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Utilization of Processed Snail Meal and Supplementation with Conventional Fishmeal in the Diet of *Clarias gariepinus*

O.A. Oyelese
Department of Wildlife and Fisheries Management, University of Ibadan, Ibadan, Nigeria

Abstract: This study intends to promote the rearing (production) and marketing of the African giant snail (*Archatina marginata*) especially for the production of processed snail meal to supplement the conventional fish meal in the diets of *Clarias gariepinus* as used in this study. The visceral mass (entire flesh) of about 150 pieces of snail (*Archatina marginata*) were washed with alum and water. They were cut into pieces and dried in an oven at a temperature range of 60-70°C in an oven for about 72 h. The dried snail meat was used in compounding 6 isonitrogenous diets each with Crude Protein (C.P) of 38.25%; labeled 0% (no snail meal) (Control) 20, 40, 60, 80 and 100% snail meal diets (i.e. Treatments 1, 2, 3, 4, 5 and 6). The processed snail meal (with C.P 55.16%) was gradually being supplemented with fishmeal (C.P 65.00%) in each of the diets. The diets were fed to 90 juvenile *Clarias gariepinus* of average weight range from 4.35-4.63 g randomly distributed in 6 plastic bowl (15 fish per bowl). The fish were fed this 6 diets twice daily (10.00 a.m. and 5.00 p.m.) for an experimental period of 12 weeks (84 days). Proximate analysis of the feed, initial and final proximate composition of the experimental fish were also determined. Fish were weighed weekly and feed fed daily were recorded to determine growth and nutrient utilization pattern of the experimental fish. The best grow out of fish and best nutrient utilization pattern was recorded in Diet 4 (60% snail meal inclusion) with the highest Mean Weight Gain (MWG) (7.33 g), Specific Growth Rate (SGR) (1.154), Protein Efficiency Ratio (PER) (0.620) and Gross Efficiency of Food Conversion (GEFC) (0.240) but with the least Food Conversion Ratio (FCR) (0.34). The second best diet is Diet 3 (40% snail meal inclusion). While the poorest diet (Diet 6) (100% snail meal inclusion) recorded the lowest Mean Weight Gain (MWG) (2.22 g), SGR (0.500), PER (0.250), GEFC (0.017) and highest FCR of 0.84. This implies snail mean is best when used in supplementation with conventional fishmeal at a ratio of 60% snail meal to 40% fish meal. The present cost of production of 1kg of processed snail meal is put at N250.00 kg^{-1} compared to N300.00 kg^{-1} of fishmeal (i.e., just with a profit margin of 16.67%) could still further be reduced by promoting the active rearing and marketing of the African Giant snail (*Archatina marginata*) especially for fishmeal production, snail meat protein supply to the populace coupled with its medicinal value and liming properties of the snail shell in improving the quality of acidic (fish pond) soils.

Key words: Agricultural production of snails, marketing of processed snail meal, Snail meal supplementation with fish meal, *Clarias gariepinus* growth; economic vialibility of using snail meal (*Archatina marginata*)

INTRODUCTION

This study intends to promote the production and marketing of agricultural animal and livestock products like snails that could be used when processed to supply the protein requirements that could supplement the expensive conventional fishmeal in compounding fish diets, especially in the diets of *Clarias gariepinus* used in this study.

Huet (1972) reported that the use of supplementary feed is recognized as the principal means of increasing fish production through aquaculture, thus the use of artificial feeds in feeding fish has created a new component in the economics of fish farming.

It is however clear that supplementary feeding is a necessity in intensive fish culture as these determines profit levels and adequate economic returns. The conventional feedstuffs used in formulating fish feeds are maize, groundnut cake, the rather expensive fish meal, cowpea, soybean, sorghum, millet etc.

Information on the use of snail meal in fish diet is very scanty, although its chemical composition compares favourably with that of fishmeal which presently forms an expensive major source of protein in most successful fish, animal feeds and human foods.

Clarias gariepinus is a species widely distributed in Africa. The fish is tolerant to low dissolved oxygen and commands high market value in Nigeria because of its good flavour and ability to grow to large size. It readily accepts artificial feed and has a rapid growth rate. Young *Clarias* is observed by Carreon *et al*. (1976) to feed on zooplankton but after few months feeds on other live food and supplemental feeds. The major food items of *Clarias gariepinus* as reported by Elliot (1986) are the fry of other fish species. Lovell (1987) reported that higher quantity and quality of feeds have been a major reason for increased yields of cat fish per hectare in an intensive culture system.

