

RESEARCH REPORT

**GLOBALISATION AND FISH UTILISATION AND
MARKETING STUDY**

**THE FISH BY-PRODUCT SUB-SECTOR
AND LIVELIHOODS IN UGANDA**

SOCIO-ECONOMICS SECTION

FISHERIES RESOURCES RESEARCH INSTITUTE

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DEFINITIONS

By-product: Parts of fish that remain after the fillets have been removed.

Fish frame/Carcass: Main skeleton of the fish to which the head and fin remain attached when the fillets are removed.

Fish maws: Swim bladders locally known as *Nnuni* which help fish move vertically in water.

Fish skins: Thin outer layer covering the flesh on fish

Trimming: Off cuts of red meat and belly flaps from the fillets

ABBREVIATIONS AND ACRONYMS

EPRC: Economic Policy Research Centre

MFPED: Ministry of Finance and Economic Development

UBOS: Uganda Bureau of Statistics

DFR: Department for Fisheries Resources

DRC: Democratic Republic of Congo

CAWODISA: Children and Widows of Disabled Soldiers Association

IMF: International Monetary Fund

GDP: Gross Domestic Product

EXECUTIVE SUMMARY

1. Fish by-products account for nearly 60% of the whole fish, consisting of fish frames, skins, trimmings, fats, fish maws and guts. Of these, only fish guts, which constitute 2% of the whole fish are discarded. The fish frames, skins, trimmings and fats are sold in local markets whereas the fish maws are exported to overseas markets.
2. The by-product market has provided a saving to fish factories for costs that would otherwise have been incurred in disposing off the by-products.
3. By-products are a significant source of revenue to fish processing factories as revealed by average weekly earnings, which is estimated at Shs. 7,000,000 per factory.
4. The local demand for by-products is high relative to supply as indicated by the fact that factories no longer discard by-products and individual traders cannot access the product on a daily basis and have to follow factory supply schedules.
5. The by-product sub-sector is an extensive network consisting of wholesale pick-up traders supplying numerous local traders and processors at various urban, rural and roadside markets, thus contributing towards employment and livelihood sources.
6. Urban markets, which are largely distribution centres operate on a daily basis and handle larger quantities whereas rural markets mainly operate on specific weekdays.
7. By-product operations require low capital investments with the exception of pick-up traders. The major assets employed include smoking kilns, bicycles and frying pans.
8. The pick-up traders spend more money on operating expenses (fuel and hire of pick-up) as compared to other traders, whose input costs are mainly firewood and transport.
9. By-product operations are profitable as indicated by the positive net revenues of all types of enterprises. Pick-up traders have low profit levels because they incur substantially higher operating costs.
10. The cost of the raw product accounts for nearly 85% of the total costs implying that by-product operations are very sensitive to changes in product prices, which are largely determined by the factories.
11. Fish frames and skins are mainly consumed in smoked form whereas trimmings are mainly deep-fried and consumed as snacks. Consumers living adjacent to by-product markets on the average consume the products 3 times a week.

12. By-products are mainly consumed by low-income groups, with average monthly incomes of Shs 36,000 and weekly expenditures on by-products of Shs 2,800 respectively for non-traders of by-products.

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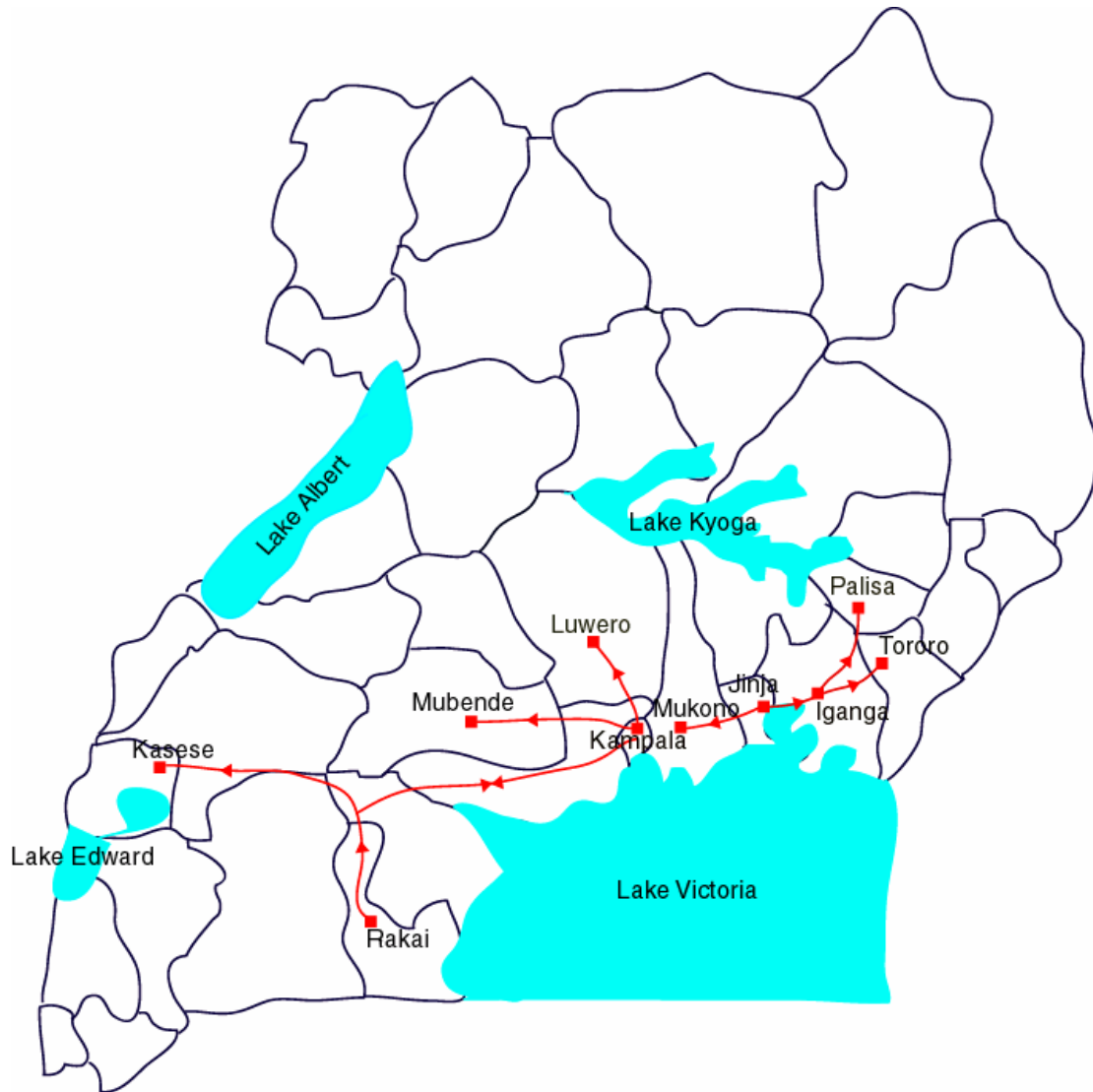
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Map 1: Fish By-product Distribution Areas of Uganda



