

Full Length Research Paper

Fish post-harvest technologies as a mean of food and nutrition security

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Fish provide the main source of animal protein to about billion people globally. Fisheries are an important part of food security, particularly for many poor peoples in developing countries. In low income food deficiencies countries (LIFDCs) they make up 22% of animal protein consumption overall. The importance of small-scale fisheries in particular for food security is emphasized by FAO especially in coastal areas and around major rivers systems. Fish and fisheries contribute to food security through Subsistence and local consumption, income, accessible protein for the poor, reduces vulnerability etc. Fish plays an important role in a nutritionally rich diet for many Ethiopians. Eating habits have been shifting in favor of fish in the areas and communities where there is regular and significant supply. In those communities, annual fish consumption can exceed 10Kg/Person". Among different solutions to maintain fisheries' contribution to food security; reduction in fish post-harvest loss, improving the traditional processing, handling, and preservation method of fish and its gear system, developing new and value added products, etc through generating and adopting new technologies are crucial and the concern of this paper.; Different fish driers, processing kits, fertilizer, meal, smoking and marinating, retaining cage are among generated, adopted and scaled up technologies which contributes a vital role in food and nutrition security through availing preserved high quality protein and minerals, increasing production and its shelf life availing throughout the year at different places, generating income job opportunities to numerous householders(fish catch, net production, value addition, distribution, market processing).

Keywords: food, nutrition, security, technology, fish, processing.

INTRODUCTION

Food insecurity remains one of the most visible dimensions of poverty and is generally the first sign of extreme destitution. Food security does not just concern food production; it can be defined as the physical and economic access to sufficient safe and nutritious food to meet dietary needs (FAO, 1996). Fish provide the main source of animal protein to about one billion people globally. Fisheries are an important part of food security, particularly for many poor people in developing countries. In low income food deficient countries (LIFDCs), they make up 22% of animal protein consumption overall. In coastal areas and around major river systems the dependence on fish is usually higher (FAO/UNDP, 1966). The importance of small-scale fisheries in particular for food security is emphasized by FAO.

Fish and fisheries contribute to food security in a variety of ways (Borgstrom G., 1962).

For example- Subsistence and local consumption; fisheries provide a direct supply of fish, either for consumption by fishers and their families, or through their sale at local markets,

Income; 38 million people worldwide are employed in fisheries, 95% of whom are in developing countries. The income from employment, and the financial revenues from the sale of fish, provides cash which can then be used for the purchase of other foodstuffs,

Accessible protein for the poor; fish are often one of the cheapest protein sources available in developing countries. Small fish are especially important for poor consumers, as they can be purchased in small quantities

Table 1. Catch and loss of three fish species in Lake Zeway for 2004 and 2005 G.C.

year	Species	Catch in ton	Loss in ton
2004	Oreochromisniloticus	178	36.12
	Clariasgarepines	219	36.79
	Common carp (carrasus)	61	2.73
2005	Oreochromisniloticus	271.7	32.12
	Clariasgarepines	151	15.44
	Common carp (carrasus)	23	0.96

NB- The above mentioned loss is only due to production as a preference of size specially and concerned with mass loss rather than nutrient loss.

at low cost. The same consumers often cannot afford to buy other protein sources which have to be bought in much larger quantities, such as chicken etc.

Fish plays an important role in a nutritionally rich diet for many Ethiopians (Reyntjens D, 1995). Access to fish varies regionally; where fish is available it contributes significantly to a healthy diet and eating habits have been shifting in favor of fish in areas and communities where there is regular and sufficient supply. In those communities, annual fish consumption can exceed 10Kg/person (FAO, 1996).

Among different solutions to maintain fisheries' contribution to food security reduction in fish postharvest loss, improving the traditional processing, handling and preservation method of fish and its gear system, developing new and value added products, etc through generating and adopting new technologies are crucial and concern of this paper. Among generated, adopted and scaled up technologies on fish post-harvest through Zeway fishery resources research center different fish dryers, fish processing kits, fish fertilizers, fish meal, marinating, fish smoking (smoker), fish retaining cage, etc contributes a vital role for food and nutrition security through availing preserved high quality protein and minerals, increasing production and its shelf life to make available throughout the year and at different places, generating and increasing income as value is added, generating job opportunity to many households (fish catch, net production, value addition, distribution, market etc).