Edible land snails belong to the Phyllum Mollusca, the Class Gastropoda (meaning Stomach footed), the order Pulmonata (lunglike organs) and the families Achatinidae (Achatina species) and Helicidae (Helix species). In West Africa, different species of snails are eaten both in the rural areas and in the urban settings. In Nigeria the most accepted specie is *Archatina marginata* (Hodasi, 1984). Presently there is a growing awareness in the rearing of the African giant snail (*Archatina marginata*) at commercial levels to supplement other sources (fish and livestock) proteins to meet the protein requirements of the populace. Surplus production of snail meat should be further encouraged in order to meet other uses such as processing to complement the rather expensive fishmeal sold in the open market.

Snail meat is exceptionally rich in iron, the iron content of snail meat is estimated at 12.20 mg 100^{-1} g while its amino acid profiles is estimated at 1½ × lysine and 2/3 × Arginine than the relative amount found in the whole chicken egg. Snail meat is rich in Vitamin A and B but less in Vitamin C than in beef. Shells of snail which is a rich source of calcium and its offal can be used as raw materials in livestock feed industry and aquaculture, respectively. While the liming potential of the snail shell can be exploited in reducing soil acidity in fish production ponds.

Of prime importance to man is the curative medicinal ability of snail meat to alleviate illnesses like tuberculosis, anaemia, diabetes, asthma, utrricaria and circulatory disorders. It can moreover surpress high body temperature constipation and haemorrhoids. It can moreover surpress high body temperature, constipation and haemorrhouls. It restores virility, vitality and can successfully cure hypertension (Oyenuga, 1968). Based on the foregoing on health grounds the necessity for the inclusion of snail meat in fish diets to produce fish protein for human consumption cannot be overemphasized.

Elmislie (1982) reported that snail meat trade is an important component of International world Trade. There has been considerable interest in snail farming in Italy and France in recent years, just as its consumption has greatly increased over the years. However, the flesh of snails, relished in many European countries appeals to few people in the United States. Foreign edible land snails have been such a nuisance that the U.S. Department of Agriculture, plant quarantine division (USDA) issues permit on limited basis for the importation and shipment of certain species of foreign edible snails for human consumption. Violation of which may attract fine or imprisonment.

In Nigeria, the local demand for snail meat is considerably high. A good number of top-social class people cherish and relish snail meat. It is sold in most restaurants as "Congo meat". While it is consumed in both Northern and Southern part of Nigeria, it is of culinary delicacy in the South. It is therefore the objective of this study:

- To determine the rate of growth and nutrient utilization of *Clarias gariepinus* fed processed snail meat supplemented compounded ration.
- To determine the best level of supplementation of fish meal with processed snail meal to promote growth in *Clarias gariepinus.*
- To determine the economic viability of supplementing processed snail meal with conventional fish meal.

MATERIALS AND METHODS

Preparation of processed snail meal: The specie of snail used in this study was the African giant land snail (*Archatina marginata*) of the genus Archatina. About 150 species of snail of sizes ranging from medium to large size were obtained from the local market. The visceral mass (entire flesh) was removed from the shell into a bowl of water containing alum. They were washed thoroughly in alum solution to remove slime from the material; after which clean water was used to wash the snail meat. This meat was cut into smaller pieces and was transferred into an oven to dry. The oven was regulated to a temperature range of between 60-70°C and the snail was dried for about 72 h. Dried snail meat was milled into powder by the use of domestic mechanical grinder.

Proximate analysis of the ovendried sample of snail meal contained 55.16% (on dry matter basis after ovendrying) Crude Protein compared to the 68.00% (C.P) fishmeal with which it is supplemented.

Preparetion of experimental diets: Six isonitrogenous experimental diets (each diet representing a treatment)

Table 1: Growth composition of compounded ration with processed snail meal supplemented with fish meal