Key



By-product distribution routes



Major by-product supply and consumption districts

1. INTRODUCTION

The considerable economic success reported to have been achieved by Uganda since the late 1980s have been attributed mainly to the Structural Adjustment Program pursued over the period, supervised and supported by IMF and the World Bank. A key element of the program involved instituting economic policies to promote investments, trade liberalisation and privatisation of business enterprises. The measures have resulted in steady growth in GDP, estimated at about 5.5% per annum for 1997/98 and in the manufacturing sector which stood at 13% over the same period, with its share of the GDP rising from 0.3% in 1992 to 9% in 1997 (MFPED 1998). Exports have risen markedly during this decade before the recent decline set in, due to other factors. The supply of the various consumer goods on the domestic market has been boosted, eliminating the shortages that characterised the economy in the 1970s and much of the 1980s.

The fisheries sector experienced its share of growth, with its contribution to GDP rising from Shs 46.0 billion in 1990 to Shs 58.1 billion in 1997, valued at constant 1991 prices (MFPED 1998). Fish exports have risen markedly, making the sector to become Uganda's second highest foreign exchange earner and fetching US \$ 86 million in 2001 (MFPED 2002). On the domestic scene, it has continued to provide employment and income and act as a source of animal protein to the people in many parts of the country.

The key policies include privatisation, liberalization and investment promotion. The privatisation policy was intended to transfer the ownership of business enterprises from public to private hands for greater efficiency (EPRC 1999). Its effect within the fisheries was that Government withdrew from its earlier role of supplying inputs, which had moderated their prices to the fishers. Fishers are now faced with the full market prices for outboard engines and fishing gears, some of which are often beyond their reach.

The market liberalisation policy reduced controls over the domestic as well as the export trade, aimed at creating a conducive environment for business. Although this led to increase of fishery inputs on the market, the policy resulted in rises in foreign exchange and interest rates, resulting in higher costs for imported inputs and of interests on loans (MFPED 2000, UBOS web site). Liberalization policy has led to the export of substantial quantities of fish, with implications for domestic traders and consumers.

The investment promotion policy, laid down within the Investment Code of 1991, was aimed at encouraging private investment through tariff reduction and provision of tax incentives (Government of Uganda 1991). Other provisions included relaxation of restrictions on profit repatriation for foreign investors and assurances of the security of their assets against any forms of expropriation. The policy, in conjunction with the other measures, has stimulated rapid growth of industrial fish processing capacity on Lake Victoria.

Table 1.1: Number of Industrial Fish Processing Firms, Total Approved Capacities, Fish Purchases and *L. niloticus* Prices, 1990 – 1998*.

Year	No. of Firms	Approved Capacity (Tonnes/Year)	Fish Purchases (Tonnes/Year)	<i>L. niloticus</i> Prices (U. Shs/kg)
1990	3	14,300	4,992	300
1991	6	30,680	14,061	400
1992	7	31,980	14,553	500
1993	9	39,780	18,414	400
1994	9	39,780	19,692	800
1995	12	50,180	48,138	800
1996	13	51,480	39,300	1,000
1997	9	35,880	30,840	1,000
1998	9	35,880	24,000	1,000

Source: MFPED 1998, DFR & Fish Processing Industries records

* Annual estimates based on 260 working days in a year.

