E-Zaraat: Evaluation Report

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Summary

Agriculture plays an important role in providing employment and livelihoods to millions of rural poor in Pakistan. A large proportion of the farming community possesses small and fragmented landholdings, making agricultural operations difficult. As a result, in many cases, farmers are only able to engage in subsistence level farming. However, standards of living can be raised if farmers are helped in improving yield and profitability of their crops. One of the critical gaps leading to low productivity and low profitability of small farmers is poor and ineffective crop production and management practices. This is primarily due to their poor access to quality agricultural extension and advisory services. In Punjab, the Provincial Agriculture Department is mandated to provide such services to the farming community. However, the Department has quite inadequate resources to cater to the province's needs, covering hardly 10 percent of all farmers.

In order to provide quality extension services to a larger segment of the farming community at critical times, CABI piloted a project, E-Zaraat, in partnership with the Government of Punjab and with funding from DFID. The main purpose of E-Zaraat was to serve the farming community through provision of timely and adequate extension services. The project was piloted in Vehari district. It had four major components: 1) a helpline for farmers; 2) text messages – transmitted to the mobile phones of farmers in accordance with crop calendars; 3) voice messages – transmitted to mobile phones of farmers in accordance with crop calendars; and 4) and an information management web-portal for the extension department.

In order to assess the impact of the project, an evaluation study was carried out. Perspectives on the E-Zaraat system and self-reported agricultural data were collected from farmers as well as from extension workers, by using semi-structured questionnaires and unstructured interviews. Farmer data was gathered both for farmers that were beneficiaries of E-Zaraat based services (Group 1) and for a control group (Group 2). Yield and profits were gathered for both groups as well as usage rates for Group 1 farmers of E-Zaraat services, general perceptions of the service and general demographic contextual information such as level of education and size of land holding. The extension workers' survey focussed on their usage of the system and their perception of its utility and effectiveness.

Results of the study are encouraging. The project has provided benefits to around 50,000 farmers, almost 19 percent of all farmers in the district. As mentioned above government led extension services were previously reaching just 10 percent of farmers. Adequate evidence is available to conclude that the project has provided benefits for farming communities as well as for the extension department.

The project staff prepared frequently asked questions (FAQs) for major crops, to support the helpline operations. The advisory text messaging service has been used most by farmers. However, the help line, has been used less by the farming community, primarily because of the cost involved in making calls. It is worth mentioning that the effectiveness of the project could be enhanced considerably by offering the helpline service free of charge. The evidence supports the conclusion that farmers receiving project services were able to manage their operations more efficiently and effectively.

The project has also had a positive impact on the organizational communication and management of the Directorate General of Agricultural Extension and Adaptive Research (DG AE& AR). It has helped the directorate in improving their processes and performance in several ways which include: 1) Automation of data entry and reports, 2) availability of technology, 3) development of databases, 4) greater access to knowledge and innovative crop management practices, 5) more effective methods of extension service provision, 6) improved and timely reporting, and 7) integration of activities. However, such benefits are available only in Vehari district. Potential benefits can be maximized, if the project services are extended to all districts of the province. Besides this, the project has also helped in developing a database of input suppliers for seed, pesticides and fertilizers.

It is expected that with the passage of time, benefits derived from the project will increase. More extension workers will use the system, more effective extension services will be provided to the farmers, resulting in greater farmer satisfaction.

Major issues, highlighted by extension workers, that are hindering project progress, are: 1) speed/connectivity of servers beyond 20 KM radius of Vehari Tehsil; 2) need for a more user friendly interface; and 3) flexibility in field report preparation. The major issue relating to reporting was the frequent preparation of non-standardized reports. However, E-Zaraat has helped in standardization of reports.

The project needs to be extended vertically as well as horizontally, in order to produce maximum results from project interventions. Vertical extension would mean integrating field assistants with the system so that they can feed data on a real time basis, directly from the field and submit field reports in a timely way. Horizontal integration refers to replication of the E-Zaraat to other districts of the province. Horizontal integration will help the extension department in standardizing the system of reporting across the districts and aggregating reports automatically.

Chapter 1

1. Introduction

1.1. Background

Agriculture contributes 21.04 percent to GDP, employs 43.7 percent of the country's labour force (Government of Pakistan, 2014, pp. 7 & 23), provides livelihoods to a large proportion of the population (150 million people and 4,500 villages; Bajwa, Ahmad & Ali, 2010), and supplies inputs to manufacturing sectors.

