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FISH

AGRO-INDUSTRIALISATION

Fish as a priority commodity for Agro-Industrialization

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1. Background

With approximately 20% of Uganda's surface area covered by fresh water, there is a tremendous opportunity for fisheries resources to be exploited through both capture fisheries and aquaculture production.[1] Overtime, Uganda has derived significant economic benefits from fisheries. For over a decade now, the sub-sector has been the second largest foreign exchange earner for Uganda after coffee. In 2017, Uganda earned 136.2 million US$ from fish exports[2], contributing about 6% of non-traditional export revenue. Apart from foreign exchange earnings, about 5.3 million people derive their livelihood from fisheries, over 1.2 million people directly depend on fisheries as the main source of household income and fisheries provides jobs for about 1 – 1.5 million people along the value chain activities, with the fish processing stage of the value chain employing at least 5,000 people.[3] Within global development agenda, fisheries is earmarked as a critical commodity for attaining Sustainable Development Goal (SDG) 14 - conservation and sustainable use of water resources. The above economic benefits provide justification for refocusing attention towards further development of the sub-sector through a transformative agro-industrialization pathway.

2. Fisheries sub sector outlook

Despite its importance, fish catch has languished below 500,000 metric tonnes (MT) per annum over the last years, and aquaculture production also remained dismal over the same period (Table 1). More than 80 % of Uganda's fish catch is from Lakes Victoria and Albert. The trends in fisheries production (both catch and aquaculture) reveal a supply side weakness that is considerably constraining revenue generation and other potential gains to the economy from the sub-sector. Apart from shortfalls in production, the share of fish exports to total production has been consistently below 4% over the period reviewed. In absolute terms, exports declined from 22,928 MT in 2012 to 19,112 MT in 2016 primarily due to declining fish stocks.

2.1 Organization of the fish value chain

Uganda largely relies on catch fishery for fish production. The first segment of the fish value chain (production) comprises fishermen (Figure 1), who are mainly artisanal fishers. Fish is caught using rudimentary technologies like canoes with sails or outboard motors. Some fishermen operate using their own boats, while others use boats owned by fish collectors or processors. Besides declining fish stock, fishermen face the challenge of poor fish preservation infrastructure which forces them to sell fish immediately after harvest to local processors or local traders at relatively cheaper prices. The fish collectors or factory agents are very powerful influencers of fish prices, rendering most fishermen price takers. On the other hand local traders connect consumers and fishers primarily through transportation while local processors may undertake some basic preservation like smoking, salting or sun drying.

The processors[4] receive raw material from collectors, but in some instances may obtain fish directly from large scale fishermen. These factories are responsible for processing and packaging quality fish products for both domestic and foreign markets. Out of identified fish products (Table 2), the processors are engaged in producing only about 38% of possible fish products, implying that the fish processors are not fully exploiting potential fish product space.