As indicated in Table 1.1, industrial fish processing has existed in Uganda since 1990, producing mainly fillets for the international market and in the process generating substantial quantities of by-products.

Earlier studies within this project have examined the impact of fish processing and export on the livelihoods of the artisanal operators and consumers within the fish sub-sector. The studies revealed that:

- a) The country has been able to realise increased foreign exchange earnings as a result of fish export.
- b) The districts involved have benefited from increased revenues attributed to the presence of refrigerated trucks and insulated vessels at the beaches. Sources of such revenues include specific tax charged on trucks and vessels and market fees earned through tendering of the beaches.
- c) Fish exports have resulted in higher income levels for boat owners and crewmembers targeting Nile perch. This is attributed to the high prices paid for Nile perch by the industrial processors.
- d) Because of reduced fish supply on the domestic market due to the export of Nile perch, the prices of other species have also increased.

- e) Fish exports have resulted in substantially decreased levels of artisanal fish processing, and in some cases virtually eliminating it from the beaches, especially on Lakes Victoria and Kyoga.
- f) The levels of local fish marketing have significantly declined due to export and only a small proportion of local traders have continued to deal in Nile perch because they cannot compete with factory trucks in securing raw supplies of the fish.
- g) Fish exports have greatly reduced fish consumption levels even at the beach level. The average buying price of Nile perch by the local consumers is significantly lower than for factory agents indicating that the local population consumes low quality Nile perch, namely rejects and juveniles.

The emergence of the by-product sub-sector in Uganda has been considered a major indicator of the impact of globalisation on the livelihoods and consumption of the local communities. At the onset of industrial fish processing, most of the by-products were disposed off by the fish processing factories as waste. As the scarcity of fish supply on the domestic market intensified due to globalisation, increasing numbers of artisanal processors and traders shifted from dealing in fish to the fish by-products. Similarly, many local consumers, either unable to access fish or afford the high prices, have shifted from consuming fish to the by-products.

It is also the policy of Government that products be diversified to meet the needs of the different consumers and waste be minimised. The industrial processors' immediate concern is to generate revenues from the by-products and avoid the cost of disposing of them. In the long run, they would like to develop value added products from the by-products in order to maximise their profits, in view of the declining trend in fish supply. Some factories have plans to make fish burgers from the trimmings while others intend to export the fish heads and skins.

2. OBJECTIVE OF STUDY

The overall objective of the study was to assess the impact of Uganda's trade in fish by-products on local livelihoods.

The specific objectives were:

- a) To establish the structure and organisation of the fish by-product sub-sector in Uganda, describing the trade from fish processing factories to consumers.
- b) To estimate the quantities and values of by-products supplied by factories.
- c) To assess the economic importance of the by-product trade in terms of income levels, employment and consumption.

3. METHODOLOGY

Existing literature relating to fishery by-products as well as statistics and reports of relevant institutions were reviewed.

Data collection was carried out at 3 selected fish processing factories, at markets and at roadside points where by-products are sold in the districts of Kampala, Mubende, Luwero, Iganga and Palisa.

Key informant interviews were held with the DFOs, relevant personnel at the fish factories and at the markets. Information from owners of by-product marketing and processing units and from consumers was obtained through interviews using structured questionnaires (Appendix 2), resulting in a total of 233 respondents as given in Table 3.1.

Table 3.1: Distribution of Respondents by District and Market

Districts	Markets	No. of Respondents
Kampala	Busega	56
	Ggaba	7
	Kalangalo	20
Mubende	Bukuya	42
	CAWODISA	12
	Wabigalo	17
Luwero	Wobulenzi	25
	Luwero Central Market	14
	Semuto	5
Iganga	Mutukula	16
Palisa	Budaka	19
Total		233

