

July 24, 2017

# Leveraging ICT Tools for Rural Livelihood Development

In the Project IFSL, Grameen Intel Social Business Ltd. (GISBL) became partners with HELVETAS International and DAE and deployed two of its prominent e-Agri tools-soil test kit and mrittikā: fertilizer recommendation software. Across the Rabi season of 2016-2017, GISBL trained 17 entrepreneurs and equipped them with the ICT tools that generated optimum farming advisory services for approximately 300 farmers. Results were measured against 13 crops cultivated by these farmers which collectively demonstrated a significant rise in yield, reduction in fertilizer cost and proved to be economically beneficial for both the farmers and the entrepreneurs.

## **1.0 Introduction**

In Bangladesh, the agriculture sector singularly contributes to about 25% of the total GDP employing approximately 60% of the labor force. Even though a boost in yield production is feasible, this sector has witnessed a decrease in average per unit production. Depletion of soil organic matter, use of imbalanced fertilizer, minimum use of organic manures, fluctuating pH etc. are the major causes of such deterioration. Moreover, lack of access to agriculture expertise, and to market information limit income of smallholder farmers.

In recent years, ICT tools and software have evolved as the change agent to address these issues; and to help improve agriculture production, food security and income generation. ICT empowered extensions can enable access to expert agriculture know how and best practices at the grassroots level; and hence can address the major challenges faced by stallholder farmers and rural community as a whole.

## **2.0 GISB E-Agriculture software: ICT Tools Enabling Progressive Farming Practices**

Grameen Intel Social Business Ltd. (GISB) is an ICT based social business, a joint venture of Grameen Trust and Intel Corp, working to develop and deliver ICT solutions for addressing social issues related to farming culture, health advisory services etc. GISB's ICT solutions coupled with its effective implementation framework are playing a significant role in bringing positive changes in the livelihoods of the people at the Bottom of the Pyramid (Bop).

GISB's suite of farming advisory software known as e-Agriculture suite has four modules to offer expert recommendations around seeds, fertilizer, pest & disease management and setting up market linkage at the farmers' door step. The four applications are called mrittikā (fertilizer recommendation solution), ankur (seed selection), protikār (pest and disease management) and vistār (market linkage solution) respectively. This light-weight, easy-to-use and scalable ICT solutions are carefully localized for target geo-regions and hence, perform as expert advisory medium to create significant impact in income generation and in firming practices as well.

## **3.0 IFSL Project: Incorporating GISB e-Agri Services in Smallholder Farming**

HELVETAS Swiss Inter cooperation Bangladesh partnered with Grameen Intel Social Business Ltd. and Department of Agriculture Extension (DAE) launched IFSL (Improving Food Security and Livelihoods) project in Gaibandha and Jamalpur district. The main aim of IFSL project is to support smallholder and

landless farmers through improved access to appropriate technical advice, affordable inputs, business and market support. On March 2016, IFSL integrated mrittikā, GISB's e-Agriculture software, and soil testing kit to provide fertilizer recommendation to the targeted local smallholder farmers.

### **3.1 mrittikā: Effective Fertilizer Recommending Software**

mrittikā is an easy and affordable software for boosting modern farming, food security and livelihood as it not only increases yield and saves cost, it also retains soil health.

It is an android based advanced fertilizer recommending software application to generate optimum fertilizer recommendation specific to the land's soil nutrient condition and hence reduces over and/or under use of fertilizers. It also details the dosage ratio and procedure of fertilizer application to ensure best practices are being advised to farmers. As a result, these optimum recommendations are directly contributing to increase in crop yield, reduction in input cost and to sustain soil health for longer period.

Farmers from the selected regions benefitted from both mrittikā and soil test kit. At a glance, here are the other key features of the IFISL project:

- **Locations:** Jamalpur and Gaibandha
- **GISB Software and Tools:** mrittikā and soil test kit
- **No of Entrepreneurs :** 17 LSPs from 6 local SPAs (Service Proving Associations)
- **Target Beneficiary:** Local farmers from the regions of Jamalpur and Gaibandha
- **Project Timeframe:** March 2016-March 2017

During this period, IFSL adopted GISB's business model that focuses on creating income sources at different levels via local entrepreneurs and distributing expert solutions among smallholder farmers.

