

## A Market Assessment of the Inland Fisheries in Mahaweli System H, Sri Lanka

Y.B. Nawaratne, K.A.S.S. Kodithuwakku<sup>1</sup>, S.P.A. Abeywickrama and J.W. Gowing<sup>2</sup>

Postgraduate Institute of Agriculture  
University of Peradeniya  
Peradeniya, Sri Lanka

**ABSTRACT.** *Inland fishing in Sri Lanka is concentrated around major irrigation tanks in the dry zone. Despite its 11.5% contribution to the total fish landings in 1998, less attention has been paid in terms of marketing studies on inland fisheries industry. An understanding in characteristics of production and consumption and the mechanism of the present marketing system is of vital importance for increasing the efficiency and effectiveness of marketing system.*

*The study was carried out in the Mahaweli System H in Sri Lanka, with the objectives of identifying existing supply chains together with their strengths and weaknesses and identifying consumer preferences for inland fish. A market research was carried out, adopting qualitative research methods. Data were collected through desk and primary research. Key informant survey, focused group discussions and personal observations were used to collect primary data. Data gathered were analyzed using the supply chain and support service analysis tools.*

*The study revealed that supply meets the demand throughout the year, thus avoiding huge market gluts and drastic price fluctuations. A marketing advantage exists for inland fisheries within the research area due to the proximity to the market, (which reduces marketing costs), low prices, and the strong distribution network. A simple and time-tested marketing network strengthened by stable interfaces with marketing features, balanced power, and justifiable marketing margins channel products to every corner of the market.*

### INTRODUCTION

The dry zone of Sri Lanka has a large number of small and large and man made tanks providing a cheap and locally available supply of fresh inland fish that caters to needs of the rural poor. In the past, most aquaculture interventions have been focused on the production, neglecting critical marketing aspects. This has undoubtedly contributed to the poor sustainability of aquaculture development projects. Before the introduction of exotic species, particularly tilapias (*Oreochromis mossambicus*, *Tilapia niloticus*, *Tilapia rendalli* and hybrids) and carps (*Channa striatus*), inland fisheries served mainly subsistence requirements. With increasing yields from new species, a more market oriented fisheries sector was developed (Food and Agricultural Organization, 1988). State intervention in the development of inland fisheries began around 1900 with the initiation of government

<sup>1</sup> Department of Agricultural Economics, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka.

<sup>2</sup> Centre for Land Use and Water Resources Research, University of Newcastle, United Kingdom.

programs to introduce new fish species into inland water bodies (Chandrasiri, 1986). Commercial inland fishery began to gain its momentum after the introduction of *Tilapia mossambica* in 1951. The gradual increase in production observed since then, had a setback during the period of 1989-1994, after the government took a policy decision to withdraw all forms of support being given to the industry in 1989. This trend has again been reversed after the commencement of government support in 1994 (NARA, 1999).

Freshwater fish remains as a major protein source for the residents of areas where marine fish availability is scarce. Out of 12891 fishermen involved in the inland fisheries industry, nearly 40% of them have gathered around 101 reservoir based freshwater fisheries cooperative societies (NARA, 1999). Two major fish breeding stations, namely Dambulla and Udawalawe with few other minor breeding stations produce seeds to stock reservoirs. In 1998 seed production was 7,251,000 and total fingerling stockings amounted to 1,402,000 (NARA, 1999).

### **The problem and justification**

To understand and contribute to the efficiency and effectiveness of the fisheries marketing system, the characteristics of production, consumption and the mechanisms of the present marketing system have to be determined. Such an understanding is important for reducing the marketing costs and thereby gaining a competitive advantage (Darrah, 1980). Today, marketing costs greatly influence retail and farm-gate prices of foods, which warrants greater attention to the food marketing system on the part of consumers, farmers and legislators (Kohls and Uhls, 1990).

Preliminary investigations revealed that the lack of comprehensive studies on the inland fisheries sector is a major problem. Although few socio-economic studies are available, only one market assessment of the industry was found (Murray *et al.*, 2000). Against this background, the major objectives of this study were to identify (i) consumer preferences for local fish varieties in the study area and (ii) the existing marketing chains, and their strengths and weaknesses of linkages of those marketing chains.