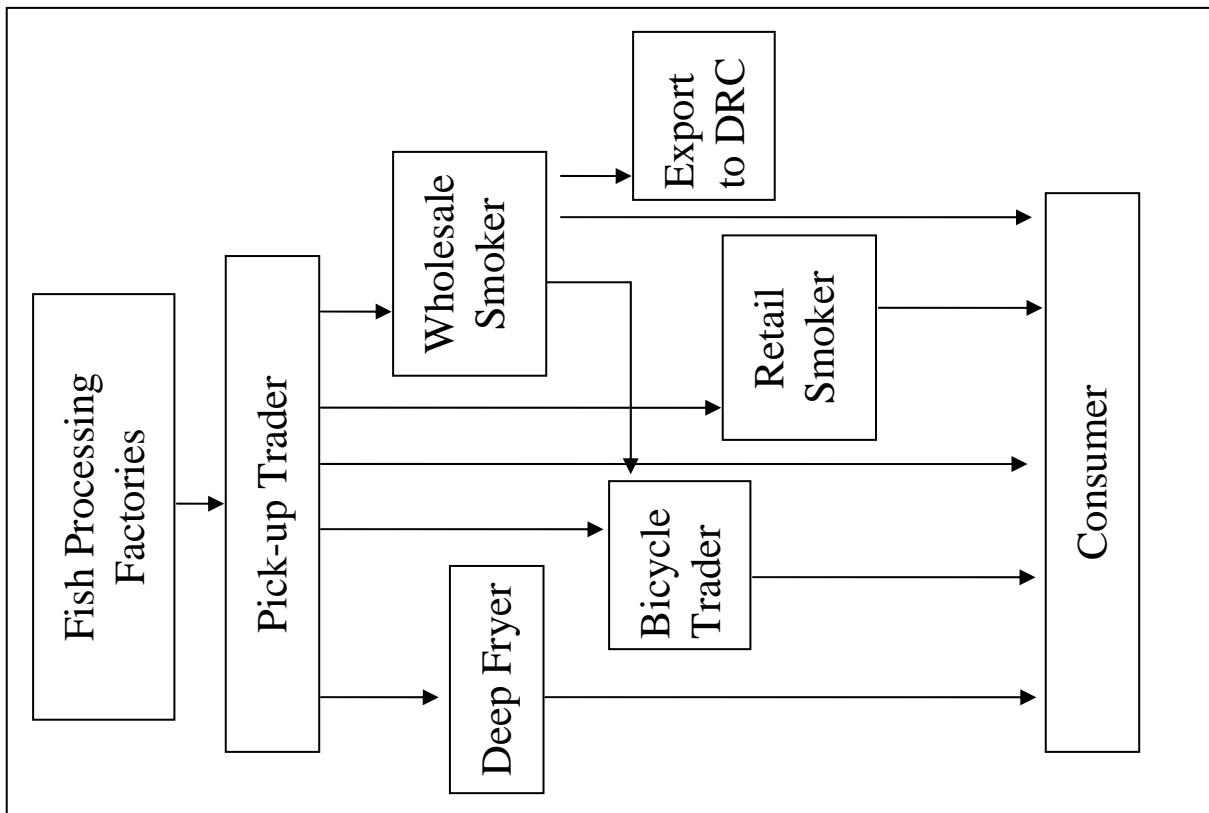
Both qualitative and quantitative data were collected. The qualitative data were analyzed and presented as frequencies whereas the quantitative data was first transformed to derive the target variables, which were analyzed using central tendencies particularly the mean. The SPSS Version 10.0 software was used in the data analysis.

4. STRUCTURE OF THE BY-PRODUCT SUB-SECTOR

The structure of the by-product sub-sector is depicted in Figure 1, showing the flow of by-products from production to consumption. Production is carried out by the industrial processing firms while distribution is done by agents who take deliveries from the factories and sell to different types of processors, traders and also direct to consumers. Consumption is mainly by individuals or by households. No institutional consumers were encountered during the survey.

Substantial quantities of smoked by-products are also transported to Kikolongo Market in Kasese District, from where it is exported to the Democratic Republic of Congo (DRC).

Figure 4.1: Fish By-product Distribution Channels



Source: FIRRI Survey data 2003

The fish factories supply various types of by-products, which include carcasses, skins, fats, trimmings, fish maws, and rejected fish/ fillets from the processing line. Overall, by-products constitute 60% of the whole fish with carcasses accounting for 40%, trimmings (2%), fats (2%), skins (8%), fish maws (2%) and others (6%).

- a) The maws are usually not sold on the domestic market. They are cleaned, fats removed, sun-dried and exported to the Asian countries (EPRC 1999).
- b) The carcasses are sold either fresh or decapitated and smoked or deep-fried before they are sold.

- c) The trimmings are usually rolled into fish balls and then fried for direct consumption.
- d) The skins are descaled, rolled and then smoked or deep-fried before they are sold.
- e) The fats are used for frying the fish balls.

Table 4.1 provides information on quantities sold, prices and values at the factory gate level. For purposes of confidentiality, the names of fish factories are not stated and instead the alphabets are used.

Table 4.1: Quantities, Prices and Values of By-products from Factories

	Quantities (kgs)	Prices Shs/ kg	Values	
			(Shs/ day)	(Shs/ wk)
Factory A				
Daily tonnage of raw fish	20,000			
Fillets	8,000			
By-products				
Carcasses	8,000	210	1,680,000	10,080,000
Trimmings	400	480	192,000	1,152,000
Fats	400	170	68,000	408,000
Skins	1,600	40	64,000	384,000
Fish maws	400	*		
Others e.g. guts	800	**		
Total value			2,004,000	12,024,000
Factory B				
Daily tonnage	13,000			
Fillets	5,200			
By-products				
Carcasses	5,200	110	572,000	1,716,000
Trimmings	260	200	52,000	156,000
Fats	260	100	26,000	78,000
Skins	1,040	80	83,200	249,600
Fish maws	260	*		
Others e.g. guts	520	**		
Total value			733,200	2,199,600
Factory C				
Daily tonnage	13,750			
Fillets	5,500			
By-products				
Carcasses	5,500	140	770,000	5,390,000
Trimmings	275	400	110,000	770,000
Fats	275	330	90,750	635,250
Skins	1,100	40	44,000	308,000

	Quantities (kgs)	Prices Shs/ kg	Values	
Fish maws	275	*		
Others e.g. guts	550	**		
Total value			1,014,750	7,103,250

Source: FIRRI Survey data * Fish maws are exported ** Not sold

Table 4.1 shows that the prices charged for the by-products vary from one processing plant to another depending on the demand, which was in turn attributed mainly to the location of the factory. There were also differences in the amount of flesh left on a carcass from plant to plant hence variations in prices.

