

### FISH FEED PRODUCTION OF CLARIAS GARIEPINUS FOR ENTREPRENEURIAL SKILLS DEVELOPMENT IN BIOLOGY

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#### **Abstract**

*Fish resources contribute substantially to the socio-economic development of a nation through the provision of labour to a large population and food rich in annual protein. Fishing generates income and savings on foreign exchange. The high cost of conventionally pelleted fish feed has severally constrained the development of low-cost aquaculture system. The development of fish feed production for sustainable entrepreneur development in the face of the world's global economic crisis and food shortage is a step in the right direction.*

#### **Introduction**

Fish is an important source of protein, which should be cheap and readily available, particularly in a country like Nigeria, that is blessed with a substantial coastline and vast inland water bodies. Yet we only produce about one – third of the quantity of fish required for the population. The fish scarcity experienced in Nigeria can be eradicated through promotion and popularization of fish feed production to make food readily available and affordable to all Nigerians through entrepreneurial skills development among biology students in fish feed production.

#### **The Concept of Entrepreneurship Education**

Kourilsky (1995), defines entrepreneurship education as “opportunity recognition, marshalling of resources in the presence of risk, and building a business venture”. While Bechard and Toulouse (1998) defines it as “a collection of formalized teaching that informs, trains, and educates anyone interested in participating in socioeconomic development through a project to promote entrepreneurship awareness, business creation, or small business development. This means that skills that can be taught and engendered in students that can help them develop new innovation plans. With reference to integrated science skills taught in classes should be needed by the Entrepreneurs and the curriculum generally should address important functions of running a business. Therefore under the current period of economic growth, many are advocating entrepreneurial education to develop new ideas and start new business.

*Claria Gariepinus*, a highly priced fish in Nigeria due to their good taste and flavour is one of the major catfish species of the family Clariidae. It is the most culturable fish species. The fish inhabits freshwater bodies and can tolerate low dissolved oxygen and high turbidity (Reed et al 1967; Fagbero 1989; Idodo-Umeh, 2003). It feeds on any available food, including plankton, insects, fish, detritus, benthic invertebrates (annelids) and tadpoles requirement for the fingerling stage as reported by (Fagbenro et al 1992): The Nigeria fish biologists have not been able to meet the demand for the species by the populace. Hence, there is a need to boost the production of this highly commercially demanded culturable fish with high growth rate for food sustainability in Nigeria to alleviate food shortage problems.

This survey will provide information on steps on fish feed production and reiterate the need for a biology graduate to be effective in the production and their becomes self-reliance as a result of the development of acquired entrepreneurial skills.

#### **Nutrient Requirements of Fish**

According to Falaye (1988), the nutrient requirement values provide information on the daily nutrient needs of desired species in order to supply these amounts in diets for good fish performance. The nutrient

requirement of the fish could be estimated from feeding trials; and the requirements are affected by the fish species, age, sex, size and environmental conditions (Dabrowski, (1979). However, available data of closely related species could be adopted in cases of species with unknown nutrient requirements. Thus the estimates of nutrients needed by fish are subject to variation depending on the prevailing biological and environmental conditions.

### **Fish Feed Ingredients**

There are numerous feedstuffs available out of which many have potentials as ingredients in fish feed manufacture. Although a wide variety of plant and animal materials could be compiled, their nutrient composition and relative cheapness and availability should be considered in selecting feedstuffs for each species at different phases of their development. Also the processing methods and their costs, with the problems of handling and storage would also affect the selection of feedstuffs for diet preparation. The knowledge, and experience of fish nutritionists would therefore be required in the formulation and selection of the various components for large scale feed manufacture. Table 1 shows a list of some agro-industrial products commonly used in the manufacture of animal feeds in Nigeria.

**Table 1:** List of some common feed ingredients and their composition.

<b>Ingredients</b>	<b>Crude protein (%)</b>	<b>Ether extract (%)</b>	<b>Crude Fibre (%)</b>	<b>ASH (%)</b>	<b>Energy (ME Kcal/kg)</b>
Fish meal (white fist)	65	4.5	1.0	23.6	2860
Blood meal	79.9	1.0	1.0	6.2	2844
Meat and bone meal	53.8	10.1	2.3	31.0	2000
Feather meal (hydrolyzed)	85.4	2.6	0.6	3.9	2300
Groundnut cake	45.0	6.0	5.0	4.5	2540
Soyabean meal	42.0	3.5	6.5	5.0	2700
Maize	10.0	4.0	2.0	3.6	3432
Millet	10.0	4.0	8.0	1.9	2560
Guinea corn	11.0	3.0	2.0	2.6	3300
Cassava tuber flour	3.3	0.8	4.2	3.8	3100
Sweet potato (Dried)	2.8	1.9	1.0	3.5	3200
Palm kernel meal	18.0	6.0	12.0		2175
Wheat middling	17.0	3.5	8.5	2.8	1870
Rice polish	13.1	14.7	3.3	3.9	3000
Molasses	8.7	0.3		10.6	1900
Brewers grains	18.0	6.0	20.0	3.4	1980
Brewers yeast	48	1.2	3.2	6.0	2420

*Source:* (Falaye; 1988)

**Table 1:** The essential nutrients and their sources.

<b>Nutrients</b>	<b>Sources</b>
a. Protein	Fish meal, fish silage, groundnut cake, soyabean meal, ex-blood.
b. Carbohydrates	Corn meal, millet, wheat, rice bran and cassava.
c. Lipids (fat)	Fish oil, palm oil, coconut oil, palm kernel oil.
d. Vitamins	Vitamin premix
e. Minerals	Mineral premix, fish meal, bone meal, common salt.

