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Factors Influencing the Prices of Fish in Central Region of Malawi and its Implications on the Development of Aquaculture in Malawi

George Matiya, Yoshikazu Wakabayashi and Naruhito Takenouchi
United Graduate School of Agricultural Sciences, Ehime University, 3-5-7 Tarumi,
Matsuyama City 790-8566, Japan

Abstract: A study to investigate factors that influence prices of fish was conducted in Lilongwe, Salima, Kasungu and Mchinji districts of the Central Region of Malawi. Market type, form of preservation, species type, length of fish, weight of fish, distance to the market, distance from the main city were examined using multiple regression analysis to find their influence on price. It was found out that species type, weight, form of preservation and market type influence the prices of fish more than the other variables. The results suggested that fish trading in urban markets can be dynamic and species type as well as form of preservation play a significant role in determining the prices. This has a bearing when it comes to aquaculture development policy. Producers in aquaculture must therefore take into consideration the market conditions when producing the fish. Species of fish promoted for aquaculture should be those that will sell well on the market. Therefore aquaculture policy must also focus on the market demand in order to ensure food security and increased income for the households.

Key words: Fisheries, market, pricing, aquaculture, Malawi

INTRODUCTION

The fish stocks of Malawian waters are, undoubtedly among the most important natural resources of Malawi. In Malawi fisheries plays a very important role in the life of the people. Fisheries contribute 60% of the animal protein consumed and most of the households that consume it are poor households who cannot afford other sources of protein. About 54% of the population in Malawi live below the poverty line^[1].

Fisheries contributes 4% to the Gross Domestic Product (GDP) and employs about 50,000 fishers and over 250,000 people are estimated to be engaged in secondary fishing industry activities like marketing, boat making, fish processing etc.^[2].

Of late the production of fish from natural waters has declined from over 70, 000 mt in 1990 to 50,000 mt in 2002. This is against an increase in human population of 2% per annum. Consequently the per capita fish consumption has decreased from 10.5 kg in 1988 to 5.6 kg in 1999 denying people their source of protein^[3]. Over fishing, pollution, use of destructive fishing nets and destruction of the breeding ground have been posted as the causes of the decline. Consequently the prices of fish have gone up over the years.

Aquaculture, which has great potential to succeed due to water availability, is now being promoted to supplement the fish production from natural waters which is on the decline. However, the existing technology in Malawi focuses on maximizing individual fish size based on the assumption that large fish would be more profitable to grow^[4]. However when making production decisions the market conditions become important. Specifically prices at the market must guide fish farmers what products they should bring on the market. Fish farmers must raise fish that will fetch high prices consequently realize high return on their investment. They must know where to sell the fish as well as in what form it must be presented at the market. In competitive economy prices are also signals of communication between producers and consumers. They guide and regulate production and consumption decisions^[5]. In order for aquaculture to be sustainable it must produce to satisfy the market.

Prices of fish have been reported to vary considerably by season as well as throughout the country. For example, in the interior markets, prices are affected by the seasonal competition from other sources of animal protein. Locations along the lake shores, as well as the two largest urban centres, Blantyre and Lilongwe, exhibit lower wholesale prices than elsewhere, particularly

the hinterland markets of the northern region^[6]. Knowing where and when to sell aquaculture products is very important for producers who would like to maximise profit. This information is equally important to middlemen and fisherman's cooperatives. Therefore this study was conducted to determine which factors had a significant influence on the price of fish. Market type (whether rural or urban), preservation form, species of fish, distance to the market and distance to the main city in the central region of Malawi -Lilongwe were analysed to determine if they had an influence on the price of fish.

MATERIALS AND METHODS

The study was carried out in four districts in the central region of Malawi. These included Lilongwe, Kasungu, Salima and Mchinji. The population in these districts is high and most of the fish is sold in these districts. Both primary and secondary sources of data were used in this study. The primary sources included informal discussions with experts and key informants like Technical Assistants from Fisheries Department and City or Town Council. In addition, a total of 223 respondents (retailers and consumers) in 13 markets were interviewed for a period of three months between August and October, 2003. Each market was visited once every week. Some of the information collected using the questionnaire is given as under;

Information of the fish being sold:

- Why retailer was selling that particular type of fish species?
- Whether the retailers bought fish from middleman or fisher
- Which fish species sold fast?
- Why fish was preserved in that particular way?

Information on the market:

- Why they sold at that particular market?
- Whether retailers sold the fish by weight or visual judgment
- Problems in marketing fish

Information from consumers:

- Which fish species the consumer liked most and why
- Does size and appearance influence their decisions when buying fish?