## **RESEARCH METHODOLOGY**

The study was carried out in the Mahaweli System H area, which was developed under the Mahaweli Development Scheme as an irrigated settlement, covering an irrigated area of 34,509 ha in the dry zone of Sri Lanka. The area consists of 101 perennial and seasonal tanks as major water bodies, around which the inland fishing industry is concentrated. This study is from an ongoing research project. Data were collected from January 2000 to April 2001.

Descriptive research methods were adopted in carrying out the study since it facilitated the systematic gathering and analysis of qualitative and quantitative data of the industry. This approach also facilitated analysing the existing situation with respect to specific contexts within the marketing space<sup>1</sup> (Kent, 1993).

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<sup>1</sup> According to Kent (1993), market research reports are often descriptive and it may be designed to secure specific kind of information.

The target population of the study included different actors of the marketing chain of the inland fisheries industry within the research area. Both desk research<sup>1</sup> and primary research were used in data collection. Collection of primary data was carried out using key informant surveys (by semi-structured interviews) and personal observations. Data triangulation proved to be a valuable method of improving the validity of findings (Yin, 1994) especially, on situations where quantitative data could not be gathered to establish trends and patterns. Both random sampling and purposive sampling method were adopted in selecting samples for primary research, depending on the situation.

Two analytical tools, widely used in market assessments, referred to as primary foundation stones were used in the analysis of findings:

### Supply chain analysis

Supply chain analysis is the analysis of interactions and transactions between the actors in a particular industry to maximise profits through supply chain optimisation. Transactions, which are more explicit, forms the primary supply chain while interactions constitute the secondary supply chain (Fig. 1). Marketing networks function through the functioning of both primary and secondary supply chains and the chain is as strong as the weakest link in it (Huppert and Urban, 1998).

In supply chain analysis interfaces starting with demand and work the way back along the chain are analysed, taking transactions/interactions between two actors as the smallest analytical unit and focusing on key interventions in achieving win-win solutions.

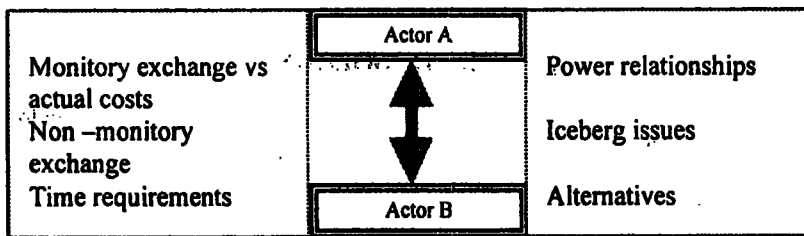


Fig. 1. Transaction/interaction analysis in supply chain analysis.

### Service interaction analysis

The service interaction analysis is a set of tools designed to help identify as symmetrically as possible the services that are being or are to be provided, and the

<sup>1</sup> As Kent (1993) describes, desk research entails the proactive seeking of data that already exist and which may be useful in the study.

relevant service relationships within a service network. The tools can also make it easier to analyse the problems associated with the provision of services and with service relationships, in a way that takes in to account the distinguishing features of services (Huppert and Urban, 1998).

## RESULTS AND DISCUSSION

### Current and seasonal fluctuations of production

A major part of the commercial inland fish supply in the System H comes from six large perennial tanks viz., Kalawewa, Dambuluoyawewa, Kandalamawewa, Rajanganawewa, Nuwarawewa and Nachchaduwwewa. Other significant perennial production points were Usgala-Siyambalangamuwa, Angamuwa and Kattiyawa tanks.

Seasonal tanks cater to subsistence fishermen around the tank with seasonally produced small volumes of fish. Despite the large number of seasonal tanks available in the dry zone, over 90% of the total commercial inland fisheries production originates from only 74 of the largest perennial reservoirs (Murray *et al.*, 2000).

Production of inland fish or the supply of inland fish within the research area was characterised by several factors such as seasonality of inland fish production is closely associated with the bimodal rainfall pattern. Peak productions occur during the dry periods of the year<sup>1</sup>. The first dry period occurs just before the south west monsoons, resulting in the first peak production period from March to May (Fig. 2 and 3). Water levels are substantially reduced by March due to the high irrigation water release for the *Maha* cultivation and low rainfall. Low water spread and low water depth increases the vulnerability of fish to gillnets. Dry south west winds during the period of June to July brings very little rain to the dry zone, resulting in a further depletion of tank water levels. These dry winds hamper the fishing efforts thereby reducing the production. Continuous reduction in water volumes of tanks brings about the lowest water levels of the year by August to October. Highest volumes of inland fish production can be observed during this period of the year (Fig. 2 and 3).

