Development of a Cell-Phone Based Seafood Market Information System (SMIS) in Ghana: Application to Tilapia

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Kwamena Quagrainie[1], Stephen Amisah[2], and Alloysius Attah[3]

[1]*Purdue University, West Lafayette, IN, USA*
[2]*Kwame Nkrumah University of Science and Technology, Kumasi, Ghana*
[3]*Farmerline, Kumasi, Ghana*

ABSTRACT

For small-scale fish producers and artisanal fishermen in Ghana, readily available market information on prices and demand for tilapia at different fish markets helps inform production and harvesting decisions. Minimizing the information gaps along the tilapia value chain greatly improves efficiencies and reduces post-harvest losses in tilapia marketing and the value chain as a whole. This investigation developed a cell-phone-based seafood market information system (SMIS) with a focus on tilapia in Ghana. This is because tilapia is the dominant fish species that is farmed and caught in inland waters. The SMIS has a database of current farm-gate and market prices of tilapia in selected locations in Ghana assembled by fisheries officers and selected agents. The SMIS is web-based and provides tilapia market information online as well as via voice and SMS/text messaging to users. There are two types of subscribers to the system — registered and ad-hoc users. The system can send out (push) farm-gate and market price information to only the registered users. However, to request (pull) information on tilapia prices from the system, both registered and ad-hoc users can access the system either by dialing or SMS/text messaging to a 10-digit phone number or a four-digit short code. When a user requests information, the voice feature of the system includes messages in English and three native languages — Twi, Ga and Ewe. The new technology has been tested with fisheries officers, selected fish farmers and fish traders. The future plan is to expand the capabilities of the system to include capture fisheries to benefit the marine artisanal fisheries subsector.

INTRODUCTION

An analysis of tilapia value chain in Ghana under a previous Aquaculture and Fisheries Collaborative Research Support Program (AquaFish CRSP) project revealed challenges in the flow of information along the value chain, especially information relating to tilapia supply, demand and prices. The lack of vital market information often led to inefficiencies, inequity, and post-harvest losses. For small-scale fish producers and artisanal fishermen, readily available market information on prices and demand for tilapia at different fish markets helps inform production and harvesting decisions. Minimizing the information gaps along the tilapia value chain greatly improves efficiencies in tilapia marketing and the value chain as a whole.

The information gaps in the value chain call for a marketing information system for tilapia in Ghana to reduce the information asymmetry between fish producers and sellers. A market information system involves processes to generate, store, analyze, and disseminate marketing information on a regular basis, which is accessible to stakeholders. A similar system is in use in Indonesia (InfoFish 2010, 2008) and Kenya (KMFRI 2010). In Indonesia, the Fish Marketing Information System provides a platform for a transparent and fair fish trading and improves market access for fish products from Banda Aceh to regional markets (InfoFish 2010). The system in Kenya involves price data from fish landing sites and inland urban markets, which is continuously relayed to a central database where it is packaged into a

format that users can access in real time by sending a query through mobile phone. The targeted beneficiaries of the Kenya system include small-scale fishermen, fish farmers, fish processors and traders at landing sites and markets, who are reported to increased fish trading activities and incomes through improved access to market information (Nyabundi 2014).

A seafood marketing information system (SMIS) in Ghana will be useful for efficient operation of the tilapia value chain. There are opportunities for improved communication and increased information flow along the tilapia value chain in Ghana through the use of mobile phone technology. This is because mobile phone penetration in Ghana is 94%, making this an ideal channel linking fish producers and artisanal fishermen with markets. Mobile-based service opens these communication pathways and allows market data and information to be programed and can be easily accessed by users from a mobile device via voice and/or short messaging service (SMS) anytime. These services could result in increases in fish quality and yield, reduce post-harvest losses, as well as increase incomes for farmers and traders. An efficient market information system via the mobile technology has an important role to play in improving aquaculture productivity and value chain efficiency in Ghana. A marketing information system for tilapia in Ghana can result in a more organized tilapia market data collection, the storage of important tilapia market data, better coordinated marketing intelligence information, and access to market information to make business decisions. It will also assist in building capacity to improve the skill of stakeholders on fish marketing.

OBJECTIVES

- Develop an electronic system for tilapia market information exchange;
- Develop a phone-based market-information-sharing platform for fish producers, fishermen, seafood marketers, and consumers; and
- Train fish farmers, fishermen, women fish processors, markets and traders on the use of the market information system developed under the first two objectives to enhance trade and profitability.

METHODOLOGY

Before commencing the development of the system, a series of meetings were held with the Fisheries Commission (FC) in Ghana about the usefulness of the system. The plan is to eventually use fisheries officers in the field to populate the database with farm-gate and market price information, and FC becomes the custodian of the final product.

The first step involved in developing the system was to identify various points of tilapia fish supply and demand in major producing and marketing regions in Ghana. A visit to selected supply and demand centers helped to identify important variables for which data and information was collected, e.g., prices, trends, etc. The data was collected from the various stakeholders including fish producers, middlemen, fish marketers and retailers and then transmitted to a central database at Kwame Nkrumah University of Science and Technology, Kumasi, Ghana and Farmerline.

The services of a programming company, Farmerline, was used to program an electronic information system into which the data and information collected from the supply-and-demand centers were transmitted, creating a database/platform. The system was set up in a form that can easily be accessed by users from a mobile device via voice or SMS anytime (Figure 1). This procedure involved detailed programming by Farmerline who build the electronic platform using the Infolink framework, which is a web based application (calls are sent from the internet). The technology behind Infolink web component is built with Laravel (PHP framework) and Twitter Bootstrap. The telephony component is built with Plivo in combination with Freeswich. There is GoIP (hardware containing GSM sim cards) attached to the server. The sim cards in the GoIP takes the command from the web application and makes the call like a normal phone call.

