IMPLEMENTING AND ASSESSING CELL-BASED TECHNICAL AND MARKETING SUPPORT SYSTEMS FOR SMALL AND MEDIUM-SCALE FISH FARMERS IN UGANDA

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Food Safety, Post Harvest, and Value-Added Product Management/Study/16FSV02AU

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Objectives

1. Develop and implement a cell-based system that will enable fish farmers to access fish production and market information.
2. Conduct trials of cell-based aquaculture applications for fish farmers.
3. Introduce mobile-based application to the network of agencies and organizations that support aquaculture.

Significance

Previous AquaFish research (13BMA04AU) identified some of the challenges and limitations to the use of mobile phones by fish farmers in Uganda (Matuha 2015). The next step in this work is to engage a mobile application developer in Uganda, then develop, test, and evaluate a prototype app in three target districts.

Mobile phones seem to influence the commercialization of farm products, as a result of easy accessibility of both market and agricultural information by farmers. They have provided new approaches to farmers to make tentative decisions much more easily than before (Ilahiane, 2007). The availability of mobile phones can lead to greater social cohesion and improved social relationships. Mobile social-networking rapid expansion in developing countries shows the growing role of cell phones in life, business, and culture (Kwaku & Kweku, 2006). Our technical provider in Uganda, AgroMarketDay[4] has an established platform for providing marketing and technical services. Our project extends these possibilities to fish farmers in Uganda.

Several different business models have emerged in efforts to provide technical support to African farmers with cell phones. Each varies in the level of public sector control, business model, cost, and flexibility. One **commercial model** invites farmers to subscribe to a fish-focused network of producers managed by

[4] http://www.agromarketday.com/

a service provider who moderates the transactions and may be compensated by subscription fees, transaction fees, or commissions. The entrepreneur firm builds and supports a network of suppliers, producers, and buyers whose transaction costs support the network. The source of technical information is NaFIRRI and the published literature; the responsiveness to technical questions may be rapid because the entrepreneur is motivated to keep and grow the number of participants. This is the approach we take in Uganda.

A **nonprofit model** may offer subscription services to producers through local lead farmer equipped with advanced, capable cell phones. The organization maintains a central source of technical guidance supported by external donors. The quality of technical information may be good, the advice timely, but the business model for the service may not be sustainable.

A **government-based model** may provide sustainable service to producers through subscription or text-fees. Responsiveness may be limited by budget constraints. Given appropriate location of the network managers, technical competence could be high, the farmers might receive clear signals about government policies, and input and output price discovery processes may be transparent and efficient.
Each of the aforementioned models of market and technical support to fish farmers is emerging in Uganda. The purpose of this activity is to implement and assess the relative efficacy and bread of participation of an application and subscriber network in the rapidly changing Uganda context. A commercial provider has been engaged, the initial steps have been taken, and the new work will implement, assess, and install a useful and sustainable market and information tool in Uganda.

Quantified Anticipated Benefits

- A farmer friendly cell-based aquaculture information system will be readily available for use by fish farmers.
- Farmers with capacity to use mobile phones able to access aquaculture and market information.
- Improved access to print and electronic aquaculture information by farmers.
- Efficient utilization of cellphones by fish farmers to improve fish farming enterprise and their livelihoods.
- Open avenues (workshops, conferences, seminars, Barazas[5], and farm tours) for aquaculture information sharing among farmers, researchers, policy makers and ICT professionals.

Research Design and Activity Plan

Location

Likamis Software Limited in Kampala, a Uganda technical provider, has offices in Kampala. The application will be initially fielded in three districts of Uganda (Wakiso, Mukono, and Mpigi).

Methods

Research task 1. Implement a cell-based system to enable fish farmers to access fish production and market information.

Implementing Partner. We will rely on a Uganda-based contractor with established connections to the major cell phone provider to implement the application. We employ one or more leading farmers in a

[5] Term refers to a community meeting usually convened on the District level where political and technical leaders are held accountable through open discussion with gathered constituents, the *wanainchi*, i.e., ordinary people, the public.

district to support other farmers. Likamis Software Limited has a mobile platform called AgroMarketDay already used by farmers and agricultural stakeholders.[6] The mobile application enables small holder, medium scale and large scale farmers to sell their agricultural produce directly to buyers in any part of the country, without heavily relaying on the rotational community markets. Such venues, where farmers bring their produce to sell, are only open on specific days. Middle men often charge high commissions or offer low prices for the farmers' produce. Selling through a mobile application helps farmers avoid the cost of transporting their produce to and from these markets.

