Prospects for Adaptable Technological Innovations in Fresh Fish Processing and Storage in Rural Areas of Doma L.G.A. of Nasarawa State

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Abstract

Most fish become inedible within 12 hours at tropical temperatures after capture. Spoilage begins as soon as the fish dies and processing should therefore be done quickly to prevent the growth of spoilage bacteria. Fishing activities are of very importance to the agricultural sector. This paper is aimed at dealing with the problems and prospects of fresh fish processing and storage. The study was carried out by means of structured questionnaires administered to selected fishermen and traders in 2003-2006. The performance of fresh fish market's revealed that 82% of the fish marketers are middlemen. Over 96% of the respondents process the fish into smoked fish. The smoked fish generally reduce the profit of the fish marketers according to 90% of the respondents. 85% of the respondents complained of suffering as a result of crude method of processing and 73% of the processors of fresh fish by smoking are women. It is recommended that natural fresh storage projects should be provided and commissioned by the Federal Government while storage centres could be created at Doma and some selected fishing villages by the Government.

1. Introduction

In many countries the bulk of fish is sold fresh for local consumption. Processing, where this is done, is either to supply distant market or to produce a range of products with different flavours and textures. Fish is an extremely perishable food. Most fish become inedible within 12 hours at tropical temperatures (32-35^0C) after capture. Spoilage begins as soon as the fish dies and processing should therefore be done quickly to prevent the growth of spoilage bacteria. Fish is a low acid food and is therefore very susceptible to the growth of food poisoning bacteria (Yohanna, 1998 and 2001)

Fish provides a good source of high quality protein and contains many vitamins and minerals. It may be classed as either white, oily or shellfish. White fish such as haddock and seer, contain very little fat (usually less than 1%) whereas oily fish such as sardines, contain between 10-25% (Dada and Yohanna, 2001). The latter as a result of its high fat content, contain a range of fat-soluble vitamins (A,D,E & K) and essential fatty acids, all of which are vital for the healthy functioning of the body (Souness, 1990).

Protein deficiency in the food intake of Nigerian rural populace has been a major problem. Comparatively, only 15m/caput/day of animal protein out of a total protein intake of 59gm/caput/day is recorded in Nigeria (Daramola *et al.,*1988) while a daily intake of about 70gm/caput/day out of which at least 35gm/caput/day should be from animal source as estimated by the UN/FAO. According to Ogunyemi (1988), Nigerians derive 35% of their per capita calories in-take from starchy crops and less than 1% from milk. This will obviously lead to malnutrition. Other factors that have contributed to the deplorable nutritional status of the country include inadequate level of production, poor marketing and distribution network, ignorance, illiteracy, religious and cultural taboos.

The fishery sub-sector is very important in the Nigerian economy. According to Okayide *et al* (1972), 47.98% of the protein intake of animal origin in the diet of the average Nigerian is from fish (Table 1). It is an important source of animal protein for a wider spectrum of the Nigerian population. Secondly, it provides gainful employment opportunities for many Nigerians, especially in the coastal riverine and the lake areas of the country (Adesimi and Aderinola, 1983).

Fish has become a prominent substitute for other animal protein products in recent times. Consequently, there is an increase in demand of fish. This may be due to the lower price of fish compared to meat which is another common source of animal protein (Yohanna, 2006). Fisheries sub-sector has contributed significantly to the Gross Domestic Product (GDP) on recent years. The fourth National Development Plan recorded the fastest growth rate in the relative contributions of the Agricultural sector to the GDP with a modest contribution of about 4% in 1984. The growth of this sub-sector was estimated at 3% for the period 1985, compared to 1% in food production within the same period (Mabawonku, 1983).

The activities of fishermen are of very important to the agricultural sector because the capture fisheries are the major source of domestic fish production. According to Yohanna (2003), the continual production of fresh fish by these fishermen is dependent on the marketing efficiency and the resultant level of profitability.