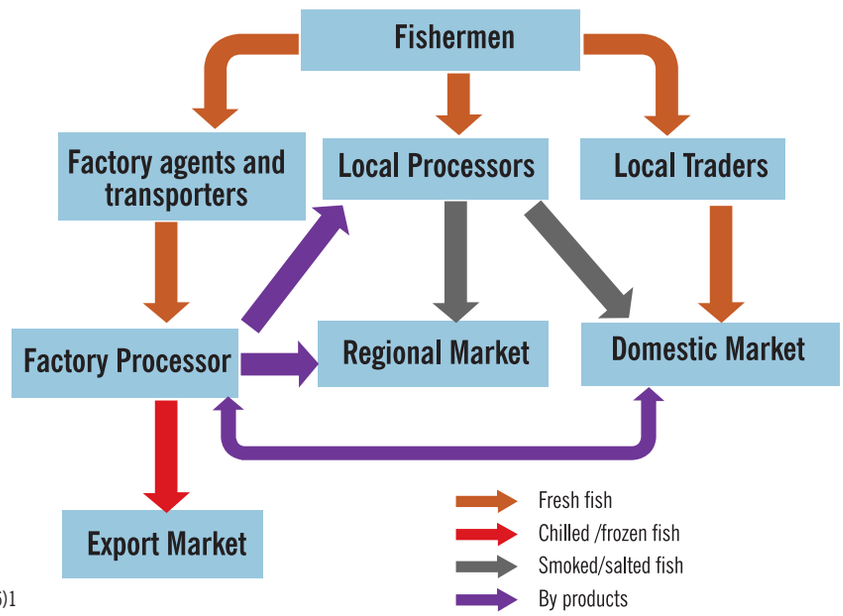
Table 1: **Fish production and export**

	2012	2013	2014	2015	2016
Production from catch (MT)					
Lake Victoria	185,000	193,000	245,000	238,630	252,804
Lake Albert	152,560	160,000	152,000	149,040	148,159
Lake Kyoga	44,049	40,000	38,000	41,768	40,710
Lake Edward, George,& Kazinga Channel	5,208	6,248	6,246	6,354	6,638
Albert Nile	5,043	5,500	5,390	5,122	5,375
Lake Wamala	5,712	4,500	4,590	4,186	3,959
Other Waters	9,547	10,000	10,500	9,760	9,883
Total catch	**407,119**	**419,248**	**461,726**	**454,860**	**467,528**
Aquaculture production (MT)	**95,906**	**98,063**	**111,023**	**117,590**	**118,051**
Export quantity (MT)	22,928	20,087	17,597	18,052	19,112
Fish export as % of total Production	4.6%	3.9%	3.1%	3.2%	3.3%
Export value (000' US$)	128,322	126,727	134,791	117,597	121,467
Fish export value as % of total export value	5.4	5.3	6	5.2	4.9

Source: Compiled from the Statistical Abstract (UBOS, 2017); and FAO fishery database.

1 Ministry of Agriculture Animal Industry & Fisheries – Department of Fisheries Resources, Annual Report 2012.
2 Background to the Budget 2018/2019
3 Ministry of Agriculture Animal Industry & Fisheries – Department of Fisheries Resources, Annual Report 2012.
4 Comprise of six functional firms under the Uganda Fish Processors and Exporters Association (UFPEA). These include include Aquaperch, Karmic Food Ltd, Greenfields (U) Ltd in Entebbe, Lake Bounty Ltd, One to Fish, Fresh Perch and Gomba

Figure 1: **The fish value chain**



Source: Modified from Gudmundsson et al (2006)1

1 Gudmundsson, E; Asche, F; Nielsen M. (2006). Revenue distribution through the seafood value chain. FAO Fisheries Circular No. 1019. Rome, FAO, 2006. 42p.

The next segment is the fish market – both local and foreign that sell fish to consumers who are the final value chain actors. According to documentation of major fish exporters[5], there is a wide range of fish export market opportunities that Uganda can exploit, and these include; markets within the region (e.g. Rwanda, Sudan, DRC), COMESA, European markets (e.g. Netherlands, Belgium, Spain, Australia), East Asia (e.g. Japan, China, South Korea, Singapore), USA, and others such as Middle East countries. It is important to note that some of Uganda's fish fillet exported to Europe are further processed by European factories to make high value products – this is a missed opportunity for Uganda due to low level of processing. In addition to the main industrial products, fish factories also produce by-products which are sold to local processors, regional and domestic consumers.

The fisheries value chain above is unique and fragile with some peculiarities that have far reaching implications for agro industrialization. First and foremost, majority of Ugandans and regional markets consume unprocessed fish[6] - inherently eliminating industries from direct participation in the local market. Processors are involved mainly when fish is being exported to international markets. In this case, vendors buy from fishers and supply to factories according to terms agreed to *a priori*. These terms specify the size of fish, quality and quantity. With these specifications, the processor controls for potential losses from substandard fish.

The fish processors/exporters are organized under an umbrella association the "*Uganda Fish Processors and Exporters Association (UFPEA)*" which was established in 1993. The association brings together industrial fish processors in Uganda. Although the association had up to 14 members by 2013, when fish stocks declined, 8 of the members closed down. Those that survived in the fish processing industry were hedged by investments in other sectors. Current membership comprises 6 fish processing firms, with a target to enroll all fresh fish processors in the country into membership. The UPFEA member factories are located in Kampala, Entebbe, Rakai, and Jinja districts.