Northeast monsoons which occur during October - January is the major rainy period in the dry zone, filling all tanks to the maximum. This is followed by a reduction in fish capture, partly contributed by the intensive fishing during the previous period of peak production. However, intensive rains increase the runoff from catchment areas resulting in muddy, turbid water in the water bodies. This situation forces the fish to come to the surface waters enhancing the susceptibility of them to gillnet fisheries. Newly developed lush grasses around the tanks which are now covered by increased water levels, provide fish with a source of food attracting them to the shallow shores. A combination of these factors provides an inconsistent, but a fair level of production between November to December. However, in the late north east monsoon period (January to February) with tanks at near capacity levels and deep, clear waters reduce the production to an annual low.

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<sup>1</sup> These patterns are more similar to the findings reported by Murray *et al.* (2000), with reference to the inland fisheries industry of the north western province of Sri Lanka.

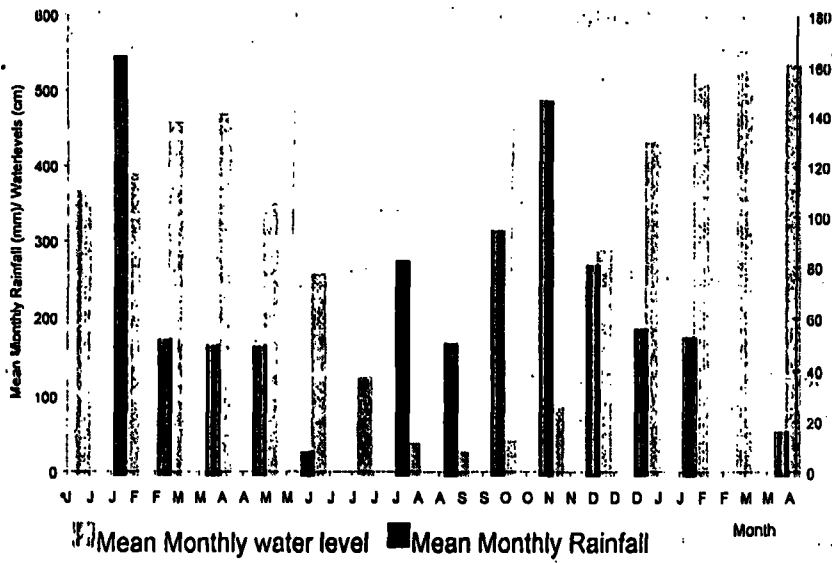


Fig. 2. Mean monthly rainfall and water level pattern at Usgla Siyabalangamuwa reservoir. [Source: Irrigation Department and interviews with farmers in Usgala].

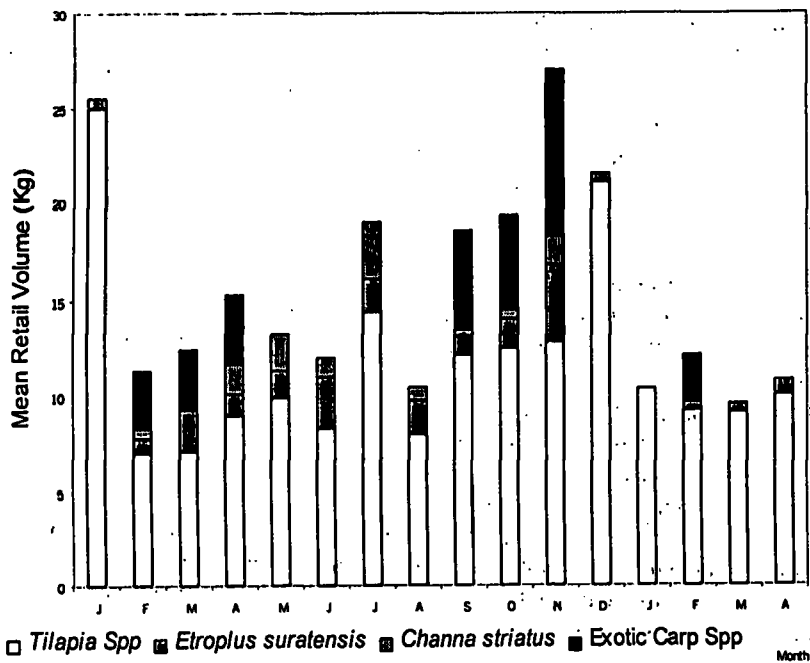


Fig. 3. Mean monthly kg of fish retailed/vendor/day by species composition at Galgamuwa junction, Jan 2000-2001.