### **4.0 Entrepreneur based Business Model of IFSL: A Sustainable and Skill Enabling Approach**

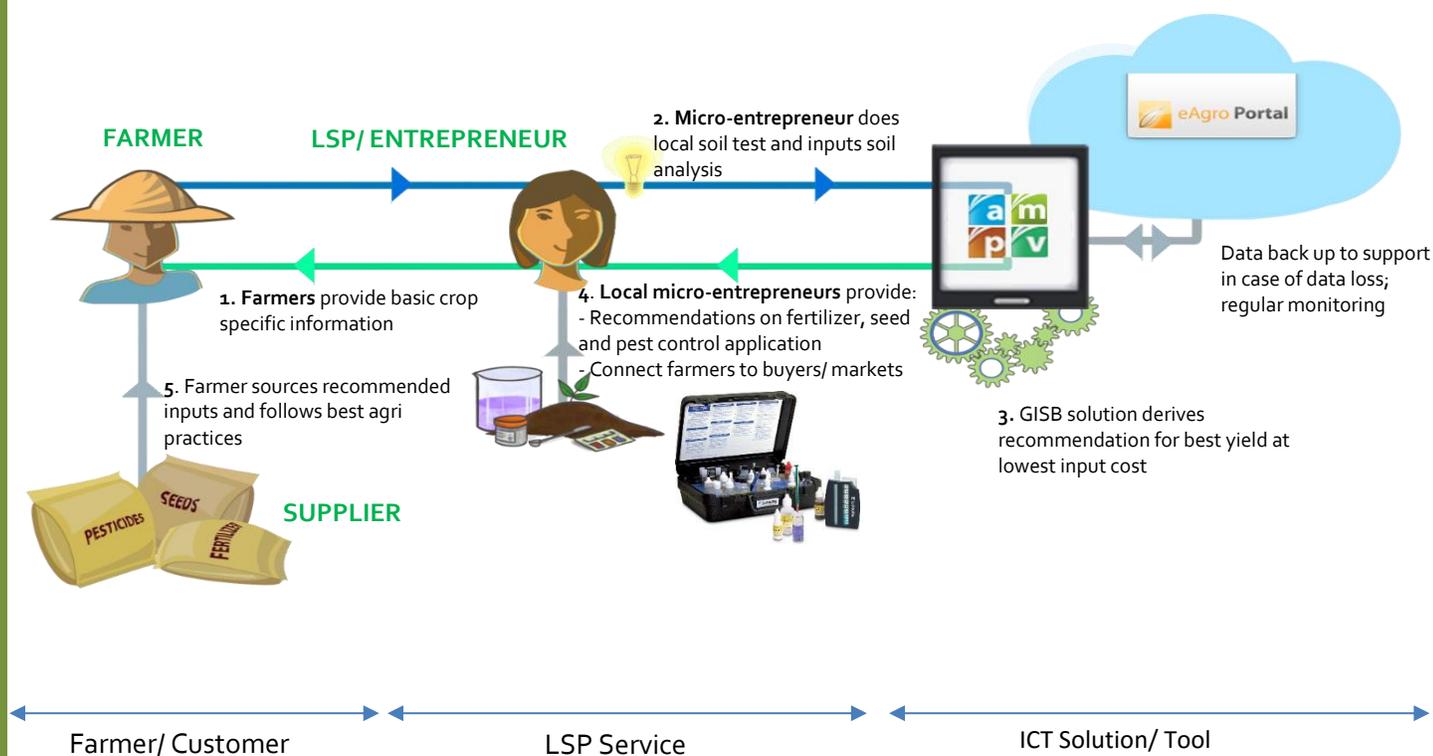
In IFISL project, GISB and HELVETAS implemented GISB's entrepreneur based business model. While farmers from the regions of Jamalpur and Gaibandha were the main beneficiary of IFISL project, established local leaders who were already providing various services to the local communities, were identified as Entrepreneurs in GISB's business model.

The entrepreneurs from each location acted as local agriculture service providers. In order to conduct the soil test and eventually generate recommendations through mrittikā, these local entrepreneurs

were trained and provided with ICT training to provide these services for beneficiary farmers. Over the Kharif and Rabi season of 2016, the local entrepreneurs served local farmers.

#### 4.1 Implementation framework:

The entrepreneur based e-Agro service delivery framework to reach smallholder farmers' doorstep is represented in the diagram:



As the diagram depicts, this model establishes a symbiotic relationship, where the entrepreneurs can gain benefit from the new income source; and the farmers can benefit from expert farming knowledge enabling them to apply the optimum fertilizer dosage. And help contributes to the conservation of soil health, prevents wastage of fertilizers and thus saves cost; and finally, it increases yield and quality produce which ultimately increases the farmer's income.

#### 4.2 Business Model's Key Components: Local Entrepreneurs for Effective Service Delivery

To make it a sustainable business model, the components were designed to satisfy certain parameters. In general, the success of this model relied on enabling capacity building, income generation; and most importantly, improving accessibility and affordability of smallholder farmers.

