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POLICY BRIEF

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Floating Fish Cage Farming a Solution to Uganda's Declining Fishery Stocks

Executive Summary

This brief is extracted from a study on cage culture and aquaculture park technologies in Uganda conducted by EPRC and National Fisheries Resources Research Institute (NaFIRRI). The brief demonstrates that favorable and bullish international fish prices have supported steady foreign exchange earnings to Uganda, amidst declining volumes of fish exports. Despite decline in fish export volumes from 39,000 metric tons in 2005, to 17,600 tons in 2014, export earnings increased from 104 million to 135 million in the same period. To enable Uganda take advantage of this opportunity, innovations that overcome supply constraints will play a critical role. Statistics from NaFIRRI suggest that floating cage technology is a more productive system in comparison to capture fishery. A farmer using floating cage technology produces 12 times more tonnage per annum than counterparts practicing capture fishery - 48 metric tons of fish per annum, compared to only 4 metric tons. To increase fish production, therefore, the adoption of floating fish cage farming technology needs to be scaled up as opposed to continued dependence on capture fishery systems that are less productive and cannot meet the increased demand for fish exports. This brief also draws policy lesson from China and Egypt - the most successful and leading aquaculture producing countries – who made deliberate investments in aquaculture technology and support services, which increased fish farming productivity and exports.

Introduction

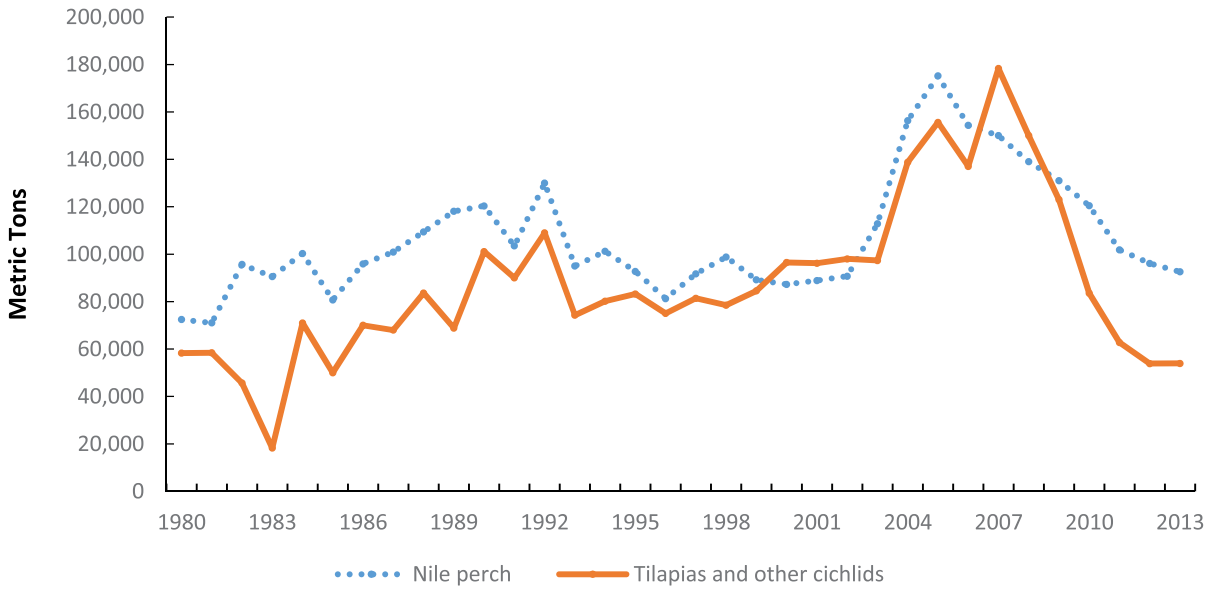
Fisheries is among priority enterprises[1] in the 2015-2020 National Development Plan (NDP II), and the Agricultural Sector Strategic Plan – ASSP (MAAIF, 2015). Over the last 10 years, the fisheries sub-sector has taken a strong position in the country's economy as the second largest foreign exchange earner after coffee. Fish exports earned USD 135 million in 2014 (MoFPED, 2015) - which amounts to approximately 3% of the Gross Domestic Product (UBOS, 2014). However, the declining trends in capture fish of major exportable species (Nile perch and Tilapia) between 2007 and 2013 brings to question the sustainability and future growth of Uganda's fisheries sub sector (Figure 1). The downward trends (Figure 1) in capture fish are widely linked to over-fishing in the fresh water bodies. This has to a great extent affected fisheries sub-sector performance in the recent past. For instance, growth in fish production declined by 12.6 percentage point in the financial year 2007/08. A brief recovery in growth, between the years 2009 to 2012, was interrupted by 4.5 percentage point decline in 2013/14[1].

