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## iFarM: ICT based Farming and Marketing Platform =A Case Study of JICA Grass-roots Technical Cooperation Project in Bangladesh=

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**Summary** Awareness about safety and security of food among consumers is increasing day by day. But the supply of safe food is not plenty in present Bangladesh. The SENSE project is the new initiatives in Bangladesh to deliver safe food directly to consumers from farmer field. The process is ongoing through iFarM platform. An android application development is underway to help the farmers where mobile network coverage is poor to operate iFarM platform. iFarM is the integrated platform to work with agriculture and marketing. All the activities of SENSE project are monitored by different expert of Agriculture, Marketing and ICT sectors from a remote location and it becomes the foundation of new ICT initiatives to support BOP farmers. This initiatives is expected to be a model in other countries that residing many of the BOP farmers.

**Key words:** Agriculture Information gathering and sharing, eCommerce, Healthy Farming, Quality Vegetables

### Introduction

The economy of Bangladesh depends on Agriculture. About 71.90 percent of the population lives in rural area (Ministry of Health and Family Welfare, 2012) and about 47.6 percent of working population is engaged in the agriculture (Ministry of Planning, 2010). The sole contribution of agriculture sector in GDP is about 18.70 percent (Ministry of Planning, 2013). Although agriculture is the main occupation of maximum villagers but their income from farming is limited due to the limited and traditional farming knowledge and limited access to profitable market. Most of them have to stay at the BOP (Bottom of the Pyramid), where the daily purchase power is less than 2.5 dollar a day.

Many of farmers who live in rural areas are following traditional farming knowledge and shared knowledge from other people is not sufficient to utilize and increase their production and income. 30 years ago, the farmers used to grow vegetables without using any chemical fertilizers. However, "the more chemical fertilizers, the more production" concept has spread over every corner of the villages and Besides, the techniques of farming depending on mass use of fertilizers and chemical pesticides. Farmers are following the information of local fertilizer and pesticides shops for their production related information mostly. They are not aware about present market conditions of agriculture products.

Farmers are mainly dependent on middleman for selling their products and small portion of their products are sold by themselves in local market.

Therefore, they are repeatedly facing loss due to presence of middleman between consumers and farmers. Due to dependency on middleman, farmers are getting very low amount of revenue from selling the products. For these consequences, farmers cannot be break away from the BOP.

In recent years, Bangladesh urban area people can excess the information via the Internet and can follow the information from advanced countries related to agriculture products. Therefore, many people are aware about safety and security of food. From this fact, the market demand of pesticide and chemical free agricultural products also increasing.

Most of the areas of Bangladesh are now in mobile network coverage. People are using smartphones which are very useful for internet use. Now rural people can excess into internet via their mobile. By using tele-center based ICT network, farmers can get excess wide range of information related to their cultivation and market conditions. This way, the economic conditions of BOP farmer can be changed day by day and also increase the safety food supply in urban area.

The authors received the support of JICA grassroots cooperation project (partner type) from June 2010 and until June 2013 to improve the economic condition of the

BOP farmers by using Information and Communication Technology. I'm working on a project (Income Generation Project for Farmers Using ICT) (IGPF).

In addition, we have received same support from February 2014 to January 2017 "for support of the BOP farmers by advanced use of ICT (Support to establish a new society of BOP farmers by using the power of ICT)" (I'm working on SENSE).

In this time, Farmer will get agriculture technology such as production information and product sales information via ICT tools. Therefore, An ICT based Farming and Marketing Support Platform (iFarM) is prepared for providing agricultural information, marketing information and also distribution of products efficiently. This platform also incorporated an e-commerce module to sale the farmer's products directly to consumers and creating a marketing channel.

Finally, a new tele-center based farming society will be formed and who will promote the "Q-Vegie" Brand.

#### **iFaRM: A Platform for Quality Vegetables Production and Marketing**

In order to support the farmers to produce quality vegetables and market them to the target customers, we have developed a platform, we call it iFaRM (ICT based Farming & Marketing Platform). The overall model and the components of the platform are depicted in Figure 1.