However, there is a substantial gap between the crop yield being achieved by progressive farmers and that achieved by traditional farmers. Small and medium farmers are usually unable to reach their full potential owing to variety of reasons, chief among them being a lack of adequate expertise. With provision of appropriate and timely technical advice, these farmers could also achieve higher yields and thus, improved livelihoods. It is worthwhile to mention that the Pakistani Government's "Vision 2025" also emphasizes upon the need for adoption of more efficient agricultural production systems (Planning Commission, 2014, p. 18).

The Department of Agricultural Extension is responsible for providing extension services, agricultural technical advice, to the country's farmers. The Department has been entrusted with three functions: adaptive research, extension and training (Iqbal, Ali, Ahmad & Abbasi, 2007). However, it is suffering from lack of capacity and resources to cater to the technical needs of farmers.

The Punjab Agricultural Extension Department is fulfilling the needs of 25,000 villages and more than 4 million farming families. The tools used by the department to reach the farmers include:

- Individual contact;
- Mass contact;
- Print and electronic media;
- Publications;
- Demonstration plots.

The province is administratively divided into districts. There are 36 districts in the Punjab, each administratively coordinated by the District Co-ordination Officer. Technical support and leadership is provided by the Executive District Officer (EDO) who leads several departments including Agriculture, at the district level. The next position in the hierarchy is the District Officer for Agriculture (DO-A) who is assisted by Deputy District Officers- Agriculture (DDO-A) who operate at tehsil levels. Each tehsil is geographically divided into a few markaz (centres). The agricultural extension office at the markaz level is managed by an Agricultural Officer (AO).The lowest level of operations of the Department are the union councils. Field Assistants (FAs) work at the union council (UC) level. Each UC is comprised of several villages

A baseline survey conducted in 2012 revealed that barely 10 percent of farmers were being covered by the extension system. E-Zaraat. To improve the situation, CABI designed and implemented a project, "E-Zaraat", jointly with the Agriculture Department of Punjab. The prime goal for E-Zaraat was to increase the percentage of farmers receiving extension services to at least 30 percent during its first phase. The project involved development of a management information system for the DG AE & AR, and for the farmers, preparation of FAQs, designing and dissemination of advisory messages, setting up a helpline and the development of databases.

The E-Zaraat project was fully implemented on a pilot basis in Vehari. The project envisaged placing greater emphasis on strengthening the linkage between farmers and extension workers, through technology (the helpline, voice and text messages, and the web portal).

1.2. Components of E-Zaraat

The project made use of a helpline, a messaging service, and a web portal to achieve the envisioned objectives of the service. Below is a brief description of the components of the project:

1.2.1. Helpline

This constituent of the project was designed to be based on a pull-strategy to address the "felt- need" advisory of the farmers. It was intended to cater to farmers for a wide range of queries. A panel of experts developed an exhaustive list of FAQs for major crops grown in the project area. Development of FAQs involved the following stages:

- Stage 1: Preliminary review of literature for identification of query areas
- Stage 2: Expert workshops for development of FAQs
- Stage 3: Exploring answers to the FAQs through a review of literature (especially various issues of the Zaraat Nama)
- Stage 4: Validation of answers by the subject experts from the extension department

A call centre was subsequently set up to entertain queries. The main features of the helpline are as follows:

- Every received call is recorded in the system with details of farmer profile and type of query. This service has gradually built up historical data regarding frequently-faced problems in the region.
- The calls are logged for quality, evaluation, and transcription purposes.
- An expert from the extension department is deputed to respond to queries; however, according to the requirements of the client, the call can be referred to another expert in the concerned district (in this case the DDO-As) or panel of experts.
- The Call Centre's transactional data also supplements the data warehouse.

1.2.2. Text Messages

Agriculture advisory messages are sent to mobile phones, in text (Urdu) format. These messages are selected and broadcast, based on timelines for the crops.

1.2.3. Voice Messages

Keeping in view the low literacy rate among farmers, another feature, voice messages, was also built into the program

1.2.4. Web Portal

This segment was initiated to replace the archaic extension system based on manual reporting, which results in huge volumes of paper-based data with all its inherent problems, such as duplication, loss of data, and redundancy. The web portal was designed to equip management with real-time data. The major characteristics of the web portal are as follows:

- Agriculture officers and senior officers have been equipped with tablets to input farmer data and information.
- A mobile application on a tablet to collect data from the field. Each record entered in the field is automatically geo-stamped to verify the location of the extension worker.
- A dynamic portal, based on the Enterprise Resource Planning principle, automates all workflows and prevalent practices at the provincial level.
- The portal's interface also serves as a backup to record field data in case a field worker's tablet is out of order.
- The portal is designed to allow each staff member of DG AE & AR and field offices to log in, enter data, and access reports.
- The portal allows officials to generate all types of reports based on the data inputs provided by the field staff.
- Reports generated at each level (e.g., AO level) are checked and verified for accuracy at a higher level (DDOA in this case) and may be rejected or require reworking.
- All agricultural advisories issued from the office of the DG are updated on the web portal and on the tablets, for ready reference and communication.

