Using internet technology to improve cage fish farming

By Joseph Davis Weddi

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Evans Akumu Nyaoro, a cage fish farmer in the Kenyan side of Lake Victoria, has been relying on fish production for his livelihood farming for the past three years.

©Rio fish

But it has not been rosy for the 30-year old father of a girl.

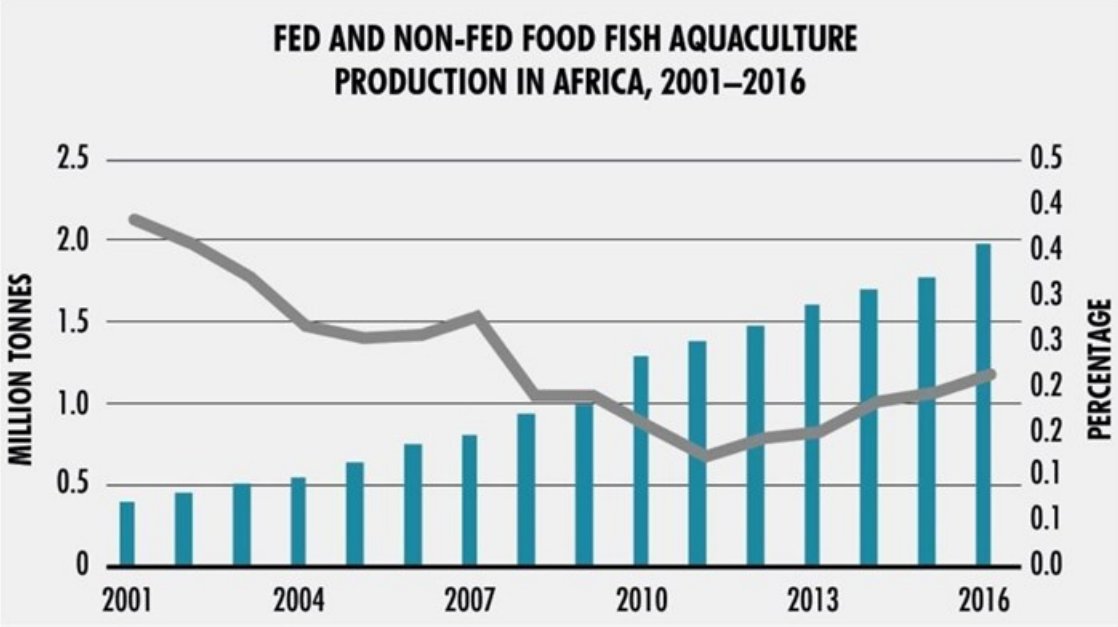
"We have been confronted with problems such as fish theft, record and data handling but the biggest problem is about best farming practices, especially when it comes to fish feeding due to fluctuating water temperatures in the lake," he says.

Cage fish farming is growing fast in Africa but there are various challenges such as fish dying from fluctuating water temperature with most farmers unaware of what to do, an expert says.

According to Word Food and Agriculture Organisation, the practice involves having cages that are usually floated in rafts, and anchoring them to the bottom of a water body or connecting the cages to shore with the aid of a wooden walkway.

Booming cage fish farming

According to the FAO, cage fish farming is increasing in sub-Saharan Africa, with countries such as Burkina Faso, Cameroon, Cote d'Ivoire, Kenya, Madagascar, Malawi, Mozambique, Nigeria and Uganda developing medium- and large-scale operations.



Source: The State of World Fisheries and Aquaculture 2018, FAO. CC BY-NC-SA 3.0 IGO

Data from the WorldFish Centre, an independent research institute headquartered in Malaysia, shows that fishing provides direct incomes for about ten million people — half of whom are women — in Africa and contributes to the food supply of over 200 million people with their consumption of animal protein.

However, fish consumption in Sub-Saharan Africa is the lowest globally and the continent is projected to need an additional 2.6 million tonnes a year by 2030.

Internet sensors to the rescue

Dave Oketch, a Kenya-based actuarial scientist who is now a fish farmer, said that internet sensors applications that detect the degree or intensity of heat present in the ponds is now helping some farmers in the feeding process around Kenya's part of Lake Victoria.

Water temperature dictates how much feed the fish will be given on particular days and the sensors help fish farmers to calculate the feed quantity every day for the next seven months with preferred readings of between 28 and 29 degree Celsius and at lowest 22 degree Celsius.