Feed Ingredients	Diet 1 0% C.P	Diet 2 20% C.P	Diet 3 40% C.P	Diet 4 60% C.P	Diet 5 80% C.P	Diet 6 100% C.P
Fish meal	1.0 6.81	0.8 5.45	0.6 4.03	0.4 2.72	0.2 1.36	--
Snail meal	--	0.2 1.10	0.4 2.21	0.6 3.37	0.8 4.46	1.0 5.54
Palm kernel cake	1.0 1.80	1.0 1.80	1.4 2.52	1.5 2.76	1.6 2.88	1.8 3.24
Maize	1.0 1.01	1.0 1.01	0.6 0.60	0.5 0.50	0.4 0.40	0.2 0.20
Soyabean	2.5 10.53	2.0 8.43	2.0 8.43	1.5 6.30	1.0 4.26	0.5 2.11
Groundnut cake	4.0 18.10	4.5 20.46	4.5 20.46	5.0 22.60	5.5 24.89	6.0 27.16
Bone meal	0.3-	0.3-	0.3-	0.3-	0.3-	0.3-
Oyster shell	0.125-	0.125-	0.125-	0.125-	0.125-	0.125-
Growers premix	0.025-	0.025-	0.025-	0.025-	0.025-	0.025-
Salt	0.05-	0.05-	0.05-	0.05-	0.05-	0.05-
Total	10.00 kg 38.25	10.00 kg 38.25	10.00 kg 38.25	10.00 kg 38.25	10.00 kg 38.25	10.00 kg 38.25

each containing crude protein level of 38.25%. The composition of the 6 experimental diet treatments is shown in Table 1.

Diet 1 (0%) has no snail meal. The following ingredients were also added to complete the diet. Maize, Groundnut cake, palm kernel cake, Soyabean bone meal, Oyster shell, growers premix and salt. While snail meal is gradually being supplemented with fish meal at each level of diet treatment. The ingredients were mixed in small quantity of hot water of 60-70°C, hand mixed and pelleted with a locally made pelleter (perforated metal plate). The pellete of 2mm size were left to dry in the sun for about two days before feeding them to the fish.

Experimental set up: The experimental fish were obtained from Hilary Syndeham fish farm Moniya, Ibadan. The initial average weight of the fish ranged from 4.35-4.63 g. A total of 90 Juvenile *Clarias gariepinus* were randomly distributed into 6 plastic bowls (15 fish per bowl) after which acclimatization was done for about two days. During this period, the fish were not fed with any artificial diets, but were starved to allow total digestion of any food in their stomach. The experiment was carried out for a period of 12 weeks (84 days). Initial proximate composition of fish samples were determined according to A.O.A.C. (1990) methods.

Experimental procedure: At the end of acclimatization, fish in each bowl were weighed to determine the initial mean weight of fish in each bowl. Some of the remaining 10 Juvenile *Clarias gariepinus* (left over of the 100 fish purchased) were taken for initial proximate analysis. Also final proximate analysis of fish were carried out at the end of the 12 week experiment.

The test diets were introduced after the mean body weight of the fish had been determined. Feeding was done at 10.00 a.m. and 5.00 p.m. (i.e., twice daily) at a rate equivalent to about 5% of the total body weight of the fish in each bowl. While the excess feed that were not fed to the fish were extrapolated and deducted from the initial quantity of feed weighed out on a daily basis.

Fish in each bowl were weighed weekly and the readings obtained were used to compute parameters line mean weight gain, Specific Growth Rate (SGR), Protein Efficiency Ratio (PER) and other growth and nutrient utilization parameters. At the end of the experiment two fish were randomly taken from each bowl for final proximate analysis of the fish for crude protein, ether extract (fat), crude fibre, ash and moisture according to A.O.A.C. (1990) methods.

Monitoring of physico-chemical parameters: Physico-chemical factors like temperature in °C, PH, Dissolved Oxygen (DO) in mg L^{-1} were monitored on a daily basis according to the methods of Boyd (1981).

Growth and nutrient utilization parameters: The following growth and nutrient utilization parameters were calculated to monitor the effectiveness and utilization of processed snail meal in the growth performance of *Clarias gariepinus*.

Specific Growth Rate (SGR)

This was done in accordance with Brown (1957).

$$\text{SGR (\% W/D)} = \frac{\text{Log W2-Log W1}\times 100}{T_2\text{-}T_1 \quad 1}\times\frac{100}{1}$$

W_2 =Weight at time T_2 (days)

W_1 =Weight at time T_1 (days)

Protein Efficiency Ratio (PER): This was calculated from the relationship between the increment in the body weight of fish (i.e the weight gain of fish) and protein consumed according to the methods of Zeitoun *et al.* (1973).

$$\text{PER} = \frac{\text{Mean weight gain}}{\text{Protein intake}}$$

Productive Protein Value (PPV)
This is

$$PPV = \frac{\text{Increment of body protein}}{\text{Protein intake}}$$

Net Nitrogen Retention (NNR)

$$NNR = \frac{\text{Increase in body nitrogen}}{\text{Nitrogen fed 1}} \times \frac{100}{1}$$