### Species composition of the fish catches

Around 90% of the catch consists of tilapia species and the remainder is a mixture of carps, snakeheads, cyprinus, eels, tank sardines (*Amblypharyngodon melettinus*) (Fig. 3). During the peak production periods, small tilapias (<100 g) flood the market where as the proportion of small tilapias in the total catch is relatively small during other times. Peak production periods also deliver relatively high amounts of snakeheads, eels and carps, increasing the variety of production (Fig. 3).

Common carps are more susceptible to gillnet fishery during the dry season which are caught by larger gill nets (up to 10"). Similarly, smaller amounts of common carp are also caught during the rainy season when they move to the surface water.

### Variation in consumer preferences and consumption patterns

Among consumables widely accepted as close substitutes for inland fish, most of the respondent consumers (70%) preferred meat or marine fish or both to inland fish. However, 30% of the respondents preferred inland fish to any of the above mentioned substitutes and all respondents ranked inland fish within the first three choices.

Apart from their preferences, 20% consumed inland fish almost every day while 92% consumed it at least twice a week. More common reasons stated to justify this behaviour despite the high preference for other substitutes are availability, relatively affordable prices, and the shared belief of comparatively higher health and nutritive benefits of inland fish.

Although tilapias account for about 90% of the total catch, most consumers prefer other species. The most preferred is the highly valued indigenous species, snakehead, for its unique taste, meat-like texture and perceived nutritive and health benefits. Sixty five per cent of the respondents gave priority for snakehead in preference ranking exercises while 27% preferred tilapia. Availability of species like carps and eels is low, despite the fact that they are ranked among highly preferred varieties. It is obvious that tilapia dominates the market because of the high availability, low price factor and its longer shelf life compared to other species.

Investigations on the preferred size of fish, especially between different sizes of tilapia, revealed mixed reactions. Twenty eight percent preferred big sized tilapias (having >175 g of fresh weight) because of its ease in processing and less processing losses. They do not opt for small fish since they contain a high amount of bones per unit weight of flesh. In contrast, 25% chose small tilapias (<100 g) because they are richer in taste compared to bigger ones. Forty seven per cent favoured medium sized tilapias (between 100-175 g).

A significant character in the consumption pattern is that consumers generally substitute inland fish for vegetables during the dry period, since availability of vegetables during this time is low resulting in a considerable increase in their prices. Increasing supplies of inland fish during this time reduces the prices, facilitating the substitution process further. Under these circumstances most of the consumers replace

vegetables in their meals with inland fish. About 86% of the consumers interviewed accepted inland fish as a substitute for vegetables.

### Seasonal patterns of the price of inland fish

Seasonal movements in supply of inland fish results in seasonal fluctuation of fish prices (Fig. 4).

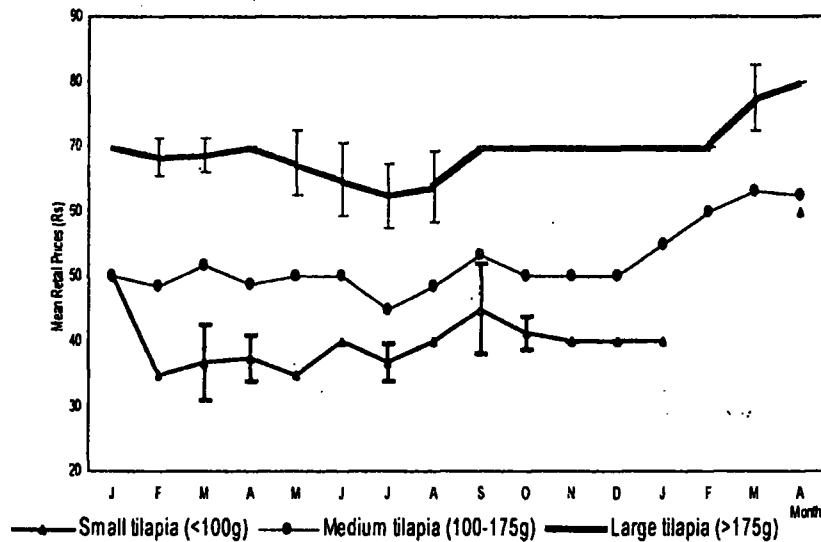


Fig. 4. Mean monthly retail prices different sizes of tilapia at (Galgamuwa) NWP, Jan. 2000 – Apr. 2001 (weekly STDs).