The problem is that colder temperatures make it harder for fish to digest what they have eaten. It means at colder temperatures, undigested food can decay in their system, sending deadly bacteria into their bloodstream.

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best farming practices. -Evans Akumu Nyaoro ”

"Getting the exact water temperature will enable the farmer to either make money or lose money. This information is critical for small fish varieties as well as bigger ones. There are three things that determine the feeding: water temperature, size of the fish and the number of fish inside a given area," said Okech.

"This has been a challenge for many farmers operating ponds and cage farms in and around Lake Victoria. But things are changing as new information and communication technologies (ICTs) are increasingly being introduced to counter these challenges and ultimately bolster aquatic harvests."

In Western Kenya, farmers are tapping into Liquid Telecom's innovative Internet of Things network to monitor and protect freshwater fish populations to counter the reducing fish catches, Oketch explained.

According to Nyaoro, without the tools to help determine the degree or intensity of heat present in water, farmers only do guess work and they often end up feeding their stock at wrong times and that leads to wastage.

Nyaoro and other cage fish farmers are now benefiting from the use of internet sensors to monitor temperatures to inform the feeding process to make the fish grow faster.

"No more wasting of fish feed and the application is making our work easy and more cost-effective. It will benefit small-scale farmers as long as they have smartphones and are registered with the app providers," explains Nyaoro. "Cage fish farming is becoming popular in East Africa and we need many new innovations to make it more productive and beneficial to those involved, especially artisanal fisheries."

Ben Roberts, the chief technology officer of Liquid Telecom, observed the first installation and implementation of the sensors and related data transmission furniture on the lake.

The sensors send information about the temperatures and feeding instructions to farmers through an app called AquaRech developed by Oketch and members of the Kenya-based LakeHub.

A study shows that Lake Victoria shared by Kenya, Tanzania and Uganda has been experiencing declining fish harvests, with 60 per cent of the endemic fish species becoming extinct from 1970 to 1986.

The decrease in fish stocks on the lake is a reason Oketch founded RioFish Company, a social enterprise providing sustainable livelihoods and increasing food security through strengthening market systems around aquaculture in Lake Victoria and its surroundings.

Curbing sex for fish trade

Among its other uses, AquaRech is a local online trading platform for fish farmers that also helps them in farm management.

"Our sensors transmit data to the cloud — software and services that run on the Internet, instead of a local computer — where it is processed before sending specific instructions to farmers on the timing and quantity for feeding," said Okech.

“ *Getting the exact water temperature will enable the farmer to either make money or lose money. - Dave Oketch, RioFish Company* ”

It connects women fish traders to fish farmers, thus empowering them to get sources of fish at their fingertips and eliminates chances of sex for fish trade.

Oketch explained that the phenomenon happens when female traders engage in sexual relationships with fishermen to secure their supply of fish. The women fish traders often get pressured into having sex with the fishermen who supply them with fresh fish to take to the market.