Farm-gate and market data are to be collected on a regular basis by fisheries officers to a central database. This can be done from a mobile phone, a tablet or a computer. The database is then packaged into a format that users can access in real time by querying the system from a mobile phone. The features of the system include the ability to query for particular price information by both voice and SMS; communicate with large numbers of users; and messages received in native languages as well as English. Users would dial or text to a 4-digit number and will receive messages through either voice or SMS on farm-gate and market price information in the database. The application for the 4-digit short code is being processed by the Ghana National Communication Authority. Queries can be made for market information at selected locations. The SMIS is web-based and also provides fish market information on-line in addition to via voice/SMS to stakeholders.

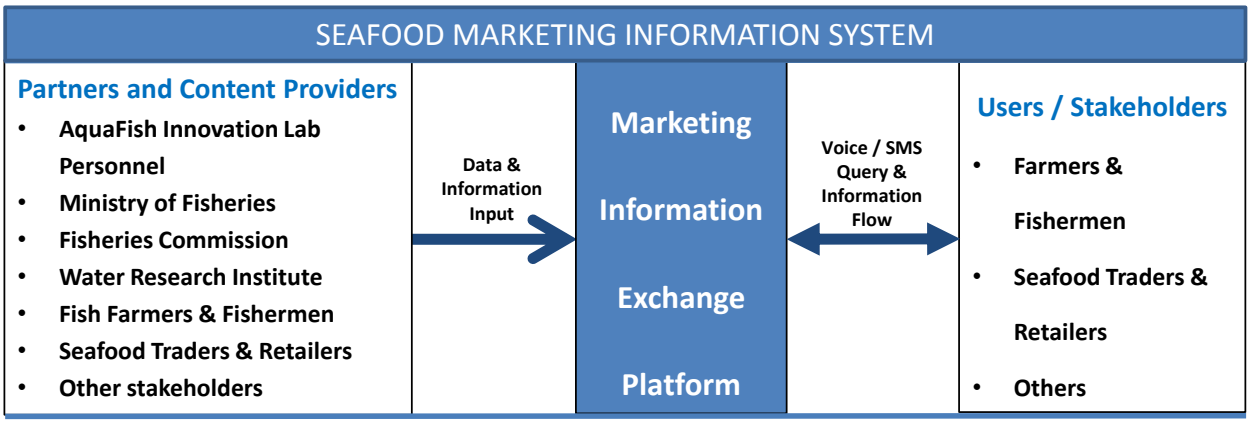

Figure 1: A schematic diagram of seafood marketing information system (SMIS).

There will be two types of users: registered and ad hoc. The ad-hoc users are not registered on the system and have to query the system for market information for specific locations. The registered users are registered in the system with their contact information including mobile phone numbers, and they can query the systems and receive information related particular locations as well as automatically receive market information relevant to their address in a very timely manner. Registered users can also receive market information through periodic electronic bulletins.

Detailed statistics can be obtained on the number of users and how messages are received. The system also includes a tool that allows the conduct of timely and longitudinal surveys with users. The survey tool will include recorded questions and users would answer by simply pressing buttons on their phone, and their responses are recorded immediately. The new technology was tested with fisheries officers and selected fish farmers at a workshop on 9 July 2015 and for fish traders on 13 July 2015.

Key features

- The SMIS has a database of current farm-gate and market prices of tilapia in selected locations in Ghana assembled by fisheries officers and selected agents;
- There is a robust and flexible data entry mode designed to allow aggregators to easily update user information through a mobile phone, tablet or a computer;
- The SMIS is web-based and provides tilapia market information on-line as well as via voice and SMS/text messaging to users;
- There are two types of subscribers to the system — registered and ad-hoc users. The system can send out (push) farm-gate and market price information to only the registered users. However, to request (pull) information on tilapia prices from the system, both registered users and ad-hoc users can access

the system either by dialing or SMS/text messaging to a 10-digit phone number or a four-digit short code;
- The SMIS is able to send calls and messages to registered users, currently at a capacity of 50;
- When a user requests information, the voice feature of the system includes messages in English and three native languages — Twi, Ga and Ewe; and
- The system has a response structure that ensures that users can request and obtain price information whenever they want.

Workshop information

Fisheries Officers and Selected Fish Farmers' Workshop
- Providence House Hostel, Kotei, Kumasi, on 9 July 2015
- Attendance — 23 males and 3 females

Market Womens' Workshop
- International Center for Innovative Learning, KNUST, Kumasi, on 13 July 2015
- Attendance — 5 males and 35 females

CONCLUSION

The tilapia SMIS will eventually become a pay-per-use system because of airtime minutes. However, it will be cost-effective when there are numerous users of the system. The SMIS at this stage is a pilot technology that functions with a focus on tilapia. The services it provides help to address market information asymmetries between buyers and sellers of tilapia and improves the bargaining power of smallholder fish farmers/fishers in their interactions with fish traders. These benefits are lacking in the marine artisanal fisheries subsector though fish from capture fisheries form part of the whole seafood value chain in Ghana. Future plans will therefore expand the functionality of the current SMIS to (1) have applicability to the marine artisanal fisheries subsector, (2) provide buyer-seller matching services, and (3) provide potential group marketing services for smallholder fish farmers and fishers.

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