1 Commodities were prioritized based on the potential for poverty reduction, contribution to exports, size effects, returns to investments, ease of adoption and future impacts among other factors.

Pic1: Example of Floating Fish Cages

This brief uses secondary data from both NaFIRRI and FAO Stat Fisheries data bases to analyze the likely outcomes of embracing floating fish cage farming as an innovative pathway for future sustainable commercial exploitation of fisheries resources in Uganda. The brief also draws policy lesson for Uganda from China and Egypt. China and Egypt succeeded in driving investment and support services into aquaculture to improve their fish industry productivity and Exports.

Figure 1: Trends in Fish Catch of Major Species (1980-2015)

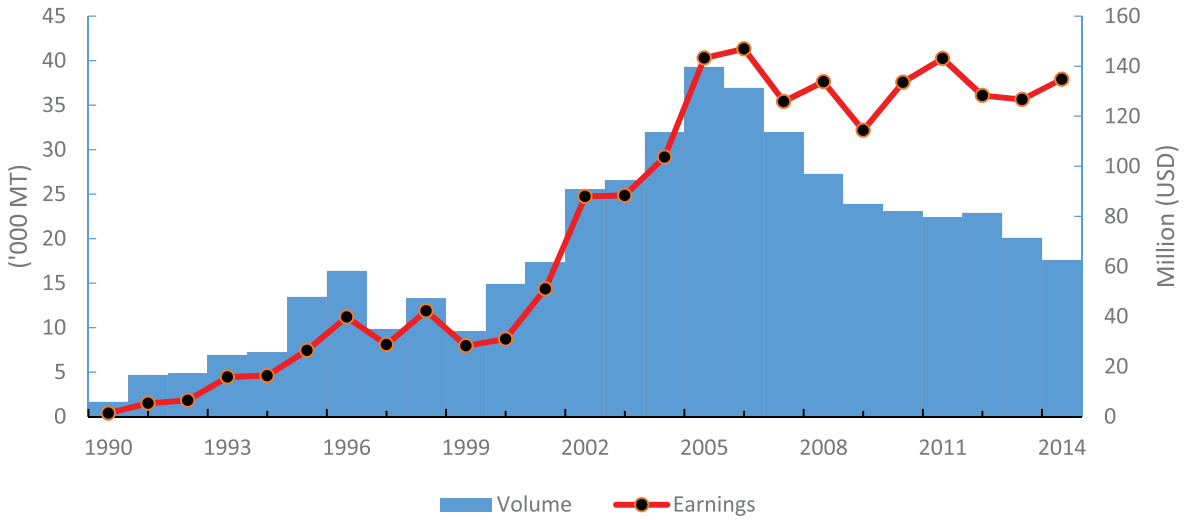


Source: FAO fishery statistics, 2015

Resilience in Fisheries Export Earnings

Using trends in value and fish export volumes (Figure 2), this brief demonstrates that the fish sub-sector is a resilient and potential earner of foreign exchange to the country that needs to be harnessed by employing cutting edge technologies that can arrest trends of declining fish stocks. Since 2005, supply-side constraints have limited capacity to have enough fish exported. Fish export volumes peaked to over 39,000 metric tons in 2005, but later-on plummeted to about 17,600 tons in 2014 (Figure 2). In the same period, export earnings increased from 104 million to 135 million USD. This was likely due to a growing and favourable international fish market regime; the price per ton of fish increased due to the general decline in volume of fish exported internationally. In this regard, two factors are imperative in designing an efficient fishing industry in Uganda: First, declining production and low productivity of capture fish system in Uganda may face difficulties in taking advantage of this growing lucrative international fish market. Second, the growth trajectory in volume exported vis-a-vis revenue earnings point towards an export sector that has resilience in returns, and with a high potential to boost export earnings of the country.

Figure 2: Trends in Volume and Export Fish Earnings (million USD), 1990-2014



Source: FAO Stat Fisheries database (2011-2011) & MoFPED (Background to the Budget (2015/16)

In Uganda, reductions to net revenue arising from decline in fish stock and subsequently catches is commonly cited as a consequence of overfishing and poor regulation of fishing activities by government agencies (Kaelin and Cowx, 2002[2]; Katurole and Wadanya, 2000[3]).