**(1) Farmers' Community:** A farmer community will consist of a number of small farmers (more than 20). By small farmers we meant, the farmers' who can offer small land size (5 to 12 decimal) and smaller (1 to 5 decimal) land sizes for our project. Ideally these farmers traditionally grow vegetables and have the farming knowledge and want to take the challenge to grow chemical-free vegetables by following the project's guideline. A farmer leader will represent the farmers who can be elected or selected by the other farmers. The tenure of the farmer leader can be for one cropping season. The leader will take training from the project and will explain it to the other farmers. It has been observed that farmers tend to learn from other farmers and try new technologies from

seeing the success stories.

**(2) QVE:** A QVE is a person, ideally lives in the village, can operate smart phones, has some agricultural background and has the interest to be an entrepreneur. The QVE will have an iFarM client box. Inside the box, there are the following low cost sensors to collect soil information, weather information, and crop information. The information can be communicated with the iFaRM server.

**(3) iFaRM:** is the platform for supporting the farmers with (a) ICT applications and (b) Experts. (a) ICT Applications: has three major tools: (1) Communication tools: By considering the ICT skills of the farmers and QVEs and the experts, we have developed a package of communication tools. We assume that all the farmers have mobile phones (which we have confirmed from our survey that more than 95% of the farmers have mobile phone in their family), the QVE has a smart phone (this is also observed that young people are tending to purchase smart phones, can download applications and use them). At the expert end, they operate PCs and smart phones. The communication tools support to have farmer-to-farmer communication, farmer-to-expert communication and farmer-to-customer communications. (2) eCommerce Tool: this is a simple eCommerce website where farmers or the QVE can upload their harvested products online. The registered consumers can purchase the products by using the eCommerce site. The salient feature of this website is that it is voice-enabled. A low-literate farmer can use the voice navigation tree to push the buttons of his mobile phone to upload digits which is then automatically converted into product's information (product name, amount and price). (3) Information Archive. We have three sources of information. (1) *Agri info*: the QVE collects farming activities by using the iFarM client box or by asking the farmers and then upload them to the agri-info database. The collected information can be analyzed to design crop calendar, production pattern and predicting good harvesting time. (2) *Farmer info*: We also archive the farmers' profile, the list of their cultivated crops, land size (both owned or leased). This information can relate with

Table 1. Target Customer Group for QVegie.

Segment	Description
Individual	Affluent people living in urban or rural areas belong to this group. They can be accessed by our marketing manager or they can purchase from our e-Commerce website.
Group	We want to test the group purchase behavior. The employees in a corporate are the target group.
Resellers/Restaurants	Supermarkets and restaurants belong to this group.

Table 2. What's inside the iFarM client box.

Item	Usage	Measurement frequency
Soil Ph Tester	To measure soil acidity or alkalinity	3 times a season
EC Tester	To measure soil nutrient availability and compost quality	Twice a month
Thermometer	To measure the air temperature	Continuous
Hygrometer	To measure the humidity of that area	Continuous
Soil Moisture Tester	To measure soil moisture	Once a week
Soil Temperature Tester	To measure soil temperature	Weekly
Soil Testing Kit	To measure NPKS (Nitrogen, Phosphorus, Potassium, Sulfur) and organic matters	Once in a one cropping season
Tablet PC	To communicate with farmers, experts and marketers, to collect, archive and archive farming activities.	Every day

their income status, health status (3) *Customer info*: We also collect and archive customer information to analyze their purchase pattern and to make marketing plans. (b) *Experts*: support the farmers with three different domains. *An agriculture expert* discusses with the farmers, farmer leaders and QVEs to make farming plan- what to grow, how to grow and how to maintain the crops from insects or other enemies. An ICT expert assists the farmers and QVEs to use the ICT tools in order to communicate with other parties, upload farming activities and sell their products by using eCommerce. A marketing expert finds customers, design marketing plan, suggests list of crops that can generate more income to the farmers.

(4) *Customers*: The objective of this project is to grow healthy vegetables by the rural farmers and sell them to affluent health conscious people in rural and urban areas at a better price. We have categorized the customers into the following three groups.

Farmers of rural areas are getting agricultural support information of chemical and pesticide free cultivation by using ICT. For helping the farmers the is prepared. iFarM is the total package for rural farmers from which they can learn and improve their production and also sell their products at a higher price in urban area.