Feed Conversion Ratio (FCR)

$$FCR = \frac{\text{Feed intake}}{\text{Wet weight gain}}$$

Net Protein Utilization (NPU): The net protein utilization was calculated according to Bender and Miller (1963).

$$NPU = \frac{N_b - N_0 + N_m}{Ib}$$

N_b = Nitrogen content of fish after experiment
N_0 = Nitrogen content of fish before experiment
N_m = Nitrogen metabolism
Ib = Nitrogen content of experimental diet

$$\text{Nitrogen content} = \frac{\text{Protein content}}{6.25}$$

Nitrogen metabolism (N_m)
This was calculated from the following

$$N_m = \frac{(0.549)\,(a + b)h}{2}$$

a = Initial weight of fish
b = Final weight of fish
h = Experimental period in days

Daily Growth Rate (DRG)

$$DRG = \frac{\text{Mean increase in weight per day}}{\text{Body weight of fish}}$$

Daily Rate of Feeding (DRF)

$$DRF = \frac{\text{Mean ration per day}}{\text{Body weight of fish}}$$

Gross Efficiency of Food Conversion (GEFC)

$$\text{Gross Efficiency of Food Conversion (GEFC)} = \frac{\text{Daily rate of growth}}{\text{Daily rate of feeding}}$$

Mean Weight of Fish (MWOF)

$$\text{Mean weight of fish (MWOF)} = \frac{\text{Total weight of fish}}{\text{Number of fish}}$$

Feed per Fish per Day (FFD)

$$\text{Feed per Fish per Day (FFD)} = \frac{\text{Weekly feed per fish}}{\text{7 days}}$$

Mean Weight Gain per Day (MWGD)

Mean Weight Gain per Day (MWGD) = Final Mean Weight Gain per Day (FMWGD)-Initial Mean Weight Gain per Day (IMWGD).

Percentage Weight Gain per Week (PWGW)

$$\text{Percentage weight gain per week (PWGW)} = \frac{\text{Mean weight gain per week}}{\text{Mean weight}} \times \frac{100}{1}$$

Mean Weight Gain per Week (MWGW): Mean weight gain per week = Final mean weight gain per week-Initial mean weight gain per week.

Gross Food Conversion Efficiency (GFCE %): This was calculated as the reciprocal of the food conversion ratio, expressed as a percentage (Stickney, 1969). Gross Food Conversion Efficiency (GFCE%) =

$$\frac{1}{FCR} \times \frac{100}{1}$$

Protein Intake (PI) GM: This was determined from the proportion of protein content in the total feed

$$\text{Consumed. PI} = \frac{\text{Total feed consumed} \times \text{Percentage protein}}{100}$$

Statistical analysis: Analysis of Variance (ANOVA) was carried out to test significance of the treatments on the fish growth rate pattern within the study period and level of significance was determined using the Duncan Multiple range test according to statistical methods of Steel and Torrie (1960).

Table 2: Proximate composition of experimental diets

Parameters	Diet 1 0% Snail meal	Diet 2 20% Snail meal	Diet 3 40% Snail meal	Diet 4 60% Snail meal	Diet 5 80% Snail meal	Diet 6 100% Snail meal
Crude protein	38.21	38.20	38.23	38.25	38.21	38.20
Fat	5.52	5.46	5.72	5.34	5.12	5.66
Moisture	51.60	51.35	51.43	51.70	51.74	50.88
Crude fibre	4.32	4.65	4.22	4.35	4.55	4.85
N.F.E.	0.35	0.34	0.40	0.36	0.38	0.41

Table 3: Initial and final proximate analysis for juvenile (*Clarias gariepinus*) fish

	Parameters	Crude protein	Fat	Crude fibre	Ash	Moisture	N.F.E
Initial	Initial	70.05	5.32	2.88	10.86	7.00	3.89
Final	Treatment 1 (0%)	72.35	3.20	0.42	6.64	8.22	9.17
	Treatment 2 (20%)	72.96	2.55	0.33	15.26	6.52	2.38
	Treatment 3 (40%)	74.04	1.86	0.24	13.90	4.83	5.13
	Treatment 4 (60%)	74.79	1.58	0.21	9.18	8.17	6.07
	Treatment 5 (80%)	73.48	2.14	0.28	14.50	5.57	4.03
	Treatment 6(100%)	71.72	4.30	0.56	15.02	4.10	4.30

Economic viability of substituting snail meal for fish meal in the diets of *clarias gariepinus:* Ten pieces of African giant snails (*Archatina marginata*) used (flesh weight) is 1 kg = ₦250:00, compared to 1 kg of 68% fish meal (₦300:00), leaves a margin of ₦50:00.