Unlike many other agricultural commodity processors, UFPEA has established a structure responsible for ensuring quality and standards of processed fish. This is achieved through quality control at factory level, regulating fish processing practices and undertaking periodic inspection of firms through the "Quality Assurance Managers Association", which is an affiliate of UFPEA. By pooling expertise from Quality Assurance Managers within the industry, UFPEA ensures a harmonized approach to fish quality, standards and safety.

Like the processors, fish vendors or suppliers are also organized under an association – Association of Fishers and Lake Users in Uganda (AFALU) and act as the link between fishers and processors. For now, apart from specifying requirements to vendors, direct trade relations between factories and fishers is limited. The processors therefore have no control over what happens at the landing sites and the raw material they obtain has capped their operations at below 30% processing capacity on average yet overheads like energy and transport costs remain high.

3. Fisheries product space

With respect to the product space, Ugandan fish processors produce a limited range of fish products which include; fish fillets, fish meat (minced or not, and fresh or chilled), and salted or dried/smoked fish. As shown in Table 2, the leading products are dried or smoked fish and fish meat (fresh, chilled). Of the product space, fish exports are dominated by chilled

5 http://www.ufpea.co.ug/fishexports.html

6 In this case vendors buy either fresh or smoked fish directly from fishermen and sell locally or export to regional markets - mainly South Sudan and DRC. This applies to all fish varieties including Nile perch, Tilapia, silver fish, mud fish and cat fish.

Table 2: **Summary of Uganda's fisheries products**

Selected fish products: production (MT)	2010	2011	2012	2013	2014	2015
Fish fillets (frozen)	5,397	5,246	4,924	3,046	2,855	4,526
Fish meat, (whether or not minced, and fillets fresh or chilled)	11,301	12,086	13,325	13,752	13,181	12,325
Fish (dried, salted or smoked)	13,800	13,128	12,455	15,501	14,097	12,896
Fish solubles (by-product of fish meal manufacture)	0	0	0	0	0	0
Fish silage (used as animal feed or fish meal)	0	0	0	0	0	0
Fish meal (fertilizer or animal feed)	0	0	0	0	0	0
Fish oils (Omega-3-fats for general health supplement & skin care)	0	0	0	0	0	0
Cutlery fishbone products (powder for health & beauty, rings, etc.)	0	0	0	0	0	0

Source: Compiled using FAO fishery database.

Figure 2: **Some of Uganda's Fish Products**

2a: Chilled Nile Perch: Photo courtesy: UFPEA

2b: Silver Fish: Photo courtesy: EPRC

or frozen fish in various forms (whole gutted, headed and gutted, skin on and skinless fillet, fish maws, portions, steaks and loins) (Figure 2a). also worth noting is that, Nile perch accounts for 99% of Uganda's processed and exported fish and tilapia/whole gutted fish are exported only on small scale to regional markets and in some cases local super markets. For the dried, salted or smoked fish, although some primary processing is undertaken, majority is locally preserved without undergoing significant industrial processes (Figure 2b).

Other potential fish products that require high or secondary level processing are not produced in Uganda. These include; fish solubles, fish silage, fish meal (fertilizer or animal feed), fish oils, and cuttle fishbone products. Although processors are aware about the benefits of higher value products, venturing into these options is constrained by the high capital requirement but also the limitation in quantities of the raw materials given the current production capacity. One high value product which is not presented in detail due to unavailability of data is the "Gas Bladder" or fish maw. This product is on high demand from the Chinese, and it is important that more is explored about it to examine possibilities of large scale production by processors in order to fully exploit the high value associated with it.

The scope of processed fish products demonstrates that primary processing activities predominate fish processing in the country. This is another critical area that needs to be bolstered through a fishery industrialization game plan that targets investments in and employment of processing technologies that are capable of widening processed fish product space through high level value addition or manufacturing, rather than depending on primary fish processing.