Why Floating Fish Cage Farming is the Best Option

Table 1 shows that 419,249 metric tons of fish are produced by 116,225 fishermen annually using the capture fishery production system. This suggests that, on average, each fisherman produces 4 metric tons under the capture fisheries system per annum. Conversely, on average each fish farmer produces 48 metric tons annually using the cage culture technology (Table 1).

Pic2: Capture fisheries system

Pic 3: Typical cage culture system

Technically, floating *cage culture technology is 12 fold (1100%) more productive system.* Therefore beyond provision of jobs, cage culture offers a superior alternative for fish production with lesser fishing efforts, for producing more fish. Also, it can go a long way in averting overfishing in fresh water lakes (saving natural resources), increasing labor productivity and ensuring sustained growth in fish supplies.

Floating Cage Fish Farming Capabilities and Challenges

Available data (Table 2) reveals that that there are 28 registered cage culture fish farmers in Uganda, with a total of 2,135 cages operational around Lake Victoria (Table 2). The limited number of registered fish farmers using caging technology can be explained by the fact that floating cage fish farming is a relatively new innovation (started in Uganda in 2007), with support from the USAID aquaculture development programme[24].

Table 2 further reveals that total fish production from the cages is about 899 tonnes in every 6-8 month production cycle. However, there is limited competition in the sector. Most cages (in the Lake Victoria) are majorly concentrated in the central region (districts of Mukono, Buikwe, Wakiso and Rakai). In the Eastern region, there are 704 cages located in Jinja wholly owned by only six registered farmers. In addition, production capacity within the fish cage farmers' community highly varies across regions. For example, cages operated by the six (6) fish farmers in Buikwe district are relatively more productive, producing 1.41 metric tons per cage annually, translating into over 180 metric tons of fish per annum. Conversely, the annual productivity of fish farmers in Mukono is 0.02 metric tons per cage. The regional differences in productivity among fish highlight the need for capacity building within the fish cage farming community.

2 Other actors that support Ugandan cage culture value chain include; national government, local government, development partners like the Belgian Technical Corporation (BTC), NGOs, individual farmers, and youth groups (Kifuko, 2015).

Table 1: Productivity per capita between Capture and Floating Fish Cage Technology

Type of fishery activity/technology	Current production (tons)	No. of fishers employed	Other employment[1]	Total employment created	Productivity
Capture fishery	419,249	116,225	4,532	120,757	4
Cage culture technology	1,349	28	-	28	48
Aquaculture parks[2]	-	-	-	-	-
Aquaculture - All	98,063	-	-	53,000	-
Fishery – All (capture & aquaculture)	517,312	116,253	-	173,785	5

Source: FAO statistics (2013), FAO (2014), NaFIRRI & DFR (various years). Productivity computed by authors.

Table 2: Distribution of Floating Cage Fish Farming in Uganda

Region	District	Number(s)		Fish Production (MT/Cage)		Productivity (MT/Annum)	
		Cages	Fish Farmers	6-8 month production cycle	Per Annum	Cage	Each Farmer
Eastern	Jinja	704	6	144.60	216.90	0.31	36.15
Central	Mukono	420	1	4.50	6.75	0.02	6.75
Central	Buikwe	779	6	733.40	1,100.10	1.41	183.35
Central	Wakiso	150	10	16.10	24.15	0.16	2.42
Central	Rakai	7	1	0.72	1.08	0.15	1.08
Central	Kalangala	75	4	-			
Total		2,135	28	899.32	1,349.0		
Median						0.16	6.75
Average						0.41	45.95