Major components from the business model and implementation framework, which make this approach a scalable and replicable one, include the following:

- a) **Building Trust through Local Entrepreneurs:** 17 entrepreneurs were identified from two locations representing local community and hence have an inherent trust factor that can motivate the farmers to adopt and accept smart farming advises easily and voice their difficulties as well.
- b) **Built in Incentive Mechanism:** Additional income generation potential emerged for both the local entrepreneurs and farmers. Besides, farmers now had easy accessibility to correct and timely agriculture advisory services in addition to potential for high yield and profit.
- c) **Capacity Building and Technical Knowledge Transfer:** HELVETAS and GISB distributed 12 soil testing kit and 12 notebook computers among the entrepreneurs to set them up as extension service providers. Trainings were provided to equip them on GISB's agricultural software- mrittikā, protikār, and vistār and their usability along with how to do soil tests.
- d) **Local Promotion and Awareness Building:** Throughout the project, GISB, HELVETAS and Department of Agriculture Extension (DAE) used flyers, radio channels and local representative to raise awareness on the importance of optimum use of fertilizer and storing soil health.
- e) **Regular Monitoring and Evaluation Mechanism:** This mechanism was put in action to evaluate the retention of knowledge transferred, quality of service delivery, crop level impact and income potential to assess the current status and take corrective actions if needed.

All these different components as a whole ensured the success of this project and lead a path to replicate the model as well.

### **5.0 Filed Implementation and Impact Assessment of GISB e-Agri Tools:**

In order to assess the success, field data were collected in the selected regions. The entrepreneurs served 310 farmers by providing fertilizer recommendation after doing soil tests during the Rabi season starting from October 2016 till March 2017. Recommendations were generated for 13 crops namely- rice, brinjal, khira, potato, sweet gourd, bitter gourd, mustard, jute, maize, vegetables, wheat, tomato and chili. Among this array of crops, rice, potato, mustard and chili were the primary crops.

### 5.1 Assessment Objectives:

To assess the impact of using fertilizer recommendation a field survey was conducted on 84 randomly selected farmers who cultivated crops by following mrittikā's fertilizer recommendation after doing soil tests. Broadly the objective of the assessment was to evaluate the effectiveness of using scientific fertilizer recommendation and the business model to support income potentials. Specifically the following objectives were defined for assessment:

- a) To identify change in yield/production volume due to use of mrittikā's fertilizer recommendation
- b) To identify change in fertilizer cost reduction occurred due to use of mrittika's fertilizer recommendation
- c) To identify cost effective method of fertilizer recommendation between mrittikā and traditional practice
- d) To identify change in ROI on fertilizer cost due use of mrittikā's fertilizer recommendation
- e) To identify the percentage of increase in the entrepreneurs' income level obtained after the integration of soil test and mrittikā's fertilizer recommendation into their existing services.

### 5.2 Indicators for impact assessment:

This section lists the indicators that were given primary attention for assessing the impact of mrittikā on the farmers. These indicators were used to assess the impact for the four major crops namely Rice, Potato, Mustard and Chile.

Indictors reflecting smallholders' interest are:

- i. **Crop yield:** Crop yield consists of total crop yield, as well as crop yield per decimal of land.
- ii. **Fertilizer expense:** The total cost of fertilizers required for achieving the total yield and the fertilizer cost per decimal.
- iii. **Return on investment on fertilizers:** The yield for per taka spent on fertilizer.
- iv. **Income potential:** The amount of extra income gained by the farmers from selling the higher yield and/or consuming more of the crops compared to last season. Furthermore, the additional income generated by the entrepreneurs from providing the soil testing and mrittikā recommendation service to farmers.

### 5.3 Assessment methodology:

- **Mixed study approach:** the survey was designed to collect both qualitative and quantitative data for the assessment.
- **User Vs Non-user approach:** Results of success indicators were compared between the farmers who used mrittikā's fertilizer recommendation with those of who did not use it.
- **Comparative fertilizer recommendation methods:** Major assessment parameters such as yield and cost per decimal were compared between mrittikā's recommendation and traditional practices, i.e., the process/methods that farmer have been using all along without any expert knowledge about fertilizer amount and application.
- **Random sampling method:** Beneficiaries were randomly selected to take part in the field survey designed for impact assessment.
- **Data collection method and tool:** The end season data was collected by conducting individual interviews and using survey questionnaire with farmers/producers by the field staffs of HELVETAS. Land and cost unit of comparison for the assessment is one decimal.