The aquaculture sector in Uganda is composed of a combination of both scattered small-scale producers, a handful of commercial-scale pond-based producers, as well as an emerging set of large-scale producers from cages in Lake Victoria and other Uganda water bodies. This poses a marketing challenge to the producer with very scanty knowledge about available selling opportunities, which often hinder new entrants because of unknown markets and prices. The application will alleviate this constraint by profiling and connecting buyers (fish traders), processors, value addition traders and input suppliers in the central region. We identified a target district where the application is going to be tested and participants enrolled in the system associated with the mobile application.

Mobile applications can help farmers to access reliable farm inputs—feed, fingerlings, nets, and other basic elements of fish culture. Vetted information platforms can reduce the prevalence of misrepresented agricultural inputs in the market. Through the same application, farmers are able to get daily market prices of agricultural commodities across the entire country. Producers are able to price their produce appropriately, and they are also able to learn of better practices conducted in other agricultural sectors.

The Mobile Application. The AgroMarketDay mobile application was copyrighted on 20th October 2014. Once all of the modules for the aquaculture project have been developed, this module will be integrated with the existing suite of applications called AgroMarketDay. Vendors and buyers must be enrolled; farmers must subscribe.

With vendor and producer data in the system, an algorithm within the application matches the farmer to the right buyers in the network. To help farmers determine the right price for their fish, the application enables farmers to view the prevailing fish market prices on offer in the region and beyond. Another challenge that the application addresses is scanty knowledge about available quality inputs. The application links farmers to quality input sources through their mobile devices.

One of the major bottlenecks to aquaculture is inadequate technical guidance to farmers and exploitation by self-proclaimed experts or consultants who purport to advise farmers. The application will address this challenge by implementing eight (8) technical modules for fish farming; site election for both ponds and cages, pond construction, water management, stocking, feeding, harvesting, disease management, and predator control.

For example, subscribing farmers will be able to get expert advice about their diseased fish by using the application; to fill out a form, attach a picture and upload it to our system where an expert will advise the

[6] We invited three known application developers to present proposals for developing and implementing a mobile-based system for fish farmers. We elected the AgroMarketDay model based on its coherence, established business experience, and potential for expansion and coverage.

farmers accordingly. This also will ameliorate the problem of inadequate extension support because farmers can access services through their phones.

The application will run on two platforms: USSD for basic phones and Android for smart phone users. The system relies on an algorithm that automatically matches the farmer to the appropriate buyer. When the farmer uploads a notice of product availability using either the smart phone app or the USSD version for basic phones, the algorithm will look through a database to find buyers that match what the farmer is selling. Notice is automatically sent back to the farmer and to all the matching buyers. Messages pass through Cloud messaging to smart phone users and through SMS to basic phone users. Because of the diversity of languages in the country and the literacy levels of the farmers, the application will be translated into five local languages. Most farmers with education are literate in basic English.

Testing and Launching. We will identify a network of fish farmers in the central region from already existing networks such as fish farmer's associations, organization, NAFIIRI and government entities dealing in aquaculture. Trainings will teach farmers on how to use the application to access its services and the benefits that the application will bring to them. A support farmer engaged by the application developer will recruit and assist users in each of the target districts.

Business Model. This project will support the development and implementation of the mobile application. Fees paid by farmers to subscribe to the network, use it for seeking information, and conduct market transactions create revenue for AgroMarketDay. Fish buyers and input vendors pay transaction fees for fish sales and access to producer networks. The fish buyers and input vendors also pay a subscription fee in order to become a verified member in the system. AgroMarketDay engages the support farmers who spread, promote, and facilitate use of the application. The firm has such arrangement for other crops and commodities in Uganda.