Stratified random sampling technique was used to identify the respondents. Two strata based on location and number of days that a market operates. Msangu

market in Salima, Chigwirizano, Nathenje and Chimbiya markets formed the rural market stratum while Lilongwe old town market, Area 13 and Area 3 markets in Lilongwe, Salima, Kasungu and Mchinji district markets formed the urban market stratum. The criterion used in categorising the markets as rural or urban was the same as the criteria used by Brummet^[7]. In the classification, a market in an area with a population of more than 10,000 people was considered to be an urban area while those places markets in areas with a population of less than 10,000 people were considered rural. Another distinction between these markets is that urban markets normally operate everyday while rural markets normally operate 3 or 4 days per week. Multiple regression was run to determine the extent to which the independent variables influence the prices of fish on the market (dependent). Statistical Package for Social Sciences (SPSS for Windows version 10.5) was used for the analysis. Scatter plots used to determine the relationship between price and the independent variables.

Model: The model was specified as follows:

$$P = f(F, S, D_L, D_m, M, L)$$

Where: Y = Price of fish (Malawi Kwacha per kg)
F = Form of preservation
S = Species group
D_L = Distance from Lilongwe City
D_m = Distance from fishery
M = Market type
L = Length of fish

Dummy variables were assigned to nominal data (species group, form of preservation and market type.)

Evaluation of the model: A bivariate (Chi-squared) analysis was carried out to find out how each of the explanatory variables relates to the dependent variable. This analysis was also carried out to find out if the influence of each of the variable separately was significant or nor.

A correlation analysis was conducted to find out whether the explanatory variables do not correlate to each other. One variable that highly correlated to the other was dropped. This was done to avoid the problem of multicollinearity. Weight and Length were highly correlated (0.7) and were hence used separately.

RESULTS AND DISCUSSION

Results from regression analysis showed that species type, weight, form of preservation and market type have significant influence on the prices of fish ($p < 0.05$) (Table 1).

Table 1: Multiple regression coefficients for factors affecting price of fish

Variable	X _i	Coefficient	S.E	t-value
Constant		223.073	24.586	0.000
Species	S	11.930	1.952	0.000*
Weight	W	-0.112	0.027	0.000*
Preservation	F	17.763	7.376	0.017*
Distance from Lilongwe	D _L	-6.192E-04	0.132	0.996
Distance of market from lake	D _m	-4.752E-02	0.053	0.374
Market type	M	-45.923	13.473	0.001*

*Significant at p<0.05

Thus the following function can be derived from the results;

$$P = 223.073 + 11.930S - 0.112W + 17.763P - 4.752E-4D_L - 6.192E-2D_m - 45.923M$$

$$(R^2 = 0.479 \quad SE = 82.128 \quad p < 0.0001)$$

The results show that consumers preferred certain species more than the other (holding all the other factors constant) and this was significantly influencing on the price (p<0.05). Within the same species, weight or length was considered an important factor to affect the price. This was common in both urban and rural markets. On weight, the relationship is negative showing that small-sized species fetched higher prices than big-sized fish. This was a significant factor. The prices of fish were low in rural areas compared to urban markets. This is shown by the negative coefficient. This was significant at p<0.05. This shows market type does significantly influence on the price.

The distance from Lilongwe city to the market and the distance from lake were not significant factors because the price was determined by demand and supply at a particular day. This shows that when middlemen bring fish from distant fishing areas, they must bring fish that would fetch a higher price to justify transportation costs incurred. Otherwise they may end up incurring high costs that may not be recovered.

Analysing each market, one observes that in urban markets, type of species and weight had a significant influence on the price while type of species, weight and form of preservation were important for rural markets. In rural areas smoked or sun dried sold were dominant than fresh fish. This might be because of lack of freezing facilities in the rural areas. The relationship between price and independent variables is discussed in details below;

Price-market type relationship: Over all the market prices in urban markets were higher than prices in rural markets. The average urban prices of fish were MK 233.07 kg⁻¹ (US\$ 2.20) while the average rural prices for fish were MK 210.19 kg⁻¹ (US\$ 1.98). The results may reflect the demand and supply or purchasing power of consumers. The consumers in urban areas have higher purchasing power

because they are mostly working class and business people and therefore have higher income than the rural people who are mostly subsistence farmers. Brummet^[7] also found that urban markets in Southern Malawi offered higher prices for fish products. Rouse^[8] reported that the demand for fish in the cities absorbed a large part of supply in El Salvador. Higher incomes allowed large city consumers to purchase relatively great quantities of all types of fish. In contrast, low incomes of rural dwellers restricted consumption to limited quantities of cheaper types of fish

Price-length relationship: The study revealed that in Malawi the length of fish does not matter when it comes to pricing. Any size of fish, which is caught by the fishermen, finds consumers. So called trash fish does not exist. This might be because of low supply as well as consumer preference. Small sized species may even cost more than big sized species if considered on dry weight basis (Fig. 1). Figure 1 also shows that one may get high return by selling small size species (*Ceteris paribus*). The advantage of this is that the cost of feeding in aquaculture would be lower if one is producing small sized species than big sized species.