1.3. Project Evaluation Survey

An interim evaluation was carried out in 2012 to assess whether the project was going in the desired direction and to identify areas needing improvement.

CABI administered a final evaluation study at the end of 2013 and early 2014 to assess the benefits of the project.

1.4. Objectives of the evaluation

Objectives of the evaluation study were:

- To assess the impact of the project on the intended beneficiaries
- To determine changes to extension services introduced by E-Zaraat.
- To identify issues in the implementation of E-Zaraat

Chapter 2

2. Methodology

2.1. Research design

The design of the study involved data collection from farmers as well as extension officials. The design involved two groups of farmers from whom data was collected:

- Group 1: Comprised farmers who were beneficiaries of project services in one way or another.
- Group 2: Comprised farmers who were NOT beneficiaries of project services.

The design is denoted as follows:

R O1 X O2
R O3 O4

Where:

O1 = Yield and profitability of Group 1 farmers before project

O2 = Yield and profitability of Group 1 farmers after the project

O3 = Yield and profitability of Group 2 farmers before project

O4 = Yield and profitability of Group 2 farmers after the project

2.2. Design of data collection instruments

Two instruments were designed for collection of data:

- **Instrument 1**: Designed for data collection from farmers, it was a semi-structured questionnaire containing variables of yield, cost, profitability, and others. It was prepared in Urdu, thus making it easier to elicit required data.
- **Instrument 2**: Designed for data collection from extension staff, an unstructured interview containing several open-ended questions, focusing on the following questions:
  - What is the level of acceptability of the project among the intended beneficiaries and the users?
  - To what extent the project has succeeded in developing adequate capacity to run E-Zaraat?
  - Is E-Zaraat being used by enough people (farmers and extension staff) to justify its existence?
  - Is E-Zaraat producing the desired results?
  - Are there any issues constraining the effectiveness of the project?
  - How can the effectiveness of E-Zaraat be further enhanced?

2.3. Population and Sampling

2.3.1. Farmers

A sample of 400 farmers was grouped into two categories:

- **Group 1**: Project beneficiaries;

- **Group 2**: Non-beneficiaries of the project (Control Group).

Tehsils (Vehari District)	Group 1: Project beneficiaries	Group 2: Non-beneficiaries	Total
Burewala	88	45	133
Vehari	90	45	135
Mailsi	88	44	132
Total	266	134	400

Table 1: Distribution of respondents

Face-to-face interviews were planned for both groups of farmers, to collect the required information. A semi-structured format questionnaire was developed, to conduct this research. This is a form of qualitative research technique, where trained surveyors are employed to elicit detailed responses from the target audience. The aim of this method is to present each respondent with a similar set of queries. This ensures that all the responses can be reliably aggregated to draw inferences and compare sample subgroups according to the requirements and objectives of the research.

2.3.2. Component 2: Extension Workers

The Key Informant Interview (KII) Method was employed in collecting data from the extension workers. KIIs with the following officers/officials were conducted:

- DG (Agriculture Extension and Adaptive Research-Punjab) 1
- EDO (Vehari) 1
- DO (Agriculture - Vehari) 1
- DDO (Agriculture – Vehari, Mailsi, Burewala) 3
- Cotton Inspectors 2
- Agricultural Officers 5
- Field Assistant 1

Unstructured interviews were used for data collection. Each interview took about one hour; however, interviews of the DO and the EDO took considerably longer (about 90 minutes in each case).

2.4. Data Analysis

Data was entered, processed, and analysed in SPSS.

Chapter 3

3. Brief on country context

3.1. Profile of farms

According to the Agricultural Census 2010, there are 8.26 million private farms in Pakistan, with a total farm area of 52.91 million acres. Most of the farms are small. Average farm size is 6.4 acres. Agriculture in Pakistan is suffering from smaller and more fragmented landholdings. Over 2.8 million farms are fragmented.

Punjab province, accounts for 64 percent of all farms and 55 percent of the farm area for the whole country. However, average size of farm (5.6 acres) is considerably smaller than the national average (6.4 acres).