. . % gain of using 1kg of snail meal in every 1kg of fishmeal is

$$\frac{₦50:00}{₦300:00}\times\frac{100}{1}=\frac{1}{6}=\frac{16.67\%}{1}$$

From this study there is presently a marginal difference of 16.67% in the cost of processed snail meal (₦250 kg^{-1}) to ₦300 kg^{-1} of fish meal.

However, considering the potentials of replacement of snail meal with fish meal apart from its medicinal value to man snail farming should be encouraged as a potential Agricultural animal product that could yield high economic returns.

With increasing awareness in snail farming the current high price of snails (more so due to its culinary value and a delicacy in the diets of the so called high class societies) will fall much more than it is the case for now, once it is readily available in the open market compared to other livestock products like chicken, (poultry), beef and other livestock.

The high economic value of snails cannot be overemphasized since the viscerals can also be fed to fish and other livestock directly and the shell provides a ready source of calcium (limestone) which can be incorporated into compounded rations and if available in large quantities can be used to lime acidic soils of fish production ponds in order to enhance release of nutrients from the pond bottom and high productivity/yield of fish.

RESULTS

Table 2 shows the proximate composition of the compounded diets to contain at least 38.00% crude protein and on the average about 51.60% moisture, 5.50% ether extract (fat), 4.50% crude fibre and NFE 0.41% also on the average.

As shown in Table 3, all the final crude protein levels of the final fish (71.72%) (Treatment 6)-74.79% (Treatment 4) was much more higher than the initial crude protein of 70.05% fish.

Table 4, shows that the best diet treatment in terms of growth and nutrient utilization is Diet 4 (60% snail meal) in terms of Highest Mean Weight Gain (MWG) (7.33 g), Specific Growth Rate (SGR) (1.154), Protein Efficiency Ratio (PER) (0.620) and Gross Efficiency of Food Conversion (GEFC) (0.240), but with the least Food Conversion Ratio (FCR) (0.34). However the second best diet is Diet 3 (40% snail meal) with Mean Weight Gain (MWG) (4.71 g), SGR (0.795), PER (0.430), GEFC (0.160) and FCR (0.50). While the poorest diet (Diet 6) (100% snail meal) recorded the lowest Mean Weight Gain (MWG) (2.22 g), Specific Growth Rate (SGR) (0.500), PER (0.250), GEFC (0.017) and highest Food Conversion Ratio (FCR) of 0.84.

Table 5, shows an optimum ambient temperature range of 26.60-27.50°C, dissolved oxygen 6.18 g L^{-1}-6.35 mg L^{-1} and pH 7.10-7.40, w hich fell within the tolerable range for fish production as recommended by Boyd (1981).

DISCUSSION

The proximate composition of the 6 compounded diet treatments (Table 2) with varying ratios of snail meal supplementation (0, 20, 40, 60, 80 and 100%) with fish meal was 38.00% (C.P) in terms of crude protein content. This is in line with Lovell (1977) who recommended a Crude Protein (C.P) level of 25-45% as the optimum range of protein level for the intensive culture of Catfishes. Higher levels of 40% (C.P) were also recommended by Faturoti *et al*. (1986), Halver (1976) and Stickney (1969).

Table 4: Total initial and final mean weight gain/growth and nutrient utilization parameters (GMS)