The highest prices within the year can be observed during March to April period. The high demand in the new-year season, combined with the minor-peak production of the year, further push prices upwards (Table 1). After the new-year prices are reduced, and the trend continues throughout the dry season from around July to October, resulting in lowest prices of the year by July to August.

### The marketing network of inland fish

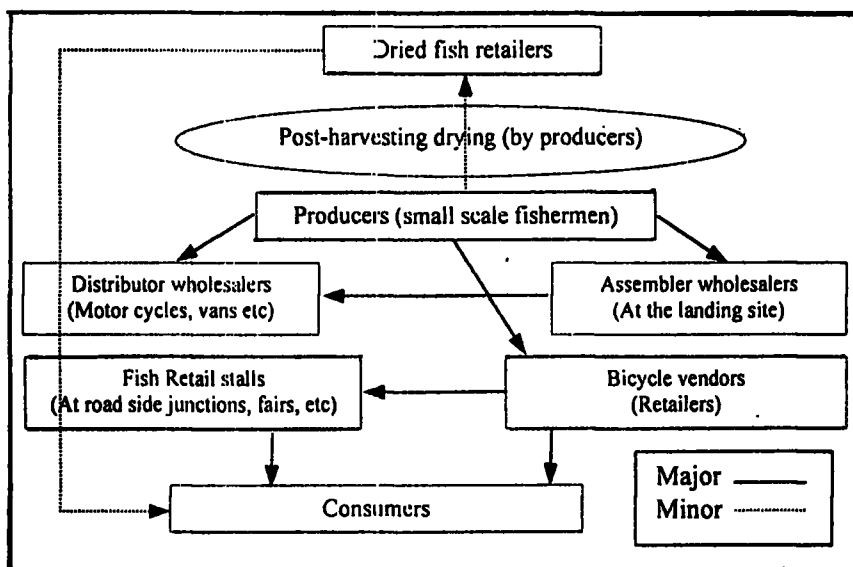
Inland fish distribution network (Fig. 5) is comparatively short and less complex than most of the other consumables in Mahaweli System H<sup>1</sup>.

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According to findings by Murray *et al.* (2000), inland fish marketing network of the north western province of Sri Lanka is comprised of same actors.

**Table 1. Price ranges and margins for different inland fish species.**

Fish species	Size range (g)	Fresh fish landing price Rs/kg	Wholesale and primary retail price	Wholesale and primary retail margin (%)	Fresh fish retail price Rs/kg	Retail margin (%)	Dried fish Retail price Rs/kg
Small tilapia	(<100 g)	20-30	25-35	17-25	30-40	15-20	60-70
Medium tilapia	(100-175 g)	30-35	35-45	17-29	45-60	28-33	90-120
Large tilapia	(>175 g)	35-45	40-50	11-14	60-80	50-60	100-120
Green chromide	100-150	20-30	25-35	17-25	35-40	14-40	60-70
Common carp	All sizes	35-45	45-55	22-29	60-80	33-45	NA
Snakehead	All sizes	45-50	45-55	10	70-80	45-55	120
Tank sardine	Small (<20 g)	15	20-25	33	30-35	40-50	40-50



**Fig. 5. Marketing network of fresh inland fish.**

**Fishermen - bicycle/motorcycle vendors/distributor wholesalers**

Fishermen sell fish early in the morning to vendors at the landing site after grading and selling is completed within about two hours. After disposing the morning purchase, bicycle vendors return back for the second purchase. This is as strong as the morning purchase during peak production periods. On an average, bicycle vendors buy about 10-15 kg per round while motorcycle vendors buy about 25-30 kg.



The interface between fishermen and bicycle vendors is the strongest where most have strong and long lasting business relationships among them, some lasting for about 7-8 years. On an average such relationships have lasted for about 2-3 years. Transactions and interactions within the interface are regulated by certain types of obligations on the part of both parties. A bicycle vendor has to buy all the catch produced by the supplier at a price agreed by both. However, price fluctuations are minimised when the interface is stronger. The fisherman ensures a continuous supply of fish to the same vendor. This is critical during slack periods competition among vendors escalate. High catches during dry seasons bring in casual entrants for vending, relieving professional vendors from the burden of having to buy big catches from fishermen

Mixtures of credit and cash transactions are active both ways across the interface. Bicycle vendors buy fish on credit as well as on cash. Short-term credit exists where they pay it back on the same day after selling fish. The credit risk involved here can be identified as minor since the transactions are based on mutual trust built over time. However, fishermen receive a better price to cover the credit risk, compared to alternative interfaces where there is no credit risk involved. Fishermen also rely on vendors for credit in emergencies, to buy fishing gear *etc.* These are paid in kind (*i.e.*, fish) as installments over a certain period as agreed by both parties.