3.2. Cropping intensity and cropping pattern

Cropping intensity in Punjab province (167 percent) is slightly higher than the average for the country which stands at 159 percent. As far as cropping pattern is concerned, wheat accounts for the biggest share – 41 percent (**Figure 1**).

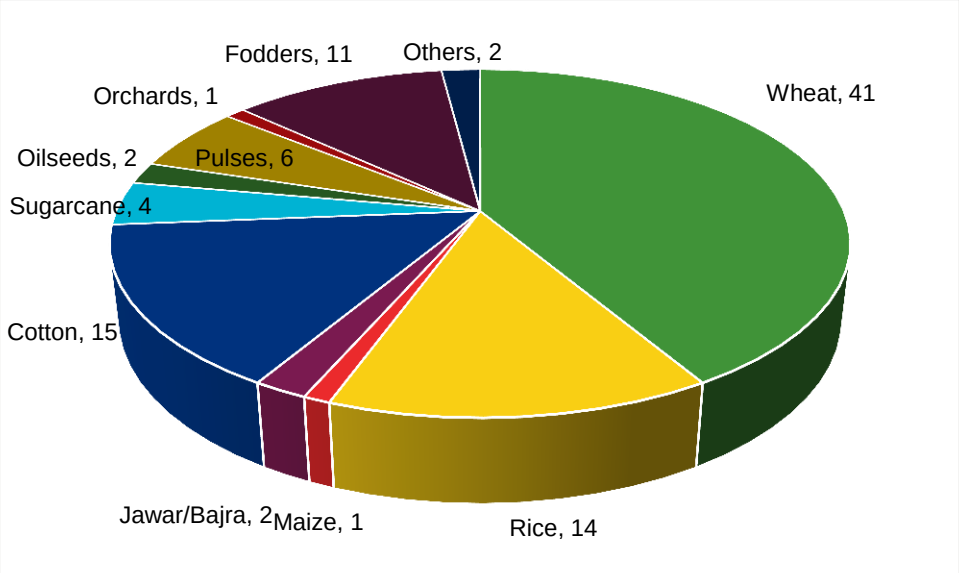

Figure 1: Share of various crops in the cropping pattern (percentage)

3.3. Extension services

There are many problems with the existing extension system:

a. Extension services reach just 10 percent of farmers.

b. Reporting channels are long, hence, communication takes a long time.

c. The officers, have an area of specialization however, each officer is not equipped with standardized knowledge needed for catering to all types of information needs of farmers.

d. Extension service provision is supply driven.

e. Extension advisory messages are supposed to trickle down to all farmers. However, usually, many farmers remain out of reach

Chapter 4

4. Profile of the Respondents

4.1. Profile of Extension Staff

Almost all levels of the Agricultural Extension Department hierarchy were covered in the evaluation study. Designations of the14 respondents from the Department were:

- DG (Agriculture Extension and Adaptive Research-Punjab) 1
- EDO (Vehari) 1
- DO (Agriculture - Vehari) 1
- DDO (Agriculture – Vehari, Mailsi, Burewala) 3
- Cotton Inspectors 2
- Agricultural Officers 5
- Field Assistant 1

4.2. Profile of the farmers

It is encouraging to note that only a small proportion of the farmers sampled (19 percent) reported that they were illiterate. At least half of the respondents had completed their matriculation (10th grade). Some of the respondents even had master degrees (Figure 2).