### 6.0 Result measurement of mrittikā VS traditional practice:

This section focuses and compares the total crop yield and the fertilizer cost incurred from using two methods: traditional practices and mrittikā's fertilizer recommendation.

#### 6.1 Increase in yield

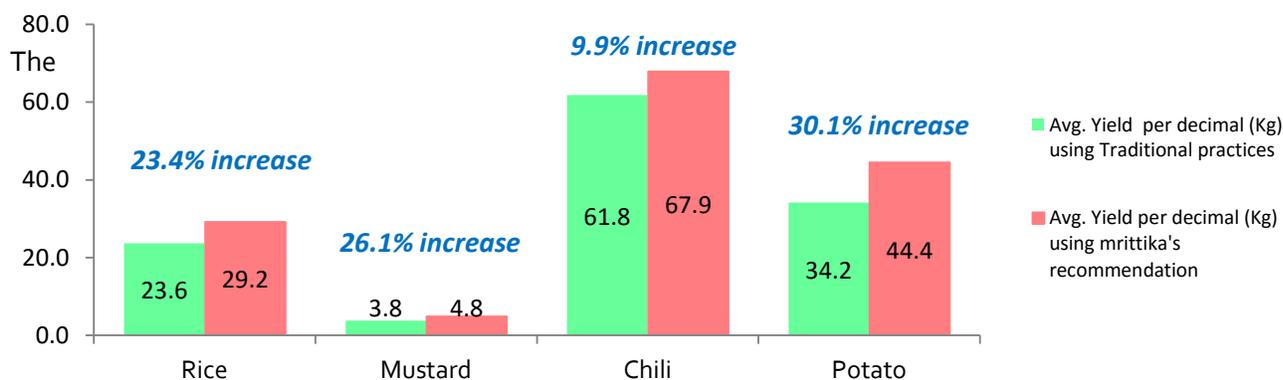


Figure 1: Yield outcome of crops using mrittikā vs. traditional practices

The graph clearly shows that the farmers obtained higher harvest after using mrittikā's fertilizer recommendation. In average, the farmers of different crops enjoyed a 22.4% increase in yield.

### 6.2 Reduction in input cost

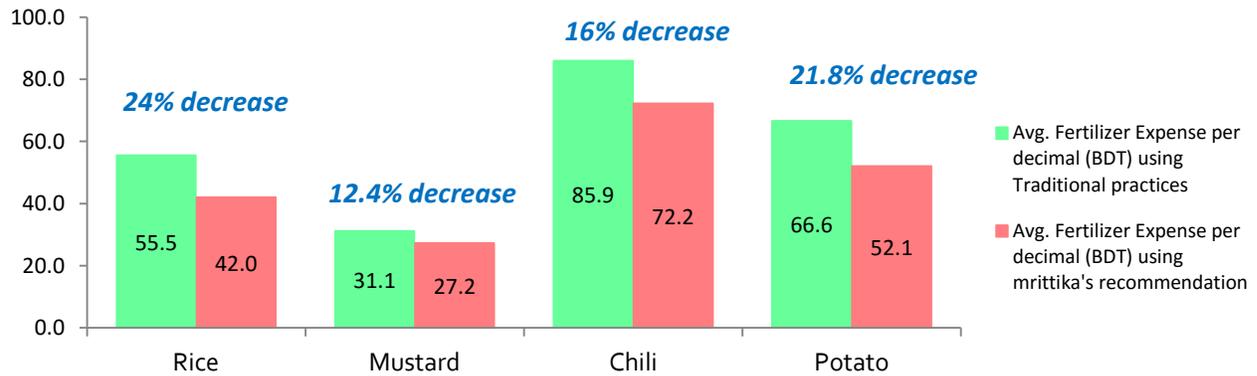


Figure 2: Fertilizer expense using mrittikā vs. traditional practices

The farmers using mrittikā's recommendation had lower fertilizer cost for all the crops (rice, mustard, chili, potato) compared to those who followed traditional practices. The highest decrease was observed for rice where the farmers using mrittikā's recommendation were able to save 24% on fertilizer cost compared to those of applying traditional practices.