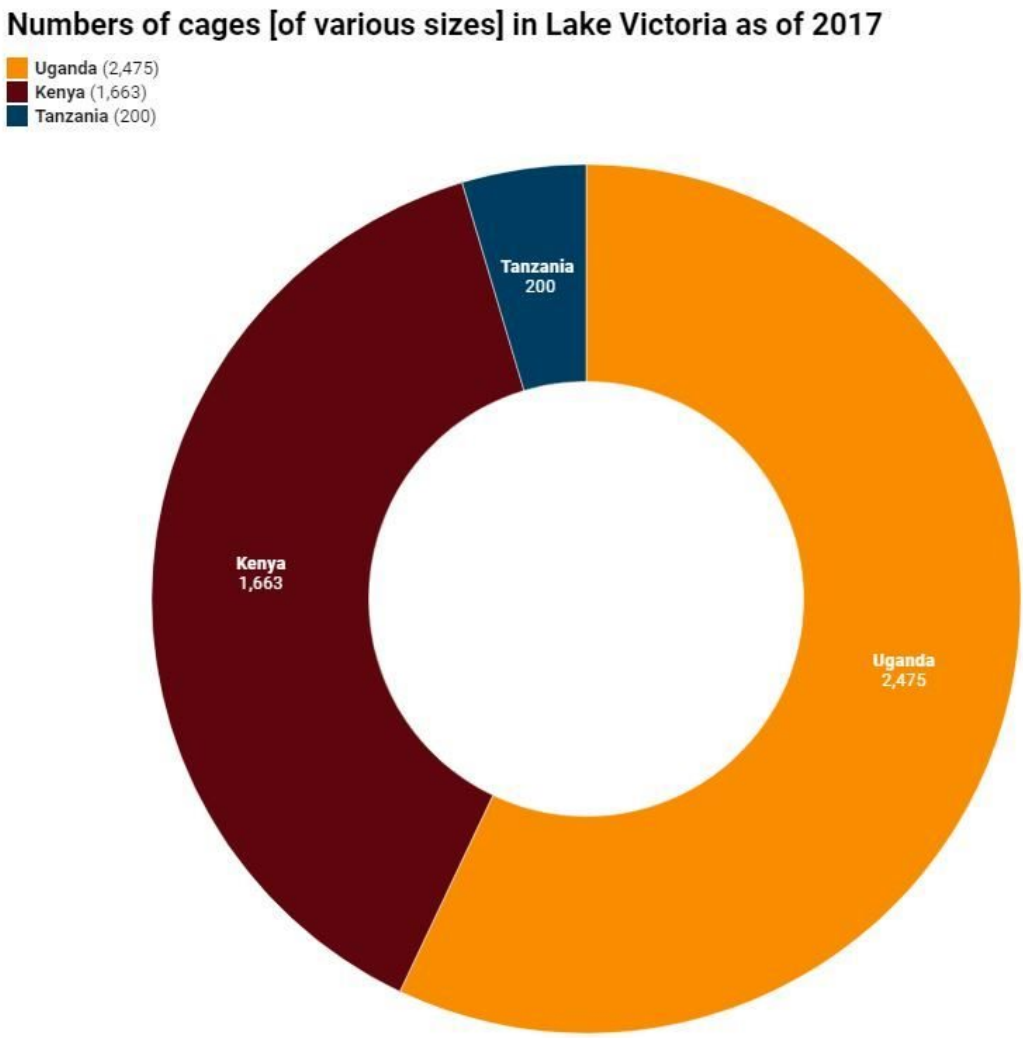
Impact of the innovation

AquaRech is also designed to help farmers monitor their fish cages, connect them with feed suppliers who can deliver the best feed to their farms. It has three parts: an app, a thermometer for the fish ponds or cages, and a website for the feed producer to process orders.

In the fish cage, the submerged digital thermometer sends signals through Liquid Telecom's Sigfox technology that feed data into the AquaRech app and this notifies connected farmers on timely feed recommendations based on water temperature. The same information is processed and sent to the feed fulfilment website which helps the local fish feed factory fulfil anticipated fish fee orders through forecast information on feed demand by the fish farms.

The internet innovation is expected to initially benefit some 5,000 Kenyan fish farmers who will be equipped with the sensors and the app by the end of 2019. Oketch explained that the innovation will eventually be rolled out to 30,000 fish pond farmers countrywide, thus helping to increase fish production.

Rhoda Tumwebaze, a director at Lake Victoria Fisheries Organisation, said that in 2017 the numbers of cages in Lake Victoria were about 1,663 in Kenya, 2,475 in Uganda and 200 in Tanzania.