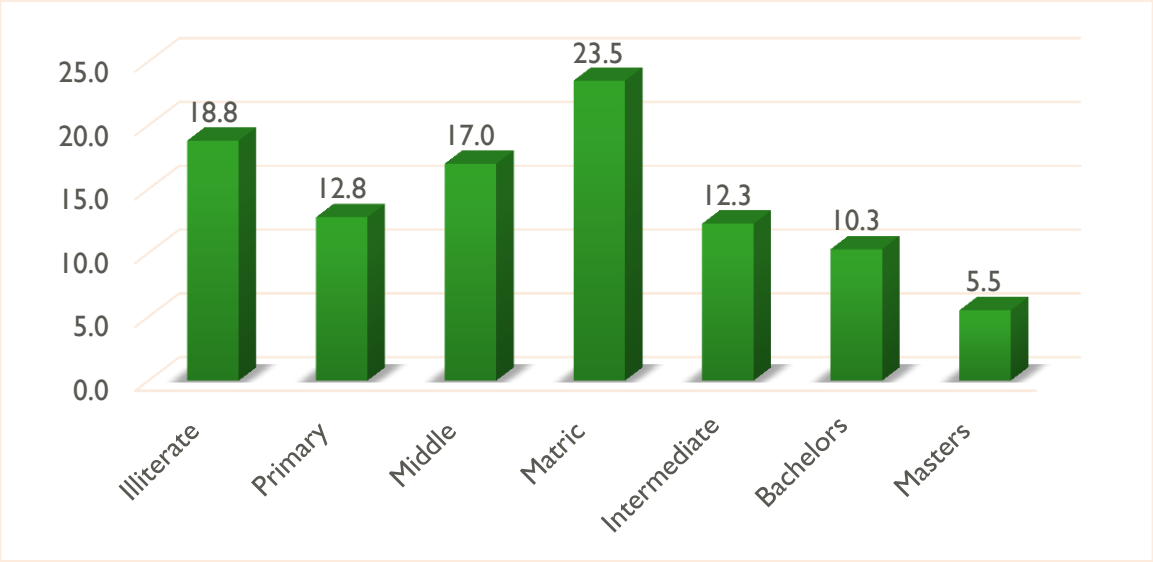

Figure 2: Educational profile of the farmers

4.3. Family size

The average family size of the respondents was 8.6 (number of family members). However, it ranged from just two to more than 10 people per family. A considerable proportion of the farmers (24 percent) reported a family size of more than 10 members. The average family size of 8.6 is, no doubt, much higher than the national and provincial averages (Figure 3). Average family size, according to Pakistan Bureau of Statistics, is 6.41 in Pakistan and 6.51 in rural areas of Pakistan[1].

The larger family sizes exhibited in our study are likely explained by the fact that respondents hailed mainly from small and poor farming communities, and families that tend to have larger families. This explanation is endorsed by data on patterns of family size given in Figure 4, which shows that family sizes of lower income groups is relatively higher than that of higher income groups. The first quintile shows the lowest income group (lowest earning 20 percent of the rural population) and Quintile 5 shows the highest income group (the highest earning 20 percent of the rural population). It clearly shows that poor families (Quantile 1) have very large numbers of family members, almost equivalent to the average size of family indicated by the survey data of this study.

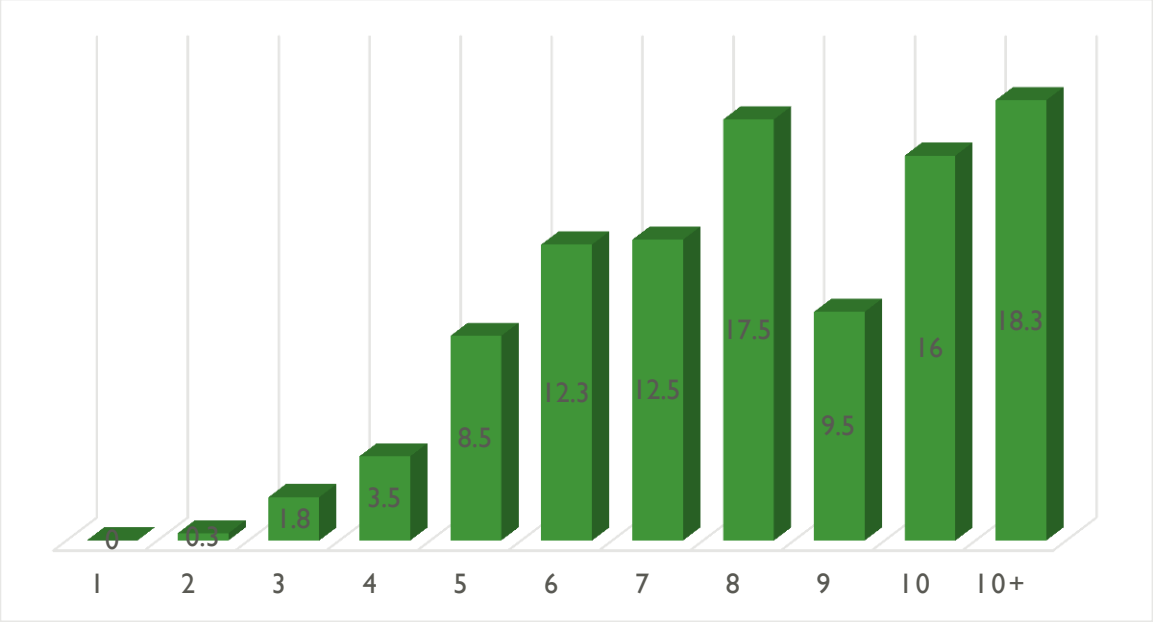

Figure 3: Family members of the responding farmers

[1] Pakistan Bureau of Statistics. (2013). Household Integrated Economic Survey (HIES) 2011-12. Islamabad: Government of Pakistan, Statistics Division. Retrieved 24 January, 2014 from http://www.pbs.gov.pk/sites/default/files/pslm/publications/hies11_12/Complete_report.pdf