Fish factories sell all by-products with the exception of fish maws and guts directly to pick-up traders. The fish maws are high-value products exported to overseas markets at about US \$5 per kg whereas the guts are discarded.

A total of 25 agents obtained their by-products supplies from Factory A whereas 10 and 3 agents bought from Factory B and C respectively. Due to the high demand of the by-products, the fish factories have introduced supply schedules that allocate specific days to the different agents. Most agents were required to deposit an agreed sum of money, typically Shs 2 million, to the factories to secure regular supplies. However, during festive seasons there is low demand for the by-products due to consumer preferences for other animal protein sources

The pick-up traders then move to urban markets namely Busega, Ggaba and Kalangalo, which are essentially distribution centres. Most urban markets begin as early as 5:00 a.m. because of the high perishability of the fresh products and receive supplies from nearly all the factories. After the urban markets, the pick-up traders proceed to rural markets with a few stoppages at roadside market points where they sell to numerous local traders, processors and consumers. Most pick-up traders deal in all types of by-products (heads/ frames, trimmings, skins and fats) and sell to processors and consumers.

The local processors either smoke or deep-fry the products. Among the smokers, there are wholesale smokers who mainly operate at the markets of Ggaba and Busega in Kampala, which handle much larger quantities and sell their products in distant rural markets. On the other hand, the retail processors buy their products from either pick-up traders or wholesale smokers at rural markets and sell to consumers on specific markets days. All deep fryers are retailers handling small quantities and sell their products either in their homes or at the markets. When there is excessive supply of the products, the pick-up traders may supply to local processors on credit.

All the markets apart from CAWADISA in Mubende District handle both processed (smoked and fried) and fresh products. Most urban-based markets operate on a daily basis whereas rural markets operate on specific weekdays, sometimes fortnightly. Urban markets by far handle larger volumes of by-products partly because they are also distribution centres.

Table 4.2: Estimated Weekly Quantities of By-products by Market

District	Markets	Fresh				Processed			
		Head/frames	Trimmings	Skin	Fats	Head/frames	Trimmings	Skin	Fats
Kampala	Busega	28	3.5	7	3.5	--	--	--	--
	Ggaba	140	14	14	10.5	--	--	--	--
	Kalangalo	2.8	2.1	--	0.4	--	--	--	--
Mubende	Bukuya*	2.0	0.5	0.5	0.5	2.0	0.5	0.5	-
	CAWODISA*	--	--	--	--	1.0	0.5	--	0.2
	Wabigalo*	4.0	0.7	6	1.0	--	--	--	--
Luwero	Wobulenzi	4.0	0.5	0.5	0.2	--	--	--	--
	Luwero Central	--	--	--	0.35	7	0.7	0.7	--
	Semuto	3.0	0.5		0.3	1.0	--	0.5	--
Iganga	Mutukula	21	0.9	0.9	0.09	--	--	--	--
Palisa	Budaka	10.5	1.5	1.5	0.45	--	--	--	--

Source: FIRRI Survey data, 2003 *Fortnightly market-day quantities

Development of the by-product sub-sector has been hindered by some factors. The main constraint has been the poor perception of the public, whereby some degree of stigma has been associated with dealing in and consuming the by-products. It is considered a matter of shame that the best parts of the fish should be sent to foreign consumers and Ugandans left to eat carcasses, skins, trimmings etc. In the extreme case, one Local Authority has placed an outright ban on marketing of the by-products in the district and one dealer was reported to have been fined Shs 300,000 for being found selling fish frames in the district.

Despite the increasing trade in by-products, very limited efforts have been made by the various authorities to provide the facilities for handling. In most markets, the wet by-products are not allowed into the areas allocated for fresh fish, where some facilities may already exist. As a result traders of fresh by-products have to sell at various undesignated marketing points along the roads and when they reach the markets, they are hosted outside. The processed by-products are, however, more acceptable and traders are seen occupying stalls together with other smoked fish dealers.

5. CHARACTERISTICS OF BY-PRODUCT TRADERS

Most traders interviewed were male (68%) and their mean age was 32 years. The majority were of the Ganda tribe (63%) and the rest belonged to other tribes such as Soga, Baruli and Banyoro. A majority of the traders (70%) were married with an average family size of 6 members. About 61% of the traders had attained primary education, 28% secondary and the remaining 1% had not gone to school at all. Overall, the traders had spent an average of 5 years in the by-product business. Table 5.1 shows the distribution of sample respondents by type of trader.

Table 5.1: Distribution of Respondents by Type of Trader

Type of Traders	Number	Percentage
Pick-up trader	14	7
Wholesale smoker	49	26
Retail smoker	32	17
Deep fryer	94	50
Total	189	100

Source: FIRRI Survey data 2003

6 INPUTS AND COSTS

6.1 Capital Costs

With the exception of pick-up traders, the capital requirements for by-product operations are low and involve simple assets such as low-technology smoking kilns, bicycles and frying pans. (See table 6.1).