The specific objectives of this paper were to examine:

i.   The processing and storage problems facing fresh fish farmers in Doma Local Government Area.

ii.   The possible prospects for adaptable technological innovations in fresh fish processing and storage.

iii.   The economic implications of the adaptable technological innovations in fresh fish processing and storage.

2. Research methodology

Well structured questionnaires were administered to 440 randomly selected fishermen and traders in 2003-2004. Data were collected on the problems involved in the fresh fish processing and storage. The research covered eleven villages in Doma Local Government Area. The villages covered are Doma dam, Agyirima, Rukubi, Alagye, Amaku, Kukuture, Ruwanbaka, Akpanaja, Agbashi, Yelwa and Agbatu.

Information was collated from the Ministry of Agriculture and Natural Resources at Doma on their involvement with the fishermen and fresh fish traders. Interview was conducted for some of the opinion leaders among the fishermen and fresh fish traders. The information supplied by the respondents through both the questionnaires and interview were collated and subjected to simple descriptive statistical analysis.

3. Results and discussion

The performance and structure of fresh fish marketers revealed that 82% of these fish marketers are middlemen. (Table 2). Some of them come from neighbouring urban centres within Nasarawa State and other neighbouring states. They buy fresh fish at Doma on market days which takes place every Wednesday of the week. Doma town serves as a central market for the fish marketers hence some travel to the fish farming villages to buy fresh fish and resell at Doma town. Over 96% of the respondents process the fresh fish into smoked fish because they do not have deep freezers or cold room facilities. (Table 3). There is no known local technological storage technique to the fishermen and fresh fish marketers. Crude methods of storage commonly practice include keeping the fresh fish in cold water for sometime and covering the fresh fish with leaves and wetting the leaves with cold water. The effect of this local method of storage is reduction in the freshness of the fish and sometimes spoilage.

Generally, the fresh fish is more costly than the processed smoked fish; hence virtually all the fishermen prefer to sell the captured fish as fresh. Comparatively, the price of fresh fish is higher than that of smoke fish. Hence, many of the fish marketers are compelled to smoke their fresh fish whenever they are not able to sell them fresh. The smoked generally reduce the profit of the fish marketers according to 90% of the respondents. (Table 4). Absence of supportive infrastructural facilities like electricity, functional transport system among others has aggravated the storage problem.

The fresh fish smoking method is regarded as tedious, cumbersome and very crude by 95% of the respondents. 85% of the respondents complained of suffering as a result of the crude method of processing, the suffering includes eye pains, sickness and frequent breakdown. (Table 5). There is the need for the development of a technology for smoking fish that will not make the processors to experience all these suffering and hazards. 73% of the processors of fresh fish by smoking are women (Table 6), the poverty alleviation programme has vital role to play in alleviating the suffering of these women.

High cost of dry woods used for smoking the fresh fish is another problem in fresh fish processing as 93% of the respondents claimed they are faced with this problem (Table 5). The vegetation in Doma Local Government.Area is very sparse, this factor may be responsible for high cost of dry wood; another possible factor for high cost of dry wood is the high demand for it because most of the consumers in these areas use dry wood as the source of energy for cooking and also most of the dry fire woods used for parboiling of rice in Lafia

L.G.C. are obtained from Doma LGA. Storage of the processed smoked fish is difficult because of attack from fish maggots and insects. Presently, these rural dwellers have not been able to store the smoked fish for long except with continual smoking which reduces both the qualitative and quantitative value of the fish.

4. Prospects for adaptable technological innovations

The solution to the processing and storage problems of fresh fish among rural fishermen demands an urgent national attention. A situation in which the plight of these fishermen has not been given adequate attention is not economically wise, considering the loss in the quantitative and qualitative value of fresh fish which will aggravate its scarcity. Adaptable technological innovations by Agricultural engineers can alleviate these multi-problems (Yohanna, 2006).