The information center is tele-center in rural areas where farmers can obtain all the information relating

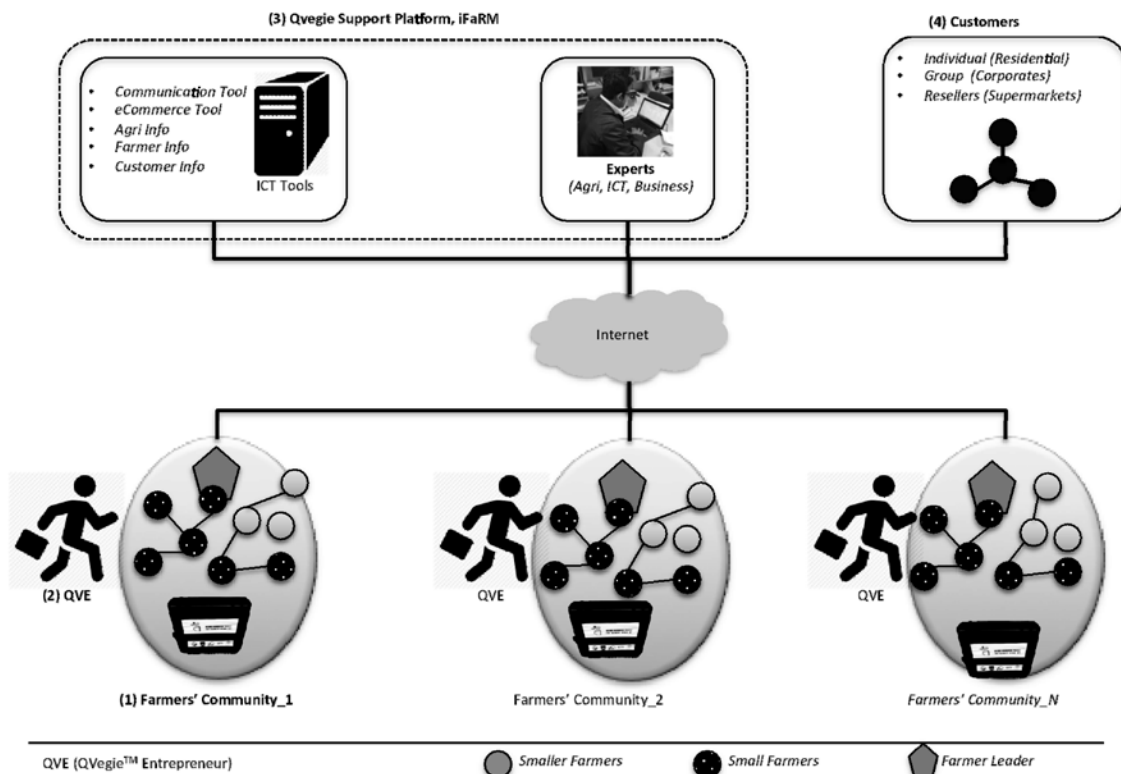


Fig. 1. Operational Model of iFarM.

to vegetable production. A project staff residing in tele-center to upload every day activities of cultivation information and gathered information are analyzed through iFarM platform and giving farmer good advice for better production. Also, this information is provided to the consumer side through the iFarM.

From the field, farmers are getting information related to chemical and pesticides free vegetable cultivation in their field. Through iFarM platform, farmers are using up to date information of cultivation to produce chemical free vegetables. The using of advanced information is changing the poor growth of plants and increasing the production of crops. The author developed the e-agriculture system and semi-organic learning section for providing the useful information among the farmers.

Farmers can easily identify their problem through iFarM platform with the help of project staff. Farmers are showing the problems and project staffs are collecting the problem types such as pest and diseases and share it via e-agriculture system. Experts are giving well solution for solving the problems via e-agriculture system.

And also, farmers can directly contact with experts by using the C2D function of iFarM platform. In addition, Agricultural weather information obtained by the agri-eye is very much helpful for the predicting the problem of the field and alerting the farmers about upcoming problems and present problems.

