few from both companies (4.76%) and State Government (1.58%).

Table 1: Distribution of fish production industry by year of establishment in Oyo state

Age	Frequency	Distribution (%)
0 – 5	10	34.48
6 – 10	15	51.72
11 – 15	2	6.90
16 – 20	1	3.44
Over 20	1	3.44
Total	29	100

Field Survey, (2014).

Table 2: Ownership of fish production industry in Oyo state

Ownership	Frequency	Distribution (%)
Federal Government	-	-
State Government	1	1.58
Company	3	4.76
Individual	59	93.65
Total	63	100

Field Survey, (2014).

Feedstuff used by the fish feed industries: Feedstuff generally used by the Fish Feed Industries in Oyo State is as shown in Table 3 below. It was obvious that most of the fish feed industries use virtually the same ingredients in compounding pelleted feeds. It was also observed that the ingredients used were based on the organic substances fish require for growth, namely protein, carbohydrate, fat and specific vitamins and minerals. However, the table revealed that fish meal (14.10%), blood meal (14.10%) and palm kernel waste (16.18%) are the most commonly used, while cotton seed cake is the least used.

Observations showed that as most fish industries in Oyo State apply various types of feedstuff to their ponds, varying quality of fish are likely to be produced. This is because the various feed components employed have different nutritional values. For example, yellow maize (11.00%, commonly used

because it contains carotene than white maize), brewery wastes, corn bran (7.19%), wheat by - product (5.39%) are mainly carbohydrate. This gives the fish energy for the various activities of the body. Groundnut cake (13.67%), cotton seed cake (2.00%), soya bean cake (11.00%), fish meal (14.10%) are all plant protein and supply growth to the fish. This agrees with Jauncey and Ross (1982), who opined that, raw materials are selected on their ability to supply particular nutrients at lowest cost and proper levels.

Feedstuff used by the fish production industries: In addition, Table 4 further established the monotonous use of brewery waste in all the fish industries visited, with the exception of a few. Due to the high demand and awareness of the brewery waste which used to be free in the past; it has now become expensive because

Table 3: Feedstuff generally used by the fish feed industries in Oyo state

Feed ingredients	Frequency	Distribution (%)
Fish meal	40	14.10
Groundnut cake	38	13.67
Yellow maize	30	11.00
Soya bean	30	11.00
Corn bran	20	7.19
Blood meal	40	14.10
Palm kernel waste	45	16.18
Wheat by-product	15	5.39
Additives	15	3.59
Cotton seed cake	5	2.00
Total	278	100

Field Survey, (2014).

the society has recognized the importance of the by-product. This observation agrees with Moses (2003), who found out similar observation that feedstuff commonly thrown away as waste materials a decade ago now sell at high prices due to rapid increase in the number of fish industries and further demand from poultry industries. Work done by Ejikwe and Otojekwu (1983), reported positive results on the use of various ingredients based on the efficiency of the diets and the advantage of using them in feed making on fish production various ingredients based on the efficiency of the diets and the advantage of using them in feed making on fish production.

According to Table 4, it could be seen that none of the fish industries depend on natural feeding. The table further revealed that 21.93% use brewery waste as their major feedstuff, while rice bran (0.88%), corn bran (0.88%), beef/chicken offal (0.88%), blood meal (2.63%) and fish meal (2.63%) are the least employed. It was also established that fertilization is carried out by the use of organic manure (16.67%) in addition to NPK 15:15:15 (7.89%). The types of organic manure

used include cow dung, poultry waste, abattoir waste, etc. However, variations in feedstuff are due to availability and proximity as observed from the response of the survey. This agrees with Nose and Arai (2002), who stated that ingredients for fish feed should be those available locally.

Types of fish feed produced by fish production industry: The distribution of industries by types of fish feed produced and availability is as shown in Table 5 below. It showed that 60.87% of the fish industries produce pelleted feeds while 26.09 and 13.4% produces paste and unpelleted feeds respectively. The ingredients used by this industries involves incorporation of few ingredients together, then grind and mix if possible to produce powdered feed or dough. The feeds produced are used internally within the fish industries and not for sale, as it is not produced on a commercial scale for sale.

The intensive fish pellets (floating) cost between N7,500 and N8,500 per 15kg more than the extensive (unpelleted) which cost N4,000 for the same quantity. However, the pelleted (floating) feeds are available

in commercial quantity for sale to fish farmers. The cost of fish feed has attracted low patronage by the fish farmers because of soaring prices due to the present economic situation which affects prices of feed. However, work

done by Huet (2005), reported that pelleted feeds have greater advantage over the raw feeds, in that pelleted feeds do not pollute the water medium and is fortified with protein, carbohydrate, vitamins and minerals.

Table 4: Feedstuff generally used by the fish production industries

Feedstuff	Frequency	Distribution (%)
Groundnut cake	4	3.50
Organic manure	19	16.67
Rice bran	1	0.88
Cassava leaves	6	5.26
N.P.K 15:15:15	8	7.89
Yellow maize	11	9.65
Soya bean	10	7.02
Brewery waste	25	21.93
Cassava peels	19	16.67
Cocoa hulls	6	5.26
Fish meal	3	2.63
Corn bran	1	0.88
Blood meal	3	2.63
Beef/chicken offal	1	0.88
Total	114	100.0

Field Survey, (2014).

Table 5: Distribution of industries by types of fish feed produced and availability

Fish feed produced	Frequency	Distribution (%)
Pellets	70	60.87
Un-pelleted	15	13.04
Paste	30	26.09
Total	115	100.0

Field Survey, (2014).

Rising prices of raw materials on fish feed production: The effects of rising prices of raw materials on fish feed production is as shown in Table 6. Majority of the fish feed industries constituting 92.06% are of the opinion that the soaring prices of raw materials affects their production. Only 5 industries (7.94%) indicated that it has no effect on their production. The prices of raw materials were found to vary

from season to season and these materials could have been bought relatively cheaper at off season, except the imported ingredients like fish meal and additives like methionine according to the response received. It is therefore evidenced from the above findings that intensive system of aquaculture which relies on compounded fish feed is unprofitable due to the ever increasing prices of ingredients.

Table 6: Effects of rising prices of raw materials on fish feed production

Effect	Frequency	Distribution (%)
Reduced production	58	92.06
Increase production	5	7.94
No effect	0.0	0.0
Total	63	100

Field Survey, (2014).

CONCLUSIONS AND RECOMMENDATIONS

- The fish industries in Oyo State were established fairly over 20 years ago, while the majority (51.72%) falls within 6 - 10 years of establishment and they are owned by the State government, companies and individuals while the majority is owned by individuals who use various feedstuffs to produce fish feeds.
- The pelleted feed is generally used by the fish farmers because of the wide acceptability and advantages which include ability to float on water. However, fish price has been found to be uneconomical to fish industries and the fish farmers as well, because of the soaring cost of ingredients and fish feed generally.
- Steps should be taken by governments to sustain both the fish feed industries and fish farmers from abandonment by reducing the cost of fish feed and other inputs through subsidy.
- Financial institutions should make credit available to boost fish feed manufacturing and fish production industries.

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