Source: NaFIRRI, 2015

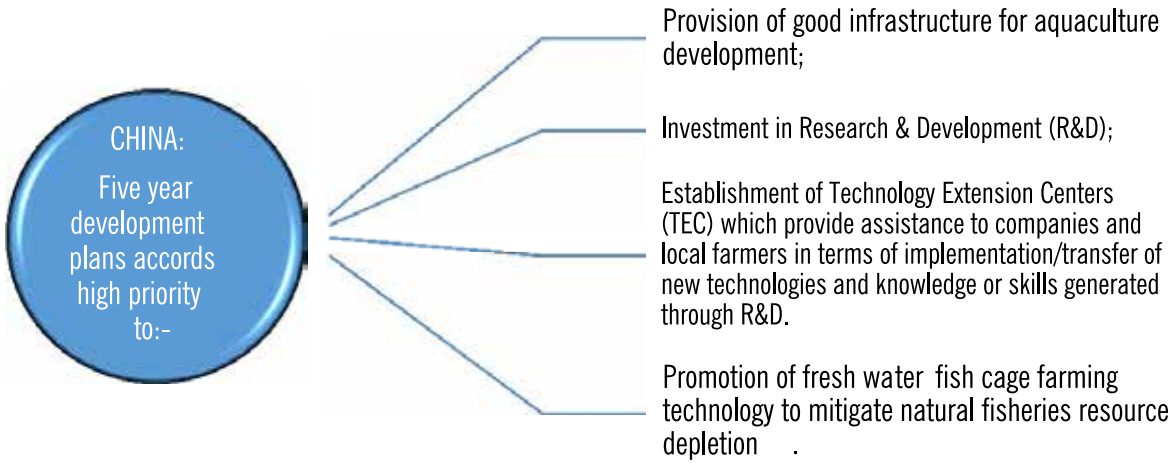
Lessons from China and Egypt

As earlier highlighted, prior to 2005 Uganda's fishery system was entirely dependent on capture fish system (Figure 3a). However, over time Uganda has built aquaculture production capability from about 10 thousand MT per annum to about 100 thousand MT per annum in 2013 - accounting for about 20 percent in total national fish production in the country. Nevertheless, more investments are needed to scale up particularly cage culture technology, to meet export demand.

China since the 90s succeeded in aggressively expanding the fishery sub-sector via aquaculture rather than capture fish (Figure 3b)-resulting into steady positive growth in the fishery sub-sector. China's approach was through the strategic implementation of a five year aquaculture development plan premised on four pillars as illustrated below.

China also embarked specifically to promote fresh water fish cage farming technology (Chen et al, 2007)[6]. The factors that contributed to success of cage aquaculture include the following: increase in number of fish species cultured, willingness to adopt cage culture by farmers (including those with little capital), production efficiency and excellent market competitiveness. The facilitative policy interventions that resulted into Chinese cage culture development include among others; waiving of rents for the use of open waters, providing interest-free or low-interest loans, and dispatching experts to disseminate aquaculture techniques and experimental demonstration to farmers using the TEC model. In Uganda, prevalent challenges in aquaculture (including cage culture) development exist: first and foremost, currently there is no existing policy framework which specifically addresses issues regarding aquaculture (including cage culture and aquaculture parks). Secondly, there is inadequate fishery specific extension support and fish farmer mobilization. Lastly, systems for quality fish fry and seed production are not well developed, with most activities being undertaken by individual private sector players which require robust regulatory mechanisms.

Figure 3: Trend in Capture Fish and Fresh Water Aquaculture Fish Production: Uganda, China, and Egypt 1990-2014)



Source: NBSO, 2010[5]