### Testing the iFarM Model: Implementation Status

In order to test our iFarM model, Kyushu University partnered with four organizations in Bangladesh and applied for JICA grass-roots technical cooperation fund and was approved for testing the model in Bangladesh. The four partnering organizations are Grameen Communications (to develop and deploy ICT applications in rural areas), Bangabandhu Sheikh Mujibur Rahman Agriculture University (to assist with their knowledge in advanced farming), Bangladesh Agriculture Research Institute (for testing QVegie) and WIN corporation (for developing farmer-friendly agriculture contents). Five sites (as in Fig. 3) have been selected in Bangladesh considering the ICT infrastructure, transportation to Dhaka, farming knowledge and interests of the farmers etc. On

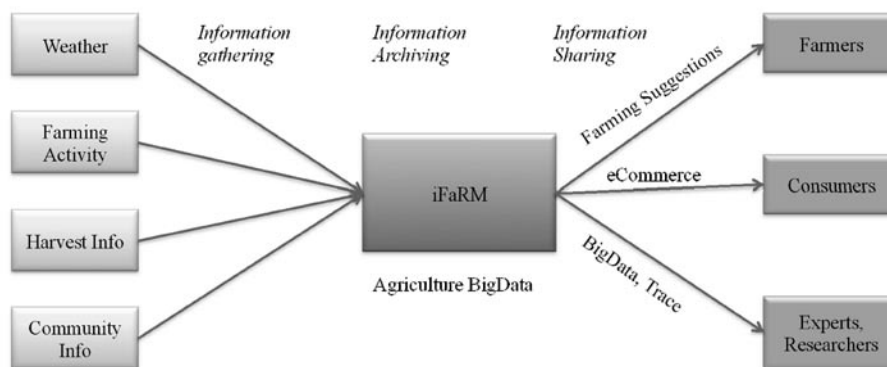


Fig. 2. Agriculture BigData.

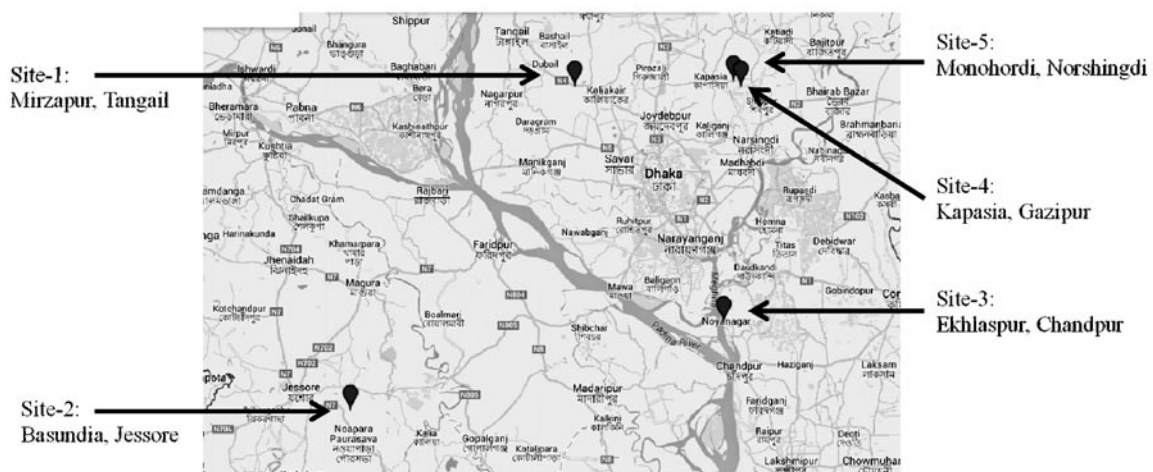


Fig. 3. Operation Sites of iFarM.



average 20 farmers from each site (100 farmers from five sites) have selected as model farmers. One QVE in each site has been employed. Selection of QVEs depended on their skills in agriculture, ICT and business. The iFarM support team resides in Dhaka for supporting the farm-

ers and create the customers. The iFarM support team consists of one agriculture expert, one ICT expert and two marketing officers. We have considered the market demand, quality of the soil and selected more than five major vegetables to grow.