### 6.3 Higher return on investment on fertilizers:

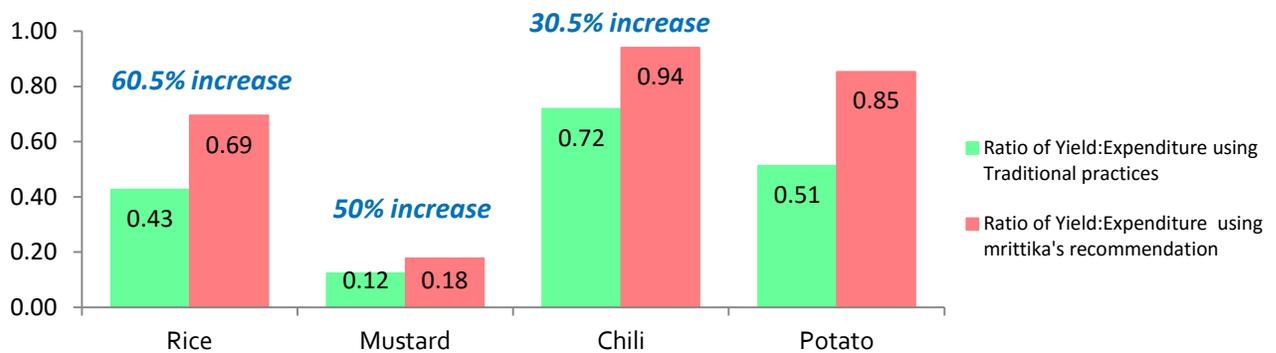


Figure 3: ROI using mrittikā vs. traditional practices

Use of mrittikā's recommendation obtained higher yield for per taka spent on fertilizer compared to traditional practice. After using mrittikā's recommendation, the farmers were able to get harvest more of rice (in 'Kg') for 'per taka' spent on fertilizers compared to that of traditional practice.

#### **6.4 Increase Income potential for local entrepreneurs:**

For offering combined service of conducting the soil test and providing fertilizer recommendation, the entrepreneurs charged a service fee of BDT 220 from the farmers. As a result, entrepreneurs received additional income and profit of BDT. 5,600/= and BDT. 5,000/= respectively in two seasons by serving approximately 18 farmers each. This extra amount reflects almost 8% increase in their income. With such increase the entrepreneurs are targeting to provide the service to 50 farmers in upcoming season, and introduce newer service related to farming.

#### **7.0 Major highlights of the assessment:**

It was evident that the use of mrittikā's recommendation was indeed the change factor driving the following outcomes:

- i. Increase crop yield of 9-30% indicating potential higher margin than before
- ii. Reduce fertilize cost of 12.5-24%.
- iii. Obtain 0.2-0.9% higher return on fertilizer investment.
- iv. Experience 8% increase in income for entrepreneurs

#### **8.0 Way to Sustainability:**

IFISL has been a very promising and successful initiative as it introduced accessible and affordability for smallholder farmers to replace the traditional farming culture with modern & smart farming.

At field level, the following prominent achievements were identified, which indicates that not only an ICT enabled entrepreneur based farming advisory service is accepted by local farmers but it also has the potential to sustain it independently:

- i. Introduction of soil test service and optimal fertilizer recommendation through ICT tools in Jamalpur and Gaibandha districts for the first time
- ii. Identifying potential income sources through these new services for local entrepreneurs and the farmers
- iii. Capacity building and skill development through daylong trainings for local entrepreneurs on ICT tools boosting knowledge and confidence.
- iv. Potential of the entrepreneurs to transfer the acquired technical skills into other business means

- v. Raised awareness among farmers on smart farming, better fertilization practice and soil health practices who are otherwise inclined toward traditional farming
- vi. Easy accessibility for the farmers to obtain expert advice affordably, and use them to change traditional farming practices, leading to optimum yield and cost saving opportunity
- vii. Potential to environmental safety by doing soil tests and using optimum fertilizers that ensures better soil health for a longer period.

Apart from the field level success, the project in general demonstrated a perfectly balanced business model, which encourages ownership, incentive and flexibility. This entrepreneur focused approach brought in new perspectives as follows:

- i. Stakeholders from public and private sectors engaged to establish a replicable and independently sustainable model, which is an epitome of PPP
- ii. Irrespective of a certain crop or season, both the entrepreneurs and farmers can reap the benefits of these advanced services as needed
- iii. Soil testing and fertilizer recommendation are mutually exclusive offering benefits not only to the beneficiaries but also for the environment
- iv. The project created a high level of ownership among the entrepreneurs and farmer groups, reflecting the strategic goals being nurtured by all the stakeholders involved and hence created an inherent support to make it sustainable
- v. The overall project balanced a “win-win” multilateral relationship, which includes all groups such as and marginalized producers on the beneficiary end and public and private partners on the benefactors end, striving to harness the same goal.

Such diverse and agency driven roles ensure active participation and partnership. Sustainability is the driving force here, as this approach can be easily customized for different locations and replicated accordingly to deploy in similar ICT4Ag initiatives targeting to improve livelihood and food security.