Contribution of fish postharvest technology to food and nutrition security

“Food security”, defined by FAO as “a condition when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” concerns not only food production and distribution but also has social, economic and institutional dimensions. A household achieves nutritional security when it has secure access to food (that is food security) coupled with

a sanitary environment, adequate health services and knowledgeable care to ensure a healthy life for all household members.

Direct Contribution of Fish to Food and Nutrition Security

Protein and calorie intake

FAO estimates that fish provides 22% of the protein intake in sub-Saharan Africa. This share, however, can exceed 50% in the poorest countries (especially where other sources of animal protein are scarce or expensive). Equally important is the fish's contribution to calorie supply. Where there is a lack of alternative locally produced protein and where a preference for fish has been developed and maintained fish can provide up to 180 calories per capital per day.

Micronutrient and fatty acid supply

The importance of fish as a crucial element in diets, especially the diets of infants, young children and pregnant women, is now widely recognized. In low-income countries, staples make up the bulk of the food consumed by the people, and they supply the majority of energy and nutrients. However some essential nutrients are not found in these staples, or are found only in small quantities, for example, iron, iodine, zinc, calcium, vitamin A and vitamin B. These nutrients must be supplied by other foods. The fish contribution in the supply of these elements can be particularly important as well as in the supply of fatty acids that are necessary for the development of the brain and body (Kandran M, 1976).

Fish: a rich food for poor people

Over large parts of sub-Saharan Africa fishing for subsistence plays a central role in sustaining human well-being. For those who cannot afford to buy food especially

not meat fish obtained through the household's own fishing efforts (subsistence) is essential; it can make the difference between good and bad nutrition, between food security and starvation.

Indirect Contribution of Fish to Food and Nutritional Security

Food security through employment for the poor

Small-scale fisheries and related activities (trade, processing) provide income to rural communities where alternative employment opportunities are scarce or even non-existent. In these situations small-scale fisheries, fish processing and trade provide people with an important, and sometimes crucial, form of safety-net that helps protect them against the effects of agricultural product price volatility, macro-economic crises, structural reforms, harvest failures, political turmoil and other factors that threaten rural stability and food security. In this way small-scale fisheries substitute and complement other economic activities and help households sustain their standard of living and food purchasing power (Reyntjens D, 1997). For women in particular fish processing and trading provide a very important livelihood support.

Issues threatening the contribution of fisheries to food and nutrition security

Postharvest loss

"FAO estimates for fisheries in some countries including Ethiopia place fish losses among the highest for all commodities" where Ethiopia losses one third of the annual production.

Processing

The characteristics and the technology of traditional fish processing are made in general under primitive condition which results in low yield (mass loss) and poor quality (nutrient loss) of the product since fish is very perishable food stuff. In addition to fish's higher water activity (A_w), the poor sanitary practices in local fish processing results in public/consumer health hazards due to the presence of pathogenic bacteria (safety loss) (Burgess G., 1965).

Overexploitation

With growing populations, there is a need to feed more and more people. Coupled with effective open-access systems, this often translates into increasing pressure on

resources, and many fish stocks are now overfished. This reduces productivity, resulting in fewer fish being available and at higher prices.

What can be done to maintain fisheries' contribution to food and nutrition security?

Among different solutions to maintain fisheries' contribution to food security reduction in fish postharvest loss, improving the traditional processing, handling and preservation method of fish and its gear system, developing new and value added products, etc through generating and adopting new technologies are crucial.

It is imperative to generate and adopt new technologies on fish postharvest to meet the above mentioned solutions. Therefore ZFRRC have been generating, adopting and scaling up different fish postharvest technologies like fish smoking, fish dryers, fish processing table, fish fertilizers, fish meal, fish retaining cage etc.