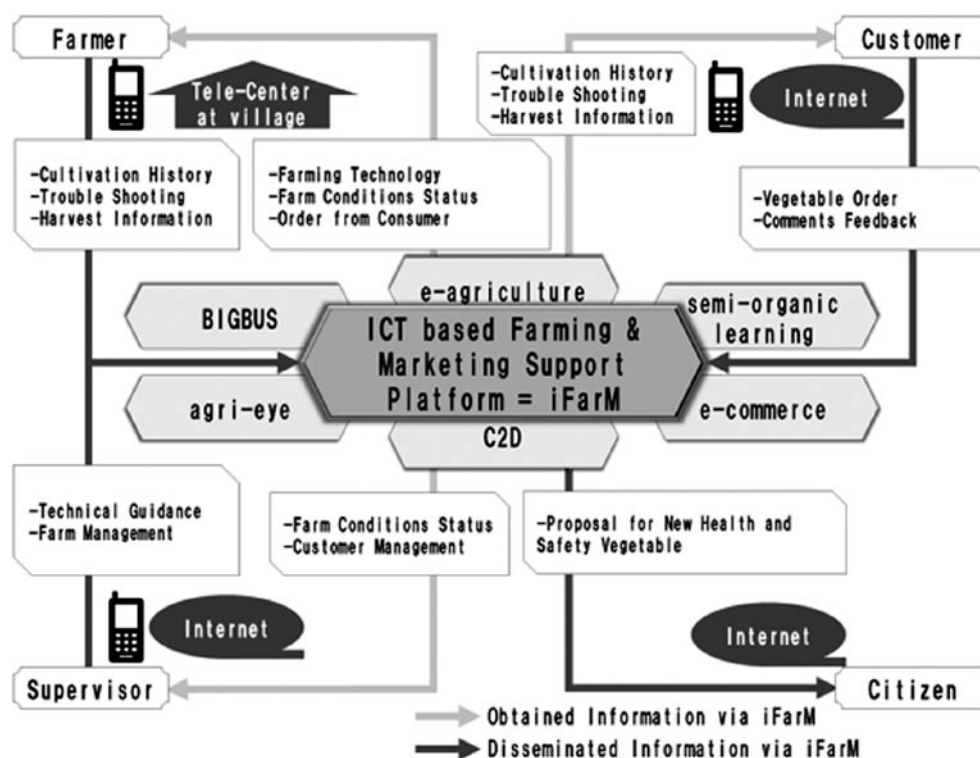


Fig. 4. List of ICT applications in iFarM platform.

Table 3. ICT Applications for iFarM Platform.

Application	Contents
E-agriculture System	E-agriculture system is a main platform for SENSE activities. This application help not only farmer's activities but every people who are interested in semi-organic vegetables can access and get the information. Main function: - Chemical and pesticide free farming support system - Harvest information upload system by farmer - Easy communication system between farmer and expert/market agent
BIGBUS	BIGBUS is one of the components of e-agriculture. Farmer can access to this system by their mobile phone and upload the harvest information by following voice navigation. So the low literacy famers can use this system.
C2D	C2D is also one the components of e-agriculture. The registered user of e-agriculture will be connected by this system. Connection example: Farmer ⇄ Project staffs: Information sharing, agricultural advice, etc. Market agent ⇄ Farmer: Order of vegetables
Agri-eye	Agri-eye can get and distribute the weather information. Based on the corrected information farmer can decide their farming activities.
Semi-organic learning	Semi-organic learning is one of the learning support contents of chemical and pesticide free farming. SENSE has already made the farming method for many vegetables. Text and picture instruction and animation instruction are available. Farmer can use these contents at tele-center.
E-commerce	E-commerce is the market place of quality vegetables. Consumer can order the vegetables throw e-commerce.

Fig. 4 shows the list of ICT applications being used in our iFarM platform. The functionalities of the tools are summarized in Table 3. We have the plan to aggregate all the tools in one platform. The tools are hosted in a local data center in Dhaka now.

The information collected from the model site is made available after processing for project staff and participants farmer residing in model site. Then they can disseminate the information among other farmers to increase their knowledge.

Farmers can place their production information by using BiGBUS system. Consumers can easily order their demand and also know the information related to cultivation method of farmers who are producing their food by

using e-commerce site. Developing a proper marketing channel for distribution of products is underway.

We have just completed one cycle of production. We are now harvesting the products and carrying out market testing of the products.

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