Considering the above mentioned characteristics of the interface, one can trace a good relationship based marketing strategy, which is beneficial to both parties involved. These time-tested relationships built on mutual trust and understanding, provide income security and capital requirements and reduces marketing risk for fishermen while ensuring a continuous supply base and reduced working capital requirements for vendors. Dependency on one another by both parties avoids power concentration in the hands of one party creating a symbiotic relationship, which adds to the stability of the interface as reported by Kodithuwakku and Rosa (2002).

#### **Fishermen - assembler wholesalers**

This interface was observed only at the Kalawewa tank fishery within the research area, manifesting a special situation as an adaptation to the context prevailing there. These traders are more powerful, both politically and financially, in overcoming certain obstacles they face in service provision. The interface is stable and strong as the interface between fishermen and bicycle vendors. Relationships between fishermen and assemblers appear symbiotic, given the special situation in Kalawewa.

Fishermen do not mind receiving low prices for being relieved from the risk of selling on credit and also, get other benefits from powerful assemblers, mainly protection: when get caught using illegal nets with small mesh sizes (less than 3.5 inches) than that recommended. Kalawewa is nearly overcrowded with fishermen and, new entrants are not regulated since the fisheries co-operative society is not strong. This has induced severe competition among them and relevant authorities arrest fishermen practice illegal fishing. Most of the fishermen in Kalawewa are also migrated fishermen who belong to ethnic minorities with few or no contacts with power centres. Under these circumstances political contacts and influencing powers of assembler wholesalers come into action rescuing arrested fishermen. This vital but unstated

service comes along with several other offers, as a service package consisting of implicit and explicit services<sup>1</sup> (Fig. 6). The cumulative effect of these factors has given more power to the assemblers, but no instances were found where the power was used exploitatively. Margins of assemblers never exceeded Rs. 5.00 per kg.

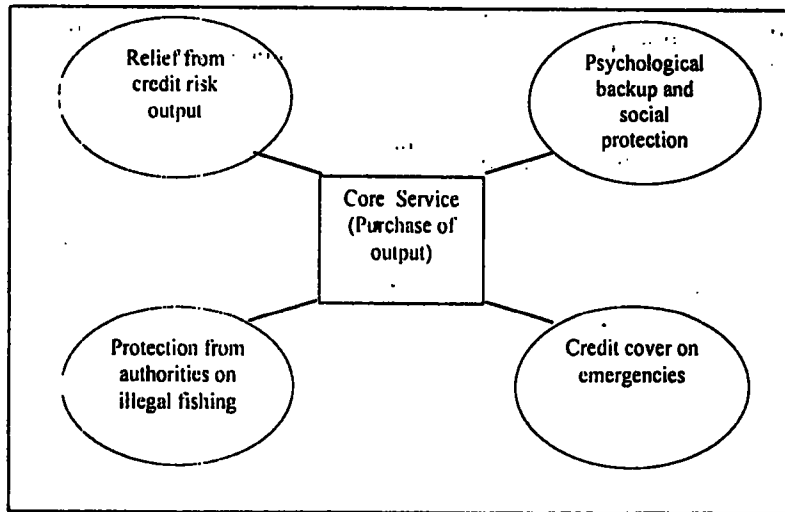


Fig. 6. Service package offered by assembler wholesalers at Kalawewa inland fish landing sites.

#### Assembler wholesalers - bicycle vendors/distributor wholesalers

Assembler wholesalers, who perform margin trading at Kalawewa, interact in their selling interface with bicycle vendors and distributor wholesalers on a daily basis. Assemblers grade the catch by species and by size prior to reselling them to bicycle vendors and distributor wholesalers.