Fish smoking technology

Smoking of fish have developed over many centuries, largely to suit the prevailing climate and is a good method of drying and preserving fish where there is no cold facility for fresh fish handling. The reason for smoking fish are varied but, as far as Ethiopia is concerned, the process has proved to prolong its shelf life, enhance flavor and increase utilization in soups and sauces, reduce wastage times of bumper catches, store for the lean season and increase protein availability to people throughout the year (Clucas and Ward, 1996).

Fish smoking technology plays a vital role in assurance of food and nutrition security through:-

- Availing very important nutrients like omega 3 fatty acids
- Increasing the palatability and bioavailability of nutrients
- Reducing the nutritional loss due to microorganisms by reducing water activity
- Increasing fish price more than five times
- Reducing mass loss as different parts of the fish become edible
- Generating job opportunities

Fish drying technology

Higher water activity and moisture content of the fish is very suited for the wide range growth of microorganisms. Therefore, reducing the moisture content of the fish have a great role in preservation of the fish product from microbial deterioration, prolongs the shelf life and preserves the nutrients (Abera et al, 2010).

Fish drying technology plays a vital role in assurance of food and nutrition security through:-

- Makes fish products available throughout the year and other places where there is no source of fish
- Reducing the nutritional loss due to microorganisms by reducing water activity
- Have a great role in supplement of protein in other food stuff (fortification)

Fish fertilizers and fish meal

Historically fish was used both whole as caught as well as the portions left over from processing the catch. Today the majority of fish fertilizers are produced from otherwise waste fish and processing by products of ocean and fresh water fish harvesting. Modern fish fertilizers effectively recycle fertility otherwise would be wasted and disposed in landfills. Fish offal fertilizer is 10-6-2 (Gaskell M, 1999). Fish fertilizer and meal technology plays a vital role in assurance of food and nutrition security through:-

- Avoiding mass loss
- Generating job opportunities
- Creating income source
- Environmental protection
- Reduction in expenses for fertilizer and feed and also waste removal

Fish retaining cage

Although, the flesh of newly caught fish is sterile, the skin, gills and intestines tend to carry considerable microbial loads depending on the environment of the fish at the time of capture. At the death these microorganisms starts to invade the tissues and this is favored by the struggle of the fish when caught and use up virtually all of the glycogen in their muscles, so little glycogen is left to be converted to lactic acid after death, thus, the preservative effect of muscle lactic acid to slow down bacterial, mould and yeast growth is limited. Thus, it is imperative to keep the fish alive until it is processed or refrigerated and shortening the time between production and processing.

Fish retaining cage technology plays a vital role in assurance of food and nutrition security through:-

- Reducing both mass and nutrient loss
- Generating job opportunities
- Creating income source

Fish processing table

Unfortunately, as it is the important & significant sources of essential nutrients for human being, fish flesh also contains the nutrients necessary to support the growth of

a wide range of micro-organisms. Therefore, selection of processing material for fish which has lower exposure to microbial contamination is essential (Demeke T, 2013).

Fish processing table plays a vital role in assurance of food and nutrition security through:-

- Reducing nutrient loss due to contamination and deterioration
- Increasing the food safety
- Generating job opportunity
- Creating income source

CONCLUSION

Fish is one of the most perishable food stuff among all agricultural products. In tropic climates of most developing countries it will become unfit for human consumption within 12 hours of capture unless it is subjected to some forms of cold preservation or further processing. But cold preservation through refrigeration and freezing is not applicable as it is very expensive and as it is difficult to get access of electric power around the production (fishing) area, thus, from this paper it is possible to conclude that fish postharvest technology such as, fish drying, fish retaining cage, fish smoking, fish meal and fertilizer, fish processing table are very important in reducing mass and nutrient loss which plays a great role in securing food and nutrition. Therefore, it is very important to further adopt, verify, popularize and disseminate these technologies for end users to secure food and nutrition.

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