*Source:* (Anozie; 1988)

## Fish Feed Formulation

In the production of diets, it is often needful to blend two or more feed ingredients together to obtain a balanced mixture with precise amounts of some major desired nutrients for the cultured species. Information on the nutrient requirements of the species are therefore essential before involving mathematical calculations with the selected ingredients until the aggregate of each nutrient contribution reach the required levels.

It is possible to use different methods of calculations in the formulation of fish diets using the specified feedstuffs:

### Pearson Square Method

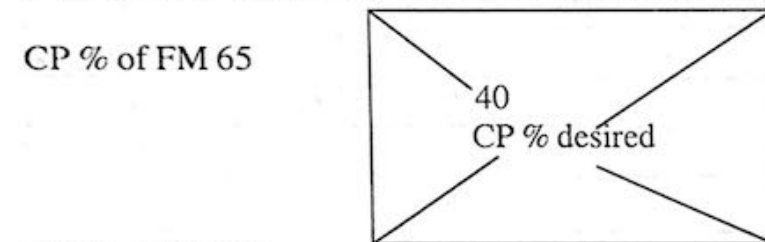
The Pearson square is a simple method by which feed ingredients of different nutrient composition can be mixed to obtain a desired concentration.

#### Exercise 1: Combination of two feed ingredients.

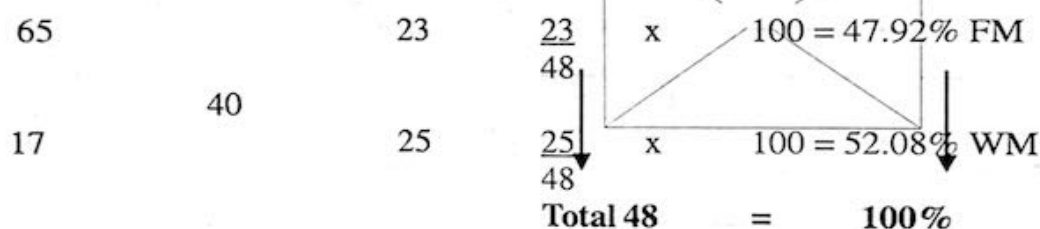
If a tropical fish species 'A' of 10g mean weight requires a 40% crude protein (CP) diet to be prepared from a mixture of fish meal (FM) and wheat middlings (WM), what combination of the fish meal and wheat middlings would provide the desired protein level in the mix.

The steps involved in the use of the pearson square method for the above purpose include:

Construction of a square with the nutrient concentration (%) of the specified feedstuffs placed at the two left angles, and the desired nutrient level inserted in the middle of the square as illustrated below.



The percentage crude protein of each ingredient is subtracted from that of crude protein desired (ignoring negative signs), and the results are recorded on the opposite corners of the diagonal.



### Preparation of Fish Feed

After the feed ingredients and their specific amounts have been selected to provide the required nutrients for the cultured species, the materials are processed into acceptable forms of feeds for the animals. In the preparation of fish feeds, the pellet size and texture are selected on the basis of species, size, feeding behaviour and characteristics of the holding facilities housing the cultured fish.

During the process of feed manufacture, all the feedstuffs are finely-ground and additives are included to fortify the basic mix with certain essential nutrients which are absent. The mixed ingredients are made into a mash by the addition of a little amount of water and the dough-form produced is forced under great pressure through an extruder containing a die of specified aperture diameter. The resultant spaghetti-like strands of feeds are collected and dried to keep moisture content below 10% for better preservation. The dried strands of feeds are broken into specified pellet sizes and stored in airtight containers until required for fish feeding.

### Feed Preparation

According to Ayinla (1988) it is possible for a fish farmer to make the required feed on the farm if the size does not exceed 2 – 5ha. If the farm is very large, it may be more difficult because of the scale and management problems.

**The steps involved in feed preparation include:**

- Collection of the raw feedstuffs: maize, cassava leaves, pawpaw leaves, groundnut cake, fish meal etc.
- Milling of the ingredient.
- Weight to specification according to formulation to satisfy the nutrient requirement of the fish.
- Mixing of ingredients and addition of water and binder to form a homogenous paste.
- Production of pellets by extruding the dough through galvanized aluminum sheets.
- The feed pellets may be applied wet to the fish or dried and stored in bags .  
For a large scale feed production, mechanical pelletizers would be required.

**Conclusion**

Entrepreneurs tend to start ventures that build on specific skills. Fish feed production of *Clarias gariepinus* if developed the knowledge acquired will be useful to the individual and the society.

**Recommendation**

If the following entrepreneurial skills are developed through Biology Education, the slogan will be achieved:

- Bee farming for honey production
- Snail farming
- Rabbit farming
- Establishment of Zoological garden.
- Establishment of Botanical garden.
- Fish farming/fingerlings production.

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