A power concentration in the hands of assemblers due to competition between bicycle vendors is a special factor that characterises interactions and transactions within the interface. Stiff competition between bicycle vendors during slack production

<sup>1</sup> Service packages: Under the 'uncertainty' of distinction between products and services, a continuum of goods and goods and services. If the provision of goods and services is viewed as a continuum, it is difficult to identify a position along this continuum for a given service. The idea was therefore developed to present a certain product as a service package, and within this package describing the various individual inputs as separate constituents of the package.

The advantage of describing services as service packages is that material and non-material elements involving very little interaction or others involving intensive interaction, can each be specified and specified separately. In this way, it is also possible to locate the key service at the centre of the service package as the core service, and to group peripheral services around the core service. This method of presentation also opens up the possibility of revealing elements to which considerable importance is often attached but which only rarely receive explicit mention in the description of services: these are known as implicit services (Huppert and Urban, 1998).

periods together with their inability to establish direct relationships with fishermen, make it difficult for them to secure their supply. In such situations assemblers give priority to regular customers pushing back casual entrants. In such a context vendors tend to sustain good relationships with assemblers and the ultimate result is power accumulation by assemblers. Although power is not used to exploit vendors by selling goods at escalated prices, it is applied in securing repayment of credit extended to vendors both in cash and in kind. Distributor wholesalers enter into the marketing network in the peak production period on the invitation of assemblers, absorbing the excess harvest.

### **Bicycle vendors/motorcycle vendors - consumers**

Low overheads allow the vendors easy seasonal entry into and out of fish marketing networks as a means of livelihood diversification. In this context, a two-wheeler network provides seasonal casual employment to many marginal farmers for few months in the dry season.

On an average bicycle vendors cover about 10-15 km (motorcycle vendors travel about 20-25 km) distance selling fish on a door-to-door basis. They operate within a selected area regularly targeting the same customers. Some vendors select strategic points like junctions, weekly fairs for retailing. They also operate at those points on a regular basis targeting almost the same customer group everyday.

Retailing of inland fish within the System H comprises more of a door-to-door delivery system, which has helped to build good business relationships. In slack production periods vendors give priority to regular customers as a reward to their loyalty, ensuring the fish portion in the meal. In return consumers tend to go to the same vendor. This has enabled the vendors to know the preferences of customers and they try to supply fish so as to satisfy specific demands. These agreements sometimes go as far as price cushioning by vendors to offer a stable price for customers throughout the year absorbing price fluctuations. These offers help vendors to retain their market share even in the face of severe competition by increasing number of vendors in the dry season. However, provision of goods on credit is not very common within this interface of the network. Considering the above-mentioned characteristics, one can conclude that the interface is strong and acts favourably for both parties.

### **Value addition activities in the industry**

The most significant value addition activity concerning inland fish is the production of dried fish. This is also not carried out in a large scale due to several reasons. First and the most important is the opportunity cost of drying and marketing fish, compared to fresh fish. On the other hand, demand and prices of inland fish remain attractive during at most times of the year. The resultant outcome of these is that fish drying is only carried out in the dry season with excessive supply. Other forms of value addition such as smoking and salting are at a minor scale mainly for consumption purposes. These are the avenues, which are not explored yet, and might have niche marketing opportunities.

## CONCLUSIONS

A marketing advantage exists in the study area for inland fish over the closest substitute, marine fish, owing to several reasons. Low prices and high availability of fish create a healthy demand for inland fish from the low income rural consumers. The well established bicycle fish vendor network has created a marketing advantage to inland fish that no other commodity has. Relationship based marketing characteristics observable between all interfaces of the network contribute heavily to the strength of links, while balance of power between network actors stabilises these relationships.

There is a special situation associated with Kalawewa fisheries. However, the existence of assembler wholesalers is an adaptation to the specific needs of the context. Power concentration in the hands of assembler wholesalers is a problem, although it is not exploited. Depletion of the fish stock is a result of intensive fishing and use of illegal gillnets. For an industry where product diversity is scarce, it would be difficult to create a demand to match future escalations in supply. Steps to increase product diversity by adding more indigenous and exotic species to the product combination is vital in creating demand, given the situation that species such as snakeheads, carps, and eels are highly preferred.

Value addition is a must, given the expectations of increased future production. Value addition processes such as drying, smoking, filleting and salting are the possibilities available, that will open doors to unexplored markets. Drying does not add value to the basic product and it is currently undertaken as a salvage strategy. Research to increase the efficiency of drying and other forms of value addition activities and extension services to introduce these activities to the industry are required to develop these value added products.

## ACKNOWLEDGEMENTS

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