4. Recommendations

To effectively drive agro-industrialization, different activities in the value chain need to be strengthened and intensified. The limited product space and other constraints notwithstanding, we observe some level of organized set-up within industrial fish processors, given the existing fish processors association and its related structures. Despite being organized, fish processors are noted to operate below capacity due to raw material shortfalls. Using the proposed model, the opportunity to harness agro-industrialization in the fisheries sector lies in broadening the production base to meet both industrial and domestic market needs.

a. Increase and sustain fish production

- Promote cutting edge technologies proven to be more productive such as cage culture, in order to complement fish catch for industrial processing. But for such technologies to be effectively utilized, notable challenges[7] in the aquaculture sub-sector have to be tackled. These include; inadequate and poor quality fish feed, dysfunctional fry centers meant for fish seed (fingerling) production, inadequate fishery extension services, and organization of fish farmers to enhance aquaculture production. Government can support investment in appropriate technology through partnerships or initiatives that will subsidize cost of investing in aquaculture and reduce operating costs particularly energy (fuel and electricity).
- The adoption of new technologies should complement proper management of the aquatic ecosystem to ensure sustainable fish production from natural water bodies. To achieve this, prioritize interventions that replenish/regenerate, conserve and sustain aquatic resources.
- Regulate fishing activities: Until MAAIF established the Fisheries Monitoring and Enforcement Unit (FMEU) which drew membership from the Uganda Peoples Defense Forces (UPDF) to manage the landing sites, fishers and vendors seldom complied with MAAIF standards for fish to harvest. However, the FMEU does not present a panacea for management of fisheries resources. As a solution, Government should strengthen public institutions that govern fisheries resources since proper management of fishing sites would curb use of irregular fishing methods, harvesting and marketing of small/immature fish and mismanagement of beaches.

b. Appropriate Research and development (R&D)

Currently Nile perch is only produced under fish capture – yet it constitutes 99% of exports and most of the processed fish. The viability of fish industries in Uganda is therefore almost entirely dependent upon perch stocks in the natural water bodies. Apart from environmental impact assessments, the ongoing R& D like cage culture, harvesting of silver fish using lamps, fish feeds, fast growing tilapia and post-harvest handling technologies spear headed by NaFFIRI have not specifically targeted Nile perch. While in the short run, there is an opportunity for the fish industries to expand since the water resources are operating below carrying capacity, in the long run R&D geared specifically for perch production or ensuring Tilapia which can currently be produced under aquaculture is scaled to make it economical for processing. Key informant information reveal that NaFIRRI started research attempts on Nile perch domestication but no serious break through has been achieved yet. Nile perch is *piscivorous* fish which feeds through hunting - there is still a problem of adapting it to feed on formulated feed, and this requires more research. Also, there is still need to succeed in breeding Nile perch in captivity to be sure of a steady supply of feeds. Therefore, there is need to strengthen R&D initiatives to ensure Nile perch production through aquaculture. It has been established that resource limitation is a major constraint for NaFIRRI to continue with the research efforts that it started. It is therefore paramount that NaFIRRI's R&D initiatives are supported with the relevant financing. Any innovations arising from R&D must be supported with effective extension services that target fishers or fish farmers as final beneficiaries.

c. Value addition:

The evidence suggest that the fishery value chain is largely dominated by primary fish processing (drying, cleaning, smoking, packaging fresh or frozen fish). More so, processing of high value products has been constrained by weak supply base (production) and high cost of investing in specific equipment. Interventions at this stage should therefore focus on supporting fish processors to take on secondary processing activities by investing in high-tech fish processing equipment that can be utilized to widen the product space for processed fish. Existing fish processors mainly process Nile perch, but Nile perch production through catch is low due to declining fish stock. Therefore, fish production capacity does not meet processing needs. Additionally, there are some processors who are engaged in Tilapia processing (e.g. One To Fish) but are also constrained due to limited supply of Tilapia for processing, hence the need for the interventions prescribed to boost production.

7 Identified challenges facing aquaculture in Uganda can be found in the paper: Swaibu, M; Odokonyero, T; Munyaho, A. T. (2017). Harnessing floating cage technology to increase fish production in Uganda. Research series # 138, Economic Policy Research Centre – Kampala, Uganda.

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