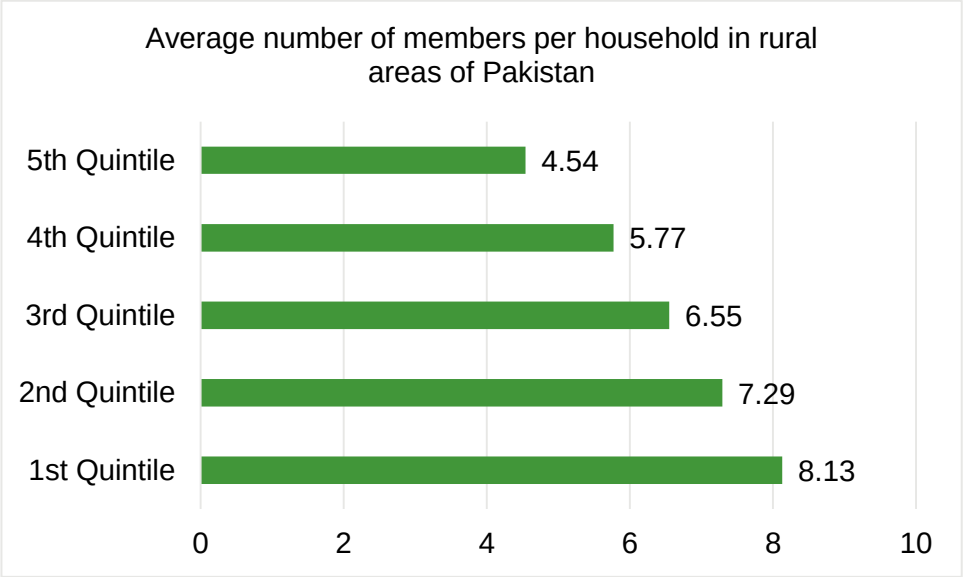

Figure 4: Income group-wise family size in rural Pakistan

4.4. Land Ownership

The majority of survey respondents were small farmers. Only 12 percent of the farmers had more than 25 acres of land (Figure 5), which shows that our evaluation has successfully sampled the target group (i.e., small and medium farmers) of the project. Average farm size in Punjab is relatively small (5.6 acres), as shown in Figure 7 (Agricultural Census Organization, 2012).

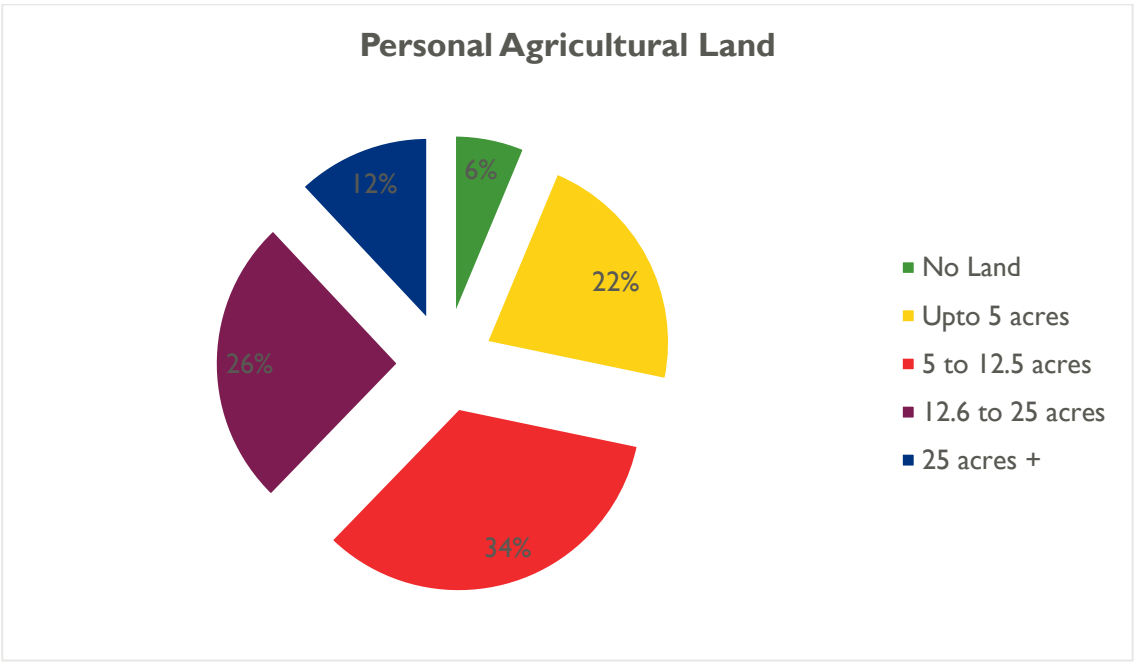

Figure 5: Land ownership

Figure 6 shows that Group 1 category farmers, who were beneficiaries of project services, had relatively smaller land holdings than Group 2 (Control Group), or non-beneficiary farmers, with an average of 9.82 acres

