INVESTMENT POTENTIALS IN SHELLFISH CULTURE IN NIGERIA

by

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ABSTRACT

The shellfish are a major but cheap protein source for human consumption as well as source of income for coastal towns and villages of the Niger Delta in Rivers State, Cross River, and Lagos States.

A research into the nutritive value of some of these marine shellfish viz: bivalves (Oyster - Crassostrea gasar and Cockle-Anadara senilis); Gastropods (Periwinkle - Tympanotonus fuscatus, Obtuse periwinkle - Semifusus morio and the giant whelk - Thais callifera) and Mangrove crabs (Green crab - Goniopsis pelli, Ghost crab - Cardisoma ormatum, and common blue crab-Callinectes latimanus) was carried out to compare their quality and cost with beef, chicken meat, pork and egg in order to identify those most suitable for commercial culture.

Results show that all shellfish had at least 16% crude protein except blue crab (13.38%). All shellfish had higher protein content than egg (13.36%). Cockle with protein content 25.47% compared favourably with beef. (29.60%). Beef, chicken meat and pork cost ₦11.50, ₦9.00 and ₦8.00 per kilo respectively while oyster, periwinkle and the common blue crab cost ₦3.50, ₦3.00, and ₦1.50 per kilo respectively. Oysters and Cockles are recommended for commercial culture based on the findings of this research.

INTRODUCTION

The most expensive single component in the human diet is protein. Conventional animal protein sources in the diet such as beef, chicken meat, pork, egg and fish are becoming very expensive owing to high cost of production.

The second national development plan report (1970-75) stated that the staple food crops of Nigeria consist of roots, tubers, pulses and cereals. Available results from limited nutrition surveys conducted in various parts of the country indicate that

the average caloric intake of Nigerians is about 2,200 kcals per capita/day. This is far below the average intake of 3,200 kcals per day recommended by FAO and recorded for some industrialised countries. The report further stated that nutritionally the available protein in the Nigerian diet is also inadequate at the indicated level of 62g per day per capita compared with the minimum requirement of about 77g. Moreover, yields of the protein nutrient crops like pulses and nuts are still very low, apart from large losses occurring in quantity both in transit and storage. Of greater concern, however, is the small protein proportion in the Nigerian diet that comes from animal sources. It was further recommended that 35g out of the required minimum of 77g of reference protein should be obtained from animal products. But only 7g out the 35g available in Nigerian diets come from animal sources. This means that only about one fifth of the minimum animal protein requirements is presently supplied from animal produced in the country. The situation is not different if not worsened today by the present economic crunch in the country.

Afinowi (1975a) estimated the quantity of fish required in Nigeria as 869,000 tons, where as the quantity then produced from all sources was 663,000 tons leaving a deficit of 206,000 tons. Of this deficit, a little over 106,000 tons was met by imports. Judging from the trend of events from 1975 to 1985, the deficit value must have escalated more seriously within the decade. Awachie (1976) reported that maximum sustainable yield of fish from all sources was 484,000 metric tonnes while the demand for human consumption alone for the target years 1975, 1980, and 1985 were 380,000 tons, 574,000 tons, and 1,229,000 metric tons respectively quite distressing indeed.

It would therefore not be improper if supplementary source of protein other than from plants and conventional animal sources including fish be recommended. Nigeria is blessed with quite a lot of marine shellfish with potential for culture. A study of their nutritional value is invaluable to determine species best for commercial production, hence this study.

MATERIALS AND METHODS

The nutritive value of some marine shellfish viz: bivalves (oyster-*Crassostrea gasar*, and cockle-*Anadara senilis*); Gastropods (periwinkle - *Tympanotonus fuscatus*, obtuse periwinkle - *Semifusus morio*, the giant whelk - *Thais callifera*) and mangrove crabs (Green crabs - *Goniopsis pelli*, ghost crab - *Cardisoma ormatum* and blue crab-*Callinectes latimanus*) were compared with beef, chicken meat, pork and egg.

The sample were purchased at a local market in Port-Harcourt and analysed for crude protein, crude fat, ash and moisture in their cooked state. Smoked and dried oyster, cockle and crabs were further analysed. All analyses were done according to methods described by AOAC (1970). Based on prevailing market prices the amounts and cost of each product required to supply 77g protein requirement in the Nigerian diet were also calculated.

RESULTS

A summary of the results obtained from the study are shown in Tables 1,2, and 3. The approximate chemical composition of the marine shellfish are compared with livestock products The highest moisture content of 81.18% was obtained for T. fuscatus while the least was obtained for beef (57.76%). Crude protein was highest in Beef (29.60%) although 13.36% for egg was lower than values obtained for all marine shellfish. Furthermore, shellfish had a low fat content while as was high in mangrove crabs with Cardisoma ormatum having highest mineral ash content of 20.70%.

Table 2 shows the effect of smoking and drying on the chemical composition of some of the shellfish studied. Moisture content was generally low but protein content was very high. As high as 52.41% protein was obtained in smoked and dried cockle, A. senilis.