Table 6.1: Average Capital Costs by Type of Enterprise (Shs)

Asset	Type of Trader			
	Pick-up trader	Wholesale smoker	Retail smoker	Deep fryer
Pick-up	4,000,000	.	.	.
Market stall	.	5,000	.	.
Smoking kiln	.	99,810	35,304	.
Bicycle	.	49,765	33,000	42,667
Frying pan	.	.	.	5,711
Total	4,000,000	154,575	68,304	48,378

Source: FIRRI Survey data 2003

6.2 Operating Costs

Large variations in the operating costs of the different enterprises exist. Overall, pick-up traders had the highest operating costs by far, with fuel costs and hire of pick-up each accounting for about 40% of the total costs. Other types of enterprises incurred relatively low but significant costs, with firewood, labour and transport costs as the major costs (See Table 6.2).

Table 6.2: Average Weekly Costs (Shs) per Unit.

Cost items	Type of Trader			
	Pick-up trader	Wholesale smoker	Retail smoker	Deep fryer
Depreciation	10,417	317	194	132
Hire of kiln	.	9,914	5,357	.
Firewood	.	9,976	7,854	5,155
Fats	.	.	.	8,040
Fuel	112,754	.	.	.
Transport	106,667	12,083	16,979	17,407
Ice	30,125	.	.	.
Labour	30,357	12,200	7,263	6,271
Total costs	245,188	22,964	22,395	21,478

Source: FIRRI Survey data 2003

6.3 Outputs and Incomes

Pick-up traders deal in all by-products while wholesale and retail smokers primarily process heads, skins and frames. In contrast, deep friers mainly process skins and trimmings and occasionally melt fish fats for sale to other deep fryers (See Table 6.3). There was an inverse relationship between quantities traded and average price margins with deep fryers having the highest price margins (Shs. 233) and pick-up traders and wholesale smokers having the least (100 Shs/ kg).

Table 6.3 Quantities, Buying and Selling Prices of Traders

	Type of Trader			
	Pick-up trader	Wholesale smoker	Retail smoker	Deep fryer
Heads				
Quantities (Kg)	1,121.4*	430.5	148.9	58.3
Buying price (Shs/kg)	183	296	367	346
Selling price (Shs/kg)	249	434	532	531
Frames				
Quantities (Kg)	.	500.0	6.0	15.0
Buying price (Shs/kg)	.	263	450	300
Selling price (Shs/kg)	.	350	550	550
Skins				
Quantities (Kg)	163.6	891.3	95.5	102.5
Buying price (Shs/kg)	64	143	158	208
Selling price (Shs/kg)	115	213	300	478
Trimmings				
Quantities (Kg)	162.5		.	15.1

Buying price (Shs/kg)	400		.	596
Selling price (Shs/kg)	535		.	956
Fats				
Quantities (Kg)	48.8	.	.	18.0
Buying price (Shs/kg)	281	.	.	100
Selling price (Shs/kg)	394	.	.	200

Source: FIRRI Survey data 2003 * Pick-up trader buys the heads complete with carcasses but the wholesale smoker separates them

6.4 Enterprise Revenues

All the various types of by-product traders earned positive net revenues indicating the by-product marketing operations are profitable (See Table 6.4). Overall, wholesale smokers realized the highest profits due to a combination of the larger quantities of product handled and low input costs. On the other hand, pick-up traders despite trading in the largest quantities, incurred considerable operating costs (fuel and vehicle hire). The cost of the raw products was considerably higher than the total cost of inputs implying that by-product operations are very sensitive to changes in product prices.

Table 6.4: Weekly Costs and Revenues by Enterprise

Costs and Revenues	Type of Trader			
	Pick-up trader	Wholesale smoker	Retail smoker	Deep fryer
Gross revenue	1,060,857	554,564	243,796	134,973
Cost of raw product	783,286	400,725	163,552	82,645
Cost of inputs	245,188	22,964	22,395	21,478
Net revenue	62,740	142,701	65,112	37,036

Source: FIRRI Survey data 2003

7 CONSUMPTION OF BY- PRODUCTS

7.1 Consumers Characteristics

Most consumers interviewed (69%) were male and their mean age was 32 years. The majority of the respondents were of the Baganda tribe (60%). Other significant tribes included the Basoga, Baruli and Banyoro. Most consumers (72%) were married with an average household size of 6 members. About 63% of the consumers had attained primary education, 25% secondary and the remaining 10.3% had not gone to school at all. The consumers were grouped into by-product traders and those who do not deal in by-products. The average incomes of consumers who do not deal in by product was Shs. 36,000.

7.2 Consumption Levels and Trends

By-products particularly the heads, frames and skins are mainly consumed in the smoked form (46%) and constitute a major part of the local diets whereas trimmings are largely eaten as snacks in a deep fried form (40%). The differences in the by-product consumption levels between by-product traders and non by-product trading consumers are largely due to differences in the frequencies of consumption rather than the quantities consumed (See Table 7.1). Furthermore, by-product traders spend less per kg on the products because they directly buy from wholesale traders.