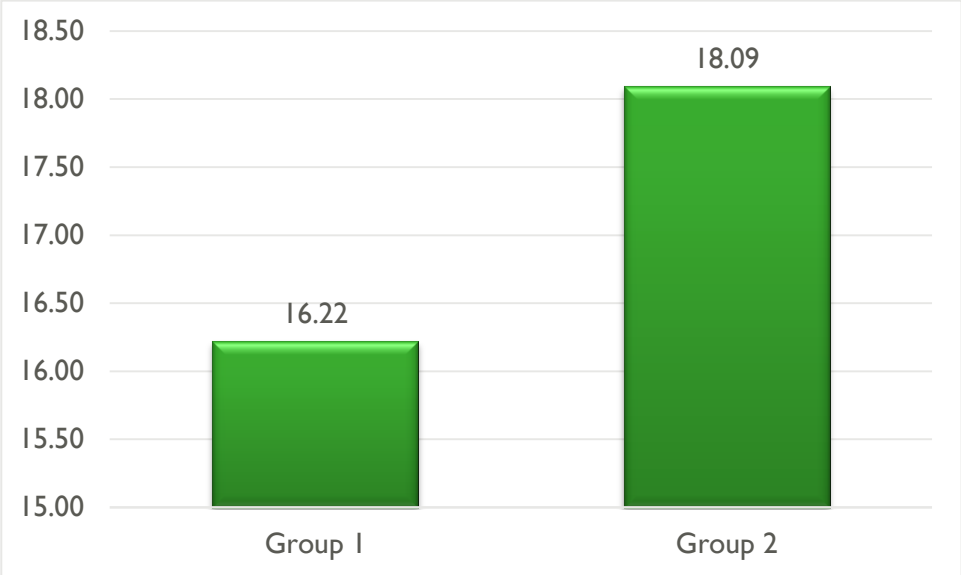

Figure 6: Group-wise land ownership of farmers (in acres)

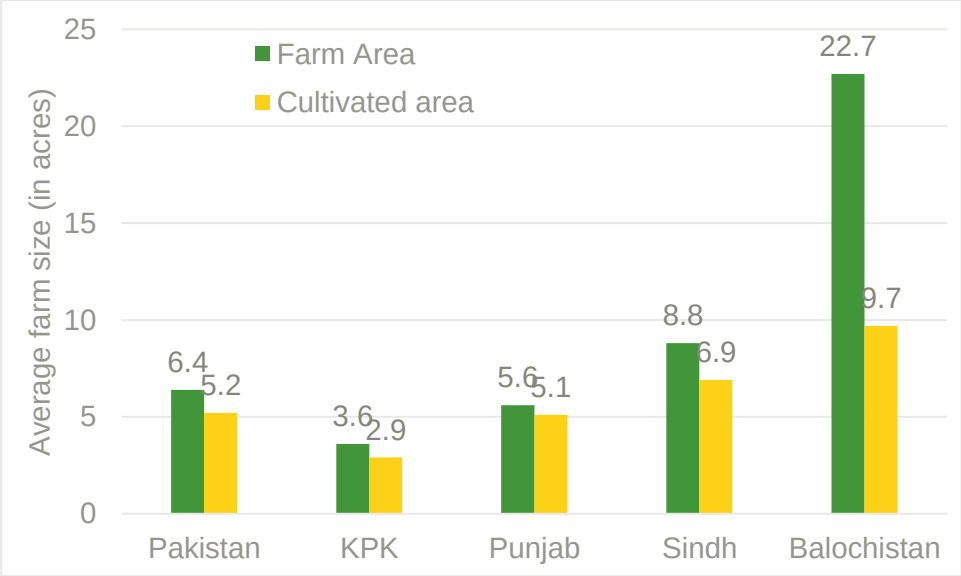

Figure 7: Average farm size (in acres)