Parameters/ Week	Diet 1 0% Snail meal	Diet 2 20% Snail meal	Diet 3 40% Snail meal	Diet 4 60% Snail meal	Diet 5 80% Snail meal	Diet 6 100% Snail meal
Initial mean weight						
Week 0	4.35	4.49	4.52	4.57	4.43	4.63
Week 1	4.47	4.64	4.74	4.85	4.75	4.73
Week 2	4.50	4.75	5.10	5.15	5.10	4.86
Week 3	4.90	5.23	5.46	5.45	5.43	5.26
Week 4	5.23	5.57	5.80	6.19	5.82	5.36
Week 5	5.29	5.95	6.17	6.81	6.18	5.61
Week 6	5.66	6.32	6.55	7.50	6.39	5.69
Week 7	6.10	6.61	6.92	8.23	6.69	5.88
Week 8	6.33	6.98	7.45	8.93	6.89	6.09
Week 9	6.68	7.31	7.86	9.56	7.89	6.37
Week 10	7.11	7.68	8.31	10.43	7.59	6.55
Week 11	7.56	8.08	8.80	11.09	7.91	6.68
Final mean weight						
Week 12	7.82	8.42	9.23	11.90	8.11	6.85
Total Mean Weight (0-12 weeks)	71.65	77.54	82.39	96.09	78.75	64.24
Mean Weight Gain (0-12 weeks)(MWG)	3.47	3.93	4.71	7.33	3.68	2.22
Food Conversion Ratio (FCR)	0.60	0.50	0.50	0.34	0.53	0.84
Specific Growth Rate (SGR)	0.708	0.759	0.795	1.154	0.735	0.500
Protein Efficiency Ratio (PER)	0.350	0.380	0.430	0.620	0.390	0.250
Productive Protein Value (PPV)	0.020	0.020	0.030	0.030	0.030	0.014
Nitrogen Metabolism (NM)	-1014.32	-1163.97	-1301.16	-21235.40	-1129.00	-664.76
Net Protein Utilization (NPU)	-19.41	-20.76	-23.61	-34.23	-21.29	-13.66
Gross Efficiency of Food Conversion (GEFC)	0.140	0.210	0.160	0.240	0.150	0.017

Table 5: Mean values of limnological parameters in the 12 week experimental period

Parameters	Diet 1 0% Sn. M.	Diet 2 20% Sn. M	Diet 3 40% Sn. M	Diet 4 60% Sn. M	Diet 5 80% Sn. M	Diet 6 100% Sn. M
Temperature °C	27.00	27.50	26.80	27.40	26.60	27.20
Dissolved 0_2 (Mg C^{-1})	6.18	6.24	6.28	6.35	6.25	6.20
pH	7.14	7.10	7.40	7.30	7.18	7.12

Table 3 also showed that much higher values of crude protein (71.72% (Treatment 6)-74.79% (Treatment 4) were recorded compared to the initial value of 70.05%. This implies all the 6 diet treatments (with the snail meal inclusion) influenced the growth pattern and nutrient utilization of the grow out fish throughout the experimental period of 12 weeks. This is further confirmed by the higher SGR, PER, GEFC, but much lower FCR shown in Diets 2, 3, 4 and 5 compared to the Diet 1 with no snail meal inclusion as shown in Table 4.

However, the best diet treatment is Diet 4 (with 60% snail meal inclusion) (Table 4) which recorded the highest mean weight (MWG) (7.33 g), Specific Growth Rate (SGR) (1.154), Protein Efficiency Ratio (PER) (0.620) and Gross Efficiency of Food Conversion (GEFC) (0.240), but with the least Food Conversion Ratio (FCR) (0.34). While the poorest diet (Diet 6) (100% snail meal) recorded the lowest Mean Weight Gain (MWG) (2.22 g), Specific Growth Rate (SGR) (0.500), PER (0.250), GEFC (0.017) and highest Food Conversion Ratio (FCR) of 0.84. This observation is in line with Stickney (1969) reports in his studies.

The above observation simply shows and implies that the use 100% snail meal will not produce the best growout of fish. However to obtain optimum and best growout pattern of fish the level of supplementation should be 60% snail meal to 40% fishmeal.

In terms of economic viability of using snail meal the cost of producing 1kg of processed snail meal is presently ₦250.00, which when compared with ₦300.00 (cost of 1kg fish meal) leaves a profit margin of 16.67%. However active rearing of the African Giant Snail (*Archatina marginata*) should be encouraged. This is because apart from its potential of being used as fish meal its medicinal values and the use of its shell, as a ready source of calcium (limestone) for liming fish ponds (especially ponds cited in acidic soils) cannot be overemphasized.

CONCLUSION

The active rearing of the African Giant Snail meat will not only bring the present cost of production of processed snail meal down but will also increase its profitability level from 16.67% compared to the use of conventional fish meal; apart from its medicinal value to man and the liming properties of the snail shell.

The best diet treatment is Diet 4 (60% snail meal) which had the highest fish growout and best nutrient utilization pattern. However 100% snail meal supplementation is not advised since this produced the poorest fish growtout. For fish compounded feed diet, snail meal should be 60% supplemented with 40% fish meal.

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