Table 7.1: Consumption Levels and Prices of By-products

	By-product Trading Consumers	Non-By-product Trading Consumers
Household size (No.)	5.8	5.8
Household daily consumption (Kg)	1.7	1.5
Per capita daily consumption (Kg)	0.3	0.3
Frequency of consumption/week (Kg)	4	2
Per capital weekly consumption (Kg)	1.3	0.6
Household weekly consumption (Kg)	7.3	2.5
Average price (Shs/kg)	481	913
Household weekly expenditure (Shs)	3,461	2,284
Average monthly income (Shs)		36,000

Source: FIRRI Survey data 2003

Most of the respondents (96%) reported that over the years the prices of by-products have been increasing. The main substitutes for by-products include beans (51%), ground nuts (22%), vegetables (14%) and meat (9%). Nearly 60% of the respondents did not experience any problems with the supply and prices of by-products whereas 27% and 9% of the respondents cited high buying prices and scarcity respectively as the main constraints limiting the consumption of by-products.

8. CONCLUSIONS AND RECOMMENDATIONS

The study has shown that at the early stages of industrial fish processing in Uganda, by-products were treated as waste and measures were being taken to dispose of them appropriately. However, as a result of growing fish scarcity and rising fish prices on the domestic market due to increasing fish export, by-products have been utilized for human consumption. A network of by-product distribution has developed, with authorized agents taking deliveries from the fish factories for further distribution by other dealers. Two main distribution centers have developed, namely Busega and Ggaba Markets, from where the by-products leave for up-country destinations.

Kampala, Luwero, Mubende and Iganga are the main destinations for the by-product trade but smoked products are ferried to Kikolongo in Kasese District, mainly for onward export to the Democratic Republic of Congo. Supplies to some of the distant districts like Tororo and Palisa have declined as result of increased consumption within the nearby districts.

By-product marketing is carried out by four categories of traders, namely pick-up traders, wholesale smokers, retail smokers and deep fryers. Average weekly net revenues for the different categories of traders range from Shs 37,000 for the deep fryer to Shs 143,000 for the wholesale smoker.

Many Ugandans have taken to consumption of by-products as a result of shortage and high prices for fish on the market. Consequently, by-products now fill a major gap on the fish market in Uganda. Development of the sub-sector has reduced the environmental dangers of disposing of the by-products as wastes and the costs associated with it.

However, business in by-products is hindered by the negative attitude of the community towards dealing in and consuming the by-products, the high factory costs of by-products and lack of facilities for the trade. Furthermore, there is lack of clarity in the policy towards marketing and consumption of by-products and as a result, some Local Authorities have not allowed by-product trade in their districts.

On the basis of the findings of the study, the following recommendations are made:

- a) There is need to come out with clear policy towards marketing and consumption of by-products at national and district levels to guide development of the sub-sector.
- b) The contribution of the by-product sub-sector as a source of income and food should be recognized and the communities sensitized to take advantage of the opportunities it presents.
- c) Appropriate standards for producers and dealers in by-products should be developed and implemented to ensure minimum food contents and hygiene.
- d) Statistics should be maintained on the sub-sector activities.

- e) There is need to provide facilities for by-product marketing at the different stages.

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APPENDICES

APPENDIX 1 PRINCIPAL PERSONS MET

Mr. Kiri Andrew	Quality Assurance Manager, Byansi Fisheries Company Limited
Mr. Mwase Godfrey	Operations Manager, Greenfields (U) Limited
Mr. Badru Lugolobi	Quality Assurance Manager, Greenfields (U) Limited
Mr. Luswata Charles	Supervisor By-products Section, Greenfields (U) Limited
Mrs. Amongin Matlida	Quality Assurance Manager, Ngege Limited
Mrs. Imaculate Sentengo	Wholesale trader, Byansi Fisheries Company Limited
Mr. Kalyango Ben	Wholesale trader, Byansi Fisheries Company Limited
Mr. Sempa Benard	Wholesale trader, Greenfields (U) Limited
Mr. Ddumba Ronald	Wholesale trader, Ngege Limited
Mr. Mutyaba D.	District Fisheries Officer, Mubende
Mr. Musozi, D.	Assistant Fisheries Officer, Wobulenzi
Mr. Musisi Ibrahim	Member of the BMU, Ggaba Market
Mr. Kimumwa	Chairman Fish Mongers' Association, Luwero
Mr. Kafumbe Paul	Secretary, Akugoba Fish Traders group, Busega
Mr. Sentongo Charles	In-charge, Kalangalo Market
Mr. Kami Katono Ali,	Health Inspector, Bukuyu
Mr. Kasujja	Chairman Fish Traders, Wabigalo
Mr. Musoke	Assistant Fisheries Officer, Semuto

APPENDIX 2 DATA COLLECTION INSTRUMENTS

KEY INFORMANT INTERVIEW WITH FACTORY MANAGER

Background information

Date _____

Name of enumerator _____

District _____

1. Name of Factory _____

2. Job description of respondent _____

3. Describe the different types of factory by-products

4. Describe the different buyers of your by-products

5. Mention the problems you encounter in the sell of by-products

6. Provide information on future plans for your by products

Questions	Type of by product					
	Fish frames	Off-cuts	Fats	Skin	Fish maws	Other
7. Average units for each sell per day/week						
8. Average price per unit						
9. Average number of times of supply per day/week						
10. Main destination of your by-products						