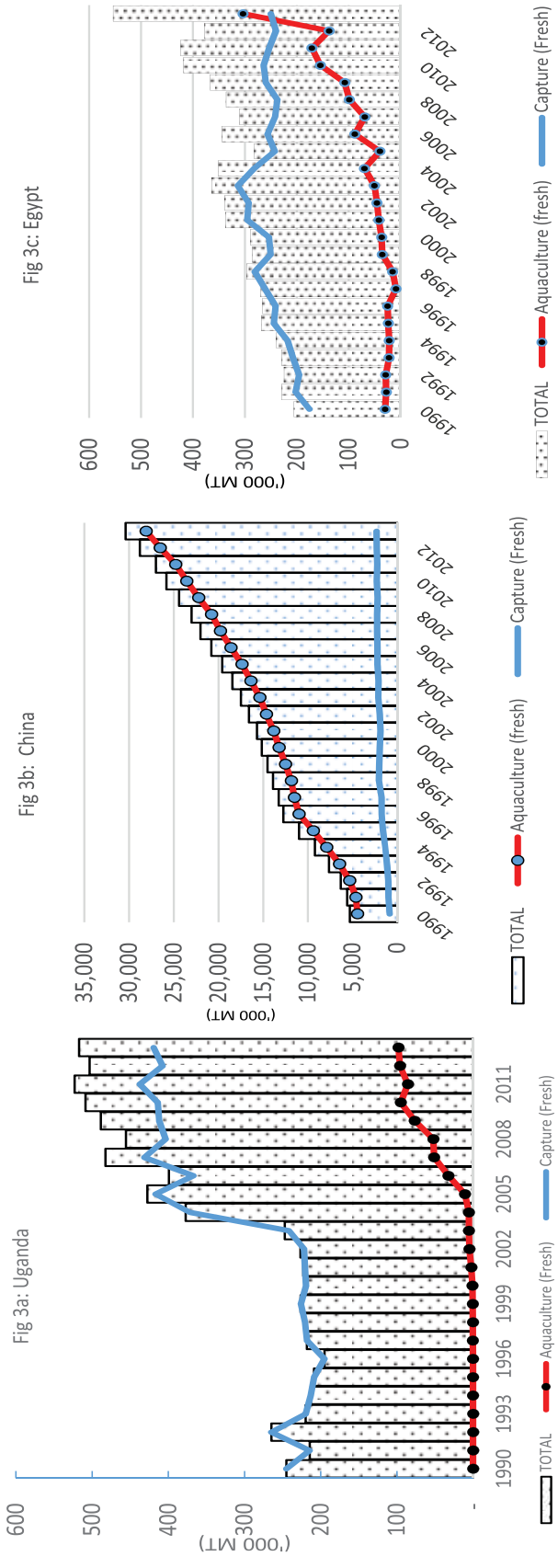


Figure 3: Trend in Capture Fish and Fresh Water Aquaculture Fish Production: Uganda, China, and Egypt 1990–2014)

FAO Stat Fisheries database (1990-2014)

In the case of Egypt, capture fish was prominent for decades, but the turn-around and sizeable gains in fish production was in the early 2010s when aquaculture picked momentum to become predominant between 2012 and 2013 (Figure 3c). Currently Egypt depends more on aquaculture for fish production, than capture fish. The increase in Egypt's production from about 280 thousand metric tons in 2005 to over 550 thousand tons in 2013 in fresh fish production is also directly linked to growth in aquaculture (Figure 3c). Egypt's success has been, by and large, driven by its long term aquaculture policy intervention. Particularly, the Egyptian government designed the national aquaculture 2030 strategy which focuses on further development of fresh water aquaculture that also encompasses floating fish cage farming, and desert aquaculture for improving fish quality and production. This strategy was in response for the need to significantly reduce imports used to fill the gap between domestic fish production and consumption resulting from fish supply shortfall in the country (Rothuis, *et al*., 2013)[7] .

Conclusion and policy recommendation

The fishery sub-sector has a high potential to boost export earnings to the Ugandan economy, but the capacity to increase fish exports is increasingly being limited by supply-side constraints. The high potential in fisheries as a foreign exchange earner is demonstrable by the resilient and relatively steady foreign exchange Uganda has continued to earn from the export of fish amidst declining volumes in major exportable fish species. The study generates evidence which suggest that floating fish cage farming is a feasible alternative or technology to the declining fish stocks – given its high productivity per capita. Lesson from successful and leading aquaculture producing countries (like China and Egypt) suggest that specific investments are necessary in order to bolster fish productivity and exports. Examples of these investments are: development and provision of quality fish seed and feed, introduction of new fish species through Research and Development, development of Technology Extension Centers (TEC) including experimental demonstrations for transfer of techniques or skills for new culture to small rural aquaculture farmers, and provision of low cost financial resources for aquaculture. Therefore, this calls for strengthening of interventions aimed at scaling up cage culture technologies. There is also a need to review the proposed National Investment Policy for Aquaculture Parks or fast-track it including its implementation in order to achieve establishment of Aquaculture Parks to boost fish production and employment in the country.

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Endnotes

1 Trade, processing, exports, transporters, boat builders, and gear repairers
2 Aquaculture parks have not yet been implemented hence no jobs created yet.

1 MFPED. (2008/9; 2011/12; 2014/15). Background to the Budget reports. Republic of Uganda. Ministry of Finance, Planning and Economic Development (MFPED).
2 Kaelin, A.J. and Cowx, I.G. (2002). "Outline of Path Forward in Uganda's Fisheries Sector". Prepared for Presidential Conference on Export Competitiveness. www.finance.go.ug/docs/Fish.pdf
3 Katurole, G; Wadanya, J. (2000). A study of impacts of fishing pressure on Nile Perch fishery on Lake Victoria (Uganda) using fisher folk community collected data.
4 Kifuko, R. (2015). The state of cage fish farming in Uganda: Actors, Enabling environment, challenges and way forward. International Journal of Education and Research, 3(3).
5 NBSO. (2010). An overview of China's aquaculture. Netherlands Business Support Offices (NBSO).
6 Chen, J; Guang, C; Xu, H; Chen, Z; Xu, P; Yan, X; Wang, Y; Liu, J. (2007). A review of cage and pen aquaculture: China. In M. Halwart, D. Soto, and J.R. Arthur (eds). Cage aquaculture – regional reviews and global overview. Fisheries technical paper # 498, FAO, Rome.
7 Rothuis, A; Duijn, A.P; Roem, A; Ouwehand, A; Pijl, W.V; Rurangwa, E. (2013). Aquaculture business opportunities in Egypt.

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