It is expected that consideration should be given to the possibilities of innovating small, medium and large scale processing machines for fresh fish. Charcoal energy fish dryer could be fabricated at affordable price for the usage of fishermen and women to process their fresh fish. Gas energy fish drying ovens could also be fabricated for the same purpose of processing fresh into dried fish. For the rural areas where there is electricity, electrical energy fish driers can also be fabricated for the use by the fishermen. Kerosene energy fish dryer is another possible technological innovation for processing of fresh fish. Possibility of fish processing plant which can be whole innovation of Nigerian Agricultural engineers or prototype of the existing types for processing fresh fish into canned fish should be explored.

Fresh fish can be stored in deep freezers and by providing cold room facilities. This is only possible in fishing rural settlement with electricity. Another possibility is the provision of mobile storage facilities which can move by road, sea or air.

5. Conclusion and recommendations

The economic implication of the adaptable technological innovations in fresh fish processing and storage includes: increased quantity and quality value for both fresh and processed fish, improvement of the standard of living among the rural fishermen, provision of employment opportunities, reduction of rural urban migration, possible increased in the income of fishermen and reduction of the chain or middlemen between fishermen and consumers.

To achieve these positive economic developmental implications, the following recommendations should be considered for implementation.

i.   The National fresh fish storage projects should be provided and commissioned by the Federal Government. These projects should be adequately funded while Agricultural Engineers, Nutritionists, Agricultural Economists and other relevant scientists should be involved. The small scale fresh fish dryers innovated should be problem cheap and affordable by the fishing community members.

ii.   Fishermen in fishing communities with electricity should be encouraged to form cooperatives which can jointly fund the acquisition of cold room facilities through the support of Federal, state and local governments.

iii.   Storage centres could be created at Doma town and some selected fishing villages by the government. Fishermen and fresh fish marketers could be allowed to store their fresh fish in cold rooms or deep freezers located at these storage centres at a token amount/cost.

iv.   Innovation of fresh fish processing machines and plants should be given urgent attention. The possible technological innovation mentioned earlier could be explored. Agricultural engineers and related scientists could form a research team for this purpose while fund should be made available by the Federal Government or sourced for from relevant international organizations.

v.   Generators could be used to provide electricity to operate the storage centre machines in fishing communities without electricity. Electrification of the rural fishing communities should be vigorously implemented.

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Table 1. Component of animal protein in the diet

Animal Products	Protein(gm) Per Caput per day	Percentage
Beef	1.77	9.13
Goat meat	0.92	4.75
Mutton and Lamb	0.18	0.93
Poultry	0.40	2.06
Pork	0.15	0.77
Offal	3.24	16.75
Bush meat	2.18	47.98
Fish	9.92	47.98
Eggs	0.38	1.96
Milk	0.95	4.40
Cheese	0.02	0.01
Total	**34.96**	**100**

Source: Olayide *et al.,* 1972

Table 2. Distribution according to fish marketers' performance

Types of Enterprise	Frequency/percentage
Fisheries	08
Middlemen	82
Traders	10
Total	**100**

Source: Field Data 2003-2006

Table 3. Distribution according to forms of processing due to lack of storage facilities

Forms of Processing	Frequency/percentage
Smoked fish	97
Others sun drying, salting etc	03
Total	**100**

Source: Field Data 2003-2006

Table 4. Reduction of profit of fish marketers due to smoking of the fish

Response	Frequency/percentage
Yes	90
No	10
Total	**100**

Source: Field survey 2003-2006

Table 5. Distribution of respondents according to problems

Types of Problems	Frequency/percentage
Eye pain, frequent breakdown	85
High cost of firewood	93
Crude methods of processing	85
Lack of storage facilities	90

Source: Field Data 2003-2006

Table 6. Distribution of sex of processors of fresh fish by smoking

Sex	Frequency/percentage
Male	27
Female	73
Total	**100**

Source: Field survey 2003-2006