Key Informant Interview with Market Tenderer/Master

A. Background information

- 1) Date _____
- 2) Name of enumerator _____
- 3) District _____
- 4) Sub county _____
- 5) Name of market _____
- 6) Title of respondent _____

B. Infrastructure/facilities in support of fish marketing (No. and description)

- 7) Fish stalls in the market
 - a) Fish stalls _____
 - b) Weighing shade _____
 - c) Raised platform _____
 - d) Ice boxes _____

Fill in the information below about fish species, rank and quantities brought per week

Type of By-product	Rank	Qty. Brought per week/Per market day
8) Heads		
9) Frame		
10) Trimmings		
11) Skin		
12) Others		

Fill in the information below about number by category, assets and rank of fish trader

Type of trader	Rank	No
13) Bicycle trader		
14) Truck trader		
15) Other		

16) State the problems faced with fish marketing _____

17) Suggest solutions _____

Unit Questionnaire for By-product Marketing Sub-Sector

Name of enumerator _____

Date _____

1. District _____
2. Market/roadside point _____

A. PERSONAL DATA

3. Name of respondent _____
4. Age _____ years
5. Sex [1] Male [2] Female
6. Tribe: [1] Ganda [2] Soga [3] Mugungu [4] Munyoro [5] Teso
[6] Mukenye [7] Acholi [8] Adhola [9] Alur
[10] Other _____
7. Marital Status: [1] Married [2] Single [3] Divorced [4] Separated
[5] Widowed [6] Other (Specify) _____
8. What is your level of education? [1] No schooling [2] Primary [3] Secondary
[4] Tertiary [5] University [6] Other _____
9. How long have you traded in by products? _____ Years

B. INPUTS/ COSTS

Capital

10. What type of trader are you?
[1] Retailer Smoker [2] Pick-up trader [3] Wholesale trader
[5] Other (Specify) _____
11. What fish trading assets do you own?

ASSET	YEAR OF ACQUISITION	COST PRICE	EXPECTED USEFUL LIFE	SALVAGE VALUE
[1] Bicycle				
[2] Basket				
[3] Ice boxes				
[4] Truck				
[7] Stall/slab				
[8]				

12. What other inputs do you use and what are their costs?

INPUT	QTY	UNIT COST
Fuel		
Ice		
Transport		
Others		

13. How many days a week do you operate? _____

Labour

14. What sources of labour do you use?
 [1] Self-employment [2] Family labour [3] Hired labour [4] Other ____

15. Provide the information below:

SOURCE OF LABOUR	NUMBER	UNIT COST/ DAY/ WK/MONTH
[1] Self-employment		
[2] Family labour		
[3] Hired labour		
[4] Other		

C. OUTPUT/ INCOME

16. What type(s) of by-product do you deal in?
 [1] All by-products except fish maws [2] heads [3] Skins [4] Frames
 [5] Trimmings [6] Other _____

17. Provide the information below:

TYPE OF BY-PRODUCT	AVERAGE WEEKLY QUANTITY TRADED	BUYING PRICES (KG)	SELLING PRICES (KG)
Heads			
Frames			
Skins			
Trimmings			
Other			

18. To whom do you sell your products? [2] Retailer [3] Consumer
 [4] Other ____

19. If to consumers, approximately how many consumers do you sell to each day you operate?

20. In what form do you sell your products?
 [1] Fresh [2] Processed-smoked [3] Processed – fried [4] Other ____

21. What problems do you face with marketing of your by-products _____

UNIT QUESTIONNAIRE FOR BY-PRODUCT CONSUMERS

Name of enumerator _____

Date _____

3. District _____

4. Market/roadside point _____

A. PERSONAL DATA

3. Name of respondent _____

4. Age _____ years

5. Sex: [1] Male [2] Female

6. Tribe: [1] Ganda [2] Soga [3] Mugungu [4] Munyoro [5] Teso
[6] Mukenye [7] Acholi [8] Adhola [9] Alur [10] Other ____

7. Marital Status: [1] Married [2] Single [3] Divorced [4] Separated
[5] Widowed [6] Other (Specify) _____

8. What is your level of education? [1] No schooling [2] Primary
[3] Secondary [4] Tertiary [5] University [6] Other _____

9. How long have you consumed by- products? _____ Years

10. What is your main source of income? [1] Farming [2] Trading [3] Salaried employment

11. How much do you earn per day/week/month/year

12. Household size _____

B. CONSUMPTION

13. What type of by-product do you most commonly eat at home?
[1] Head [2] Skeleton [3] Skins [4] Trimmings [5] Others _____

14. What form of by-products do you consume?
[1] Fresh [2] Processed – smoked [3] Processed – fried [4] Other _____

13. How much by-products does your family eat each day? _____ Kgs

14. How often does your family eat fish by-products per week? _____

15. At what price per kg do you buy by-products? Shs. _____

16. Over the past year, has there been change in price at which you buy products for consumption? [1] Yes [2] No

17. If yes, what change? [1] Increased [2] Decreased

18. What is your substitute for fish? 1] Beans [2] Meat
[3] Vegetables [4] Chicken [5] Other _____

19. State problems associated with consumption of by-products? _____