Weight was only significant in urban markets. This was because in urban markets fish was sold according to weight while in rural areas prices were set by using visual judgement and not necessarily by weight (kg). Therefore supply determines the price more than the weight kg. The absence of price standards exacerbates the situation as the prices are fixed on visual judgement which is very subjective. This situation where consumers are ready to pay for fish of any size may be temporal as the consumers' preference might change when the size of fish being offered on the market increases. The small size of fish being sold on the market might be as a result of over-fishing^[9]. One of the signs of over-fishing is changes in species composition as well sizes.

Price-species relationship: The study found out that the price of fish depends on the species. Some species were preferred more than the other and hence by forces of demand and supply fetch high price. Different species fetched different prices (Table 2).

About 80% of the consumers indicated that they preferred cichlids to cyprinids. *Chambo* (*Oreochromis* sp.) was specifically mentioned to be the most preferred fish. Weyl^[10] found out that the beach price of *Chambo* (*Oreochromis* sp.), *Mpasa* (*Opsaridium microcephalus*), other tilapia and *Sanjika* (*Opsaridium microcephalus*) were higher than *Kampango* (*Bagrus meridionalis*), *Ntchila* (*Labeo mesops*), *Usipa* (*Engraulicypris sardella*), *Utaka* (*Copadichromis* sp.) and *Mlamba* (catfish).

Table 2: Prices (kg⁻¹) for different species of fish sold on the markets

Name of fish	Price (kg ⁻¹)
Bombe (<i>Bathyclarias</i> sp.)	MK175 (US\$1.65)
Chambo (<i>Oreochromis karongae</i>)	MK320 (US\$3.02)
Kambuzi	MK175 (US\$1.65)
Kampango (<i>Bagrus meridionalis</i>)	MK280 (US\$2.64)
Matemba (<i>Barbus</i> sp.)	MK175 (US\$1.65)
Mbaba (<i>Buccochromis</i> sp.)	MK175 (US\$1.65)
Mcheni (<i>Ramphochromis</i> sp.)	MK280 (US\$2.64)
Mlamba (<i>Clarias</i> sp.)	MK175 (US\$1.65)
Mpasa (<i>Opsaridium microcephalus</i>)	MK342 (US\$3.23)
Ntchira (<i>Labeo mesops</i>)	MK275 (US\$2.59)
Chisawasawa (<i>Lenthrinops</i> sp.)	MK175 (US\$1.65)
Usipa (<i>Engraulicypris sardella</i>)	MK400 (US\$3.77)
Utaka (<i>Copadichromis</i> sp.)	MK180 (US\$1.70)

However in terms of volume of sale, *Utaka* (*Copadichromis* sp.) was consumed in largest proportions because it was readily available and sold in small heaps thereby suiting the purchasing power of poor consumers. Small-sized species were favoured for this reason as opposed to big-sized species.

In addition, results of the study show that smaller species such as *Usipa* (*Engraulicypris sardella*) fetched higher prices per kilogramme (dry weight basis) than bigger species like catfish or *Bombe* (*Bathyclarias* sp.). These smaller fish are sold by basket or pile and a consumer with low income can afford to buy the amount sufficient for his family. Bigger-sized fish species are sold by piece, which is often much more expensive than its equivalent amount of small-sized fish species. For example, *Mpasa* (*Opsaridium microcephalus*) was selling at MK 342.30 kg⁻¹ (US\$3.23) while a heap or pile (usually about 50 g) of *Usipa* (*Engraulicypris sardella*) or *Utaka* (*Copadichromis* sp.) would cost MK 20 (US\$0.19). This makes it impossible for low-income households to buy bigger-sized pieces of fish. However, in the final analysis retailers selling small fish would make more profit than those selling big fish because there the price was not proportional to weight. Nonetheless, this depended on the species. For example *Usipa* (*Engraulicypris sardella*) was more costly than *Utaka* (*Copadichromis* sp.) implying that even the smaller species some are more expensive than others. In the study *Mpasa* (*Opsaridium microcephalus*) had the highest price while *Mcheni* (*Ramphochromis* sp.) and *Chisawasawa* (*Lenthrinops* sp.) had the lowest price of MK173.76 (US\$1.64) and MK 180.14 kg⁻¹ (US\$1.70), respectively. This suggests that consumers have certain liking for some species and hence species type has significant influence on the price. Garber *et al.*^[11] reported that size and appearance might not translate to purchase, consumption or market success of fish but consumers' perception of its taste and other socio-economic factors.