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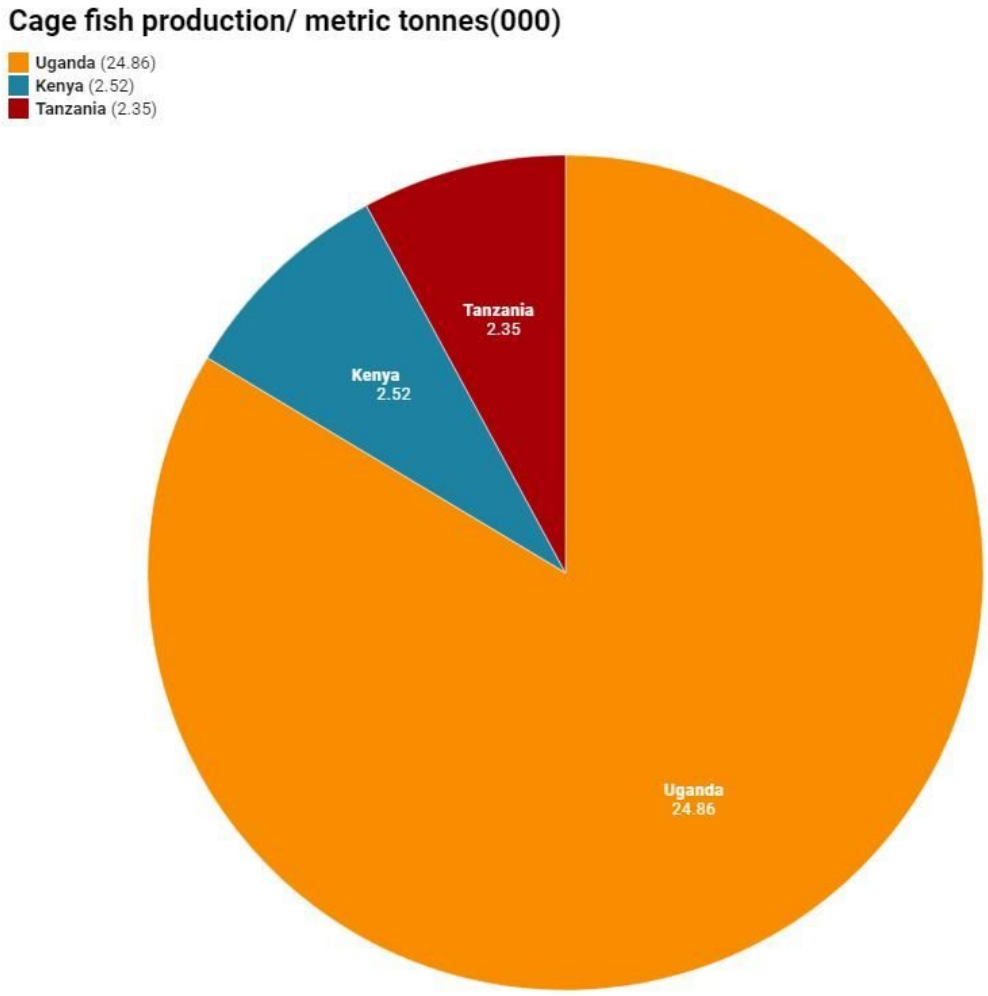
She said that in Uganda, the National Fisheries Resources Research Institute is also developing a mobile app which is expected to fast-track development of aquaculture in the East African region by providing a platform for information

dissemination and feedback.

"Cage fish farming is increasingly being practised across the lake and it is estimated that production stands at 2,522 metric tonnes for Kenya, 2,350 metric tonnes for Tanzania and 24,855 metric tonnes for Uganda," said Tumwebaze.



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Tumwesige added that there are about 219,919 fishermen with 74,257 fishing craft operating from 1,535 landing sites around Lake Victoria in Kenya, Tanzania and Uganda.

Tumwebaze said her organisation is building the capacity to manage the lake and partner governments of Kenya, Uganda and Tanzania. To ensure sustainable fisheries, her outfit intends to introduce new mechanisms including the introduction of multi-agency coast guard to improve compliance to fisheries regulation.

Tackling challenges

Moses Kemibaro, the CEO of Dotsavvy, a digital agency in Kenya for holistic and performance-driven digital marketing, said that monitoring temperature fluctuations to inform better fish feeding process will help in addressing some of the challenges faced by cage fish farmers in East Africa.

"We have seen in agriculture how technologies are playing a huge role in optimising farming practices, as well as the quality of the farm, produce achieved across the board. It has every reason to succeed provided the right levers are moved," he added.

But one of the challenges in the application of the technology, according to Kemibaro, could be the steep learning curve in terms of using ICTs to enhance fish farming practices.

The investment required to acquire and support ICTs could be another barrier to the uptake and more productive outcomes.

"It sounds to me like this is a very new technology so in the first instance it will be for early adopters and there could also be the high cost of maintenance," explained Kemibaro, adding that other challenges include learning how to use it, and access to mobile networks.

This piece was produced by SciDev.Net's sub-Saharan Africa English desk.

ABOUT THE AUTHOR

Davis is the digital producer of SciDev.Net, where he works to ensure quality content, design and delivery while facilitating user-interaction through social media and digital engagement. He has a Bachelor of IT degree and several Journalism Diplomas from institutions including Islamic University in Uganda, Stockholm University, International Institute of Journalism Berlin and Uganda Institute of Business and Media Studies, among others. Before joining SciDev.Net in August 2017, Davis previously held communications officer roles first at Nile Basin Discourse, then at Open Society Initiative for Eastern Africa.