The contribution made by these food items to the protein needs of humans and their relative costs are shown in table 3. The marine shellfish were found cheaper than the livestock products. It costs ₦0.71 to supply reference protein in human diet using the crab, G. pelli, while it will cost ₦2.30 using egg which is the cheapest of the livestock products.

DISCUSSION

Marine shellfish, whose culture have so far been neglected in this country, are no doubt an invaluable additional protein source in the human diet. The high protein content of smoked and dried oysters and cockles is notable. A production of 20 tons/ha have been reported in Japan (Bardach, 1972) using raft culture method, for C. gigas which is also the species identified in Nigeria. In the Philippines, over 4,000 ha of bottom in Manila bay alone are devoted to oyster culture of clams- cockles of Anadara spp. is already practiced in Japan, China and Philippines. In Taiwan, two of Japanese species of cockles A. granosa an Sinovacula constricta which are cultured commercially, contributed 60,989 and 11,047kg respectively in 1965 while the principally cultured clam in Taiwan, the blood clam, Meretrix mertrix, yielded 1,252,432kg in 1965 (Bardach, 197

There are well over 6,049 square kilometers of brackishwater swamps with creeks, estuaries, and intertidal swamps, (Scott, 1966), presently unexploited for aquaculture purposes but with suitable sites for culture of marine shellfish. Afinowi (1975b) reported on the biology of A. senilis and C. gasar and also identified potential areas for possible cultivation. The cost of production are expectedly low since inputs are minimal and their culture technology such as bottom culture in parks, raft culture, tray culture, and long line culture are easy to adapt to local conditions in Nigeria. Hitherto production and supply of marine products have been dependent on harvests from the wild by local fishermen. There is no doubt that if commercialised the venture will be profitable bearing in mind the low production costs and ready market.

SUMMARY AND CONCLUSION

The above study suggests that marine shellfish could contribute significantly to our mitritional needs in this country. They are cheaper protein source than conventional sources such as beef, chicken meat, pork, egg, and even fish and are acceptable to consumers. Their generally low fat content could render them useful in cases of obesity in our society. The above factors coupled with an abundant natural seed supply are good indicators that marine shellfish culture especially oysters and cockles have good prospects for investment in Nigeria.

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Table 1 - Approximate Chemical Composition Of Cooked Livestock and Shellfish Products

Samples	Moisture %	Crude Protein %	Crude fat %	Ash %
Beef	57.76	29.60	10.36	1.40
Chicken meat	64.60	28.01	6.01	1.19
Pork	57.03	29.01	12.13	1.25
Egg	74.01	13.36	10.60	2.15
T. fuscatus (Periwinkle)	77.22	16.44	0.87	0.90
C. gasar (Oyster)	73.65	17.92	3.29	1.74
S. morio (Obtuse Periwinkle)	67.87	21.13	2.00	2.93
T. callifera (Whelk)	68.42	25.03	3.27	1.96
A. senilis (Cockle)	67.83	25.47	2.07	0.73
C. ornatum (Green crab)	60.08	15.77	1.95	20.76
G. Pelli (Ghost crab)	63.09	17.32	1.07	18.32
C. latimanus (Blue crab)	72.61	13.38	1.34	10.39

Table 2 - Approximate Chemical Composition of smoked and dried marine shellfish

Samples	Moisture %	Crude Protein %	Crude fat %	Ash %
C. gasar	14.90	45.20	10.19	6.88
A. Senilis	15.53	52.41	3.84	7.56
C. ornatum	24.39	26.72	1.73	40.91

Table 3 - Amount of Shellfish and Livestock Products Required To Supply Reference Protein in Adult Humans Vs Cost

	Amount to supply 77g reference protein for adults (g)	Cost per 100g ₦	Cost for requirement of 77g ₦
Beef	260.14	1.15	2.99
Chicken meat	274.90	0.90	2.47
Pork	265.43	0.80	2.12
Egg	575.06	0.40	2.30
T. fuscatus	468.37	0.30	1.41
C. gasar	429.69	0.35	1.50
S. morio	364.41	0.30	1.09
A. senilis	302.32	0.40	1.21
T. callifera	325.86	0.41	1.34
C. ornatum	488.27	0.15	0.73
G. Pelli	444.57	0.16	0.71
C. latimanus	575.49	0.15	0.86
C. gasar (smoked & dried)	170.35	0.55	0.94
A. Senilis " "	146.92	0.40	0.59
C. ornatum " "	288.17	0.43	1.24

Appendix Table 1 - Formulae for Calculations

1. Protein/100g = % protein of samples

2. Amount of sample to supply reference protein

$$= \frac{100 \times \text{Reference Protein}}{\text{Amount of Protein in Sample (\% protein)}}$$

3. Cost of Sample to Supply Reference Protein ₦ :

$$= \frac{\text{cost of sample 100g} \times \text{wt. of sample supplying ref. protein}}{100}$$