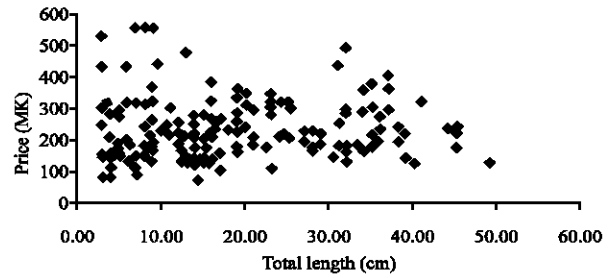


Fig. 1: Scatter plot of price of fish by their length

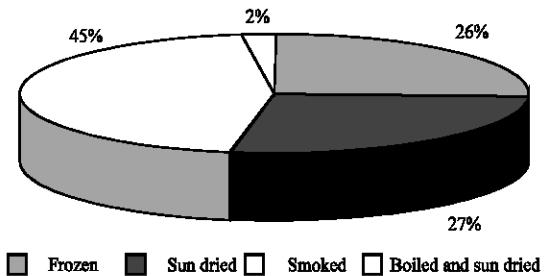


Fig. 2: Proportion of fish sales by method of preservation

Price and form of preservation relationship: Since the fishing activities are taking place away from the consumption areas, preservation is very important to enable the fisheries products reach consumers in a good state. It tries to reduce post harvest losses. The form of preservation being used in Malawi include smoking, freezing and boiled and sun dried. Although consumers preferred fresh fish, in both rural and urban markets smoked fish was in large amount. Smoked fish constituted about 45% of the total fish purchased with frozen fish, boiled-sun-dried and sun-dried constituting about 26, 27 and 2%, respectively (Fig. 2). This may be because of absence of ice plants, only smoking would guarantee long shelf life. With wood becoming scarce, this form of preservation may be affected in future.

The price of boiled-sun dried fish was the highest. Smoked, sun dried and frozen came second, third and fourth, respectively. This reflects the cost involved in the preservation. Of importance to note is the fact that preservation added some value to the fish and pushed the prices upwards. Producers may want to process their products before bringing it to the market. However, preserving fish in rainy season becomes a challenge as the weather is mostly cloudy and humidity levels are high for sun drying. Since the wood is wet, smoking becomes impossible registering high post harvest losses. During

this time there are few middlemen as most of them do not want to take risk. This results in high prices in rainy season as supply is very low.

IMPLICATIONS OF THE RESULTS TO AQUACULTURE DEVELOPMENT IN MALAWI

The study has some implications as far as aquaculture development is concerned. Probably it's high time the fish farmers are encouraged to start considering market factors in their aquaculture business. Most of fish producers are production oriented rather than market oriented. According to the study certain species are liked by consumers more than others. This entails high demand. Looking at the aquaculture species being reared so far *Chambo* (*Oreochromis karongae*) is the most preferred fish. It can grow big (20-400 g) and therefore can fetch a high price. Therefore this fish could be produced by commercial fish farmers as they have the necessary facilities while *Tilapia rendalli* and *Oreochromis shiranus*, which are small and require low cost feed, could be raised by small scale fish farmers. The results show that fish of any size can sell on the market and therefore species that are prolific should be produced to supply the much needed protein. This could a short term measure to address the decline in supply of fish problem. Big sized fish like *Chambo* (*Oreochromis karongae*), which require high quality feed, should be promoted to the commercial fish farmers as they can fetch high prices on the market increasing profit margin of the producers. This will also give consumers a wider choice than now when only small sizes are available. The Fisheries Department's aquaculture extension must also make available fingerlings for *Chambo* (*Oreochromis karongae*) to the farmers.

Since processing influenced the price of fish, fish farmers may consider integrating their marketing activities by doing some processing in order to add value. This might help to maximise their profit. However, it might be worthwhile to investigate whether the benefit is higher than the cost.

Urban markets offer higher prices than rural markets and fishers could organise themselves into cooperatives and transport their fish to urban markets. Individually the quantity of fish might be small to justify transportation but as a group they can hire one truck and share the cost.

Aquaculture should be promoted more in the study area especially Lilongwe, Mchinji and Kasungu because the area is not only geographically suited to aquaculture

but also market is readily available. The buying power is high as evidenced by higher prices of fish than rural markets. Fish farmers could take advantage of this high demand to their advantage.

In summary, the focus of aquaculture development efforts should be on a market-driven technology development approach, not a technology-driven approach to market development. A market-driven approach investigates what the market demands and provides those products to the markets to meet human needs, rather than producing products, then scurrying around to try and find markets that will take them. The fish farmers must take into considerations the market situation before they start their business. This answers some of the basic questions in production economics including what to produce, where to sell and in what form.

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