Technical Considerations. Uganda has one of the strongest cell networks on the African continent. MTN maintains that it offers 4G coverage across the country. Battery charging is widely available through conventional power systems as well as street vendors offering immediate services.

Google's Mobile-Friendly Test will be used to analyze the application on several criteria and measure its mobile-friendliness. Although a machine assessment, it provides understanding of capability and usability based on a standard test. Another useful tool, offered by Google inside of its Chrome browser, is a mobile emulator. The F12 key (or Ctrl+Shift+I) opens up the developer tools in Chrome. This tool will facilitate migration of web-based information in mobile applications.

Research task 2. Conduct trials of cell-based aquaculture applications for fish farmersIntensive individual and group interviews will be conducted with fish farmers, fish farmer's association leaders, researchers, and representatives from public agencies. We use snowball and positional sampling techniques to identify individuals serving the aquaculture sector in Uganda--MAAIF, NARO, and DFOs. In addition, local leaders and IT professionals will be asked about how cell-based information systems can address aquaculture information topics. Such topics include; stocking, harvesting, feeding management, pond construction and management, disease management, water quality management, broodstock management and market prices. The interviews will be conducted in the selected districts of Uganda.

The meetings will present the application as it has been developed, as well as other state-of-the-project information. The intent is to gauge and record participant perspectives on the productive use and development of mobile applications for fish farmers. The guided conversations will endeavor to identify critical aquaculture information needs and mobile phone access preferences of fish farmers.

We will employ specialized software (NVivo, Atlas-ti) to process and summarize information obtained through these conversations. The tool will be piloted among selected fish farmers (40), suppliers of inputs (10), and extension service providers (5). This piloting will involve training the users to employ the application on their mobile phones to access marketing information, technical support, price discovery, and input sourcing. Informal discussions will be held with targeted populations of fish farmers who participate in the trainings on the use cell-based aquaculture information application

Two of the discussion groups will be largely women and the focus of these meetings will address the differential needs and experiences of women. Access to cell phones, the experience of using cell-based information, and expectations for the technology will be addressed. We will subsequently utilize information obtained from fish farmer discussions about the cell-based technical and marketing support system to shape application development. Simple queries about use, experience, and expectation will be used to profile patterns of uptake and participation in mobile-based technical and information systems.

Research task 3. Introduce mobile-based application to the network of agencies and organizations that support aquaculture. We will hold three workshops in Jinja, Kampala and Gulu that will involve project participants, selected officials from NARO, MAAIF, researchers and ICT technical personnel. These will mainly focus on the introduced mobile application. The meetings will gauge partner responses, and assess the modules that have been developed for cell-based system. In particular, the interaction between business model, technical responsiveness, and user-friendliness will be addressed.

Mechanisms for continued involvement of the public agency fish farmer support network will be discussed. In particular, we seek to open avenues (workshops, conferences, seminars, Barazas, and farm tours) for aquaculture information sharing among farmers, researchers, policy makers and ICT professionals. The workshop report will summarize participant comments and issues identified in these meetings. These meetings are a central aspect of our exit strategy in Uganda.

Trainings and Deliverables.

Item	**Mechanism** *(e.g. podcast, reports, factsheets)*
Profiled information packages on fish buyers, processors, value addition, fish farmers and input suppliers	Two Workshops will be held in Kampala
Training of farmers to use the newly developed aquaculture app	Two trainings of farmer will be held in Kampala
Specific cellphone aquaculture information packages.	Inventory sheets, Brochures, farmer leaflets
Cell-based information application system for fish farmers	Aquaculture App
Report on implementation and evaluation of usage of a cell-based aquaculture Application by fish farmers.	Journal article

Schedule

Task	2016		2017			
	3rd	4th	1st	2nd	3rd	4th
Hold workshops with fish buyers, processors, value addition	x	x	x	x	x	x
Field implementation of cell-based application Hold workshops with fish farmers and input supplier		x	x	x	x	x
Conduct two interviews and two discussion groups with fish farmers in Wakiso, Mpigi, and Mukono			x	x		
Develop cell-based aquaculture application		x	x	x	x	x
Train farmers to use aquaculture application				x	x	x
Hold workshops with public agency fish farmer support network. Evaluate utilization of cell-based application					x	x