Chapter 5

5. Impact of the Project

5.1. Envisaged Impact of the Project

The project aimed at improving the livelihoods of farmers in the target areas. The indicator set for measuring impact is:

- *Improved earning capacity of the farmers*

Improved earning capacity of the farmers was measured through increases in yield of their crops. In Vehari district, major crops include cotton and wheat. Results of the evaluation exercise related to crop yield are presented and discussed below:

5.1.1. Cotton Yield and Profitability

Findings

- Cotton yield of beneficiary farmers declined by 4.75 percent to 34.45 maunds/acre in 2013 from 36.17 maunds/acre in 2012. Moreover, their profit declined by 1.86 percent (from Rs. 13,196/acre in 2012 to Rs. 12,911 in 2013) during the corresponding period (Figure 8).
- Cotton yield of control group farmers increased marginally (by 0.75 percent) from 36.69 maunds/acre in 2012 to 36.96 maunds/acre in 2013. However, their profit declined by 1.77 percent (Figure 8). (from Rs. 11,396/acre in 2012 to Rs. 11,194 in 2013)
- During the corresponding period, the national average yield plummeted by 5.76 percent (from 815 kg/hectare to 769 kg/hectare; Government of Pakistan, 2014).

Conclusion:

Findings show that although, yield declined in the case of project beneficiaries their profit declined by a significantly lower proportion than the decline in their yield, and remains higher than per acre profit of control farmers. On the other hand, profit of the control group farmers declined sharply despite the fact that their yield increased. Evidence therefore shows that project beneficiaries were able to use their resources with greater efficiency than the control group farmers to achieve higher profits, both proportionally to yield and in real terms. The decline in beneficiary yields can be explained by a drop in national yields, which declined to an even greater extent, though it is unclear why control group yields increased slightly. However, from the findings related to profits it can be concluded that the **project has had some important positive impacts on farmers' livelihoods that benefitted from the project interventions.**

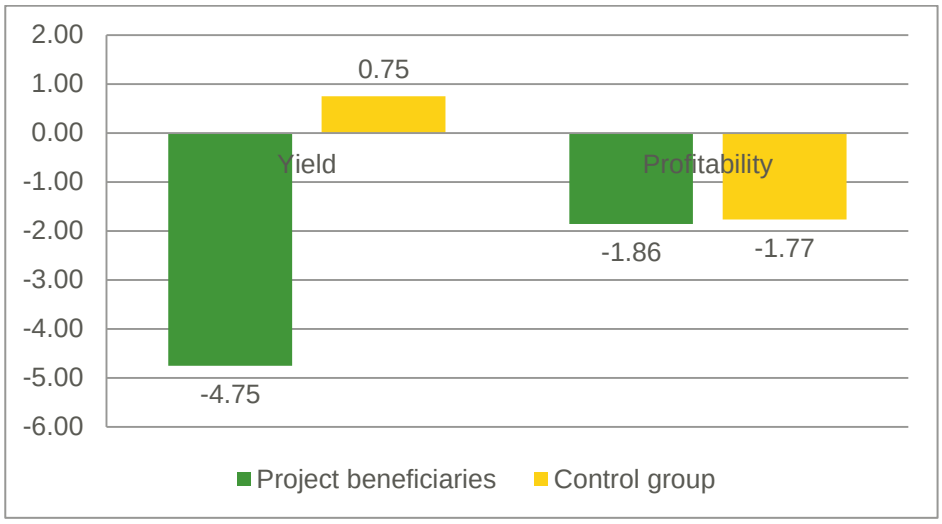

Figure 8: Group-wise change in cotton yield 2012-2013 and profitability (as % change/time)

5.1.2. Wheat yield

Findings

- The wheat yield of beneficiary farmers increased from 37.58 maunds/acre in 2011 to 38.29 maunds/acre in 2012 (increase of 1.91 percent). Their profitability was enhanced by 2.02 percent during the corresponding period.
- The wheat yield of control group farmers showed a greater increase relative to beneficiary farmers, by 2.68 percent, from 40.09 maunds/acre in 2011 to 41.16 maunds/acre in 2012. However, their profitability declined by 5.58 percent during the corresponding period. One of the reasons for the increase in wheat yield is greater use of inputs. This is evident from the increase in the cost of production, which has resulted considerable erosion in their profit.
- During the corresponding period, wheat yield declined at the national level by 4.2 percent. [2]
- Some of the extension staff respondents) believed that due to the greater effectiveness of the extension services, the gap between potential yield and actual yield was narrowing. One DO-A said, “More skilled extension staff means, more capacity building of the farmers. Thus, farmers are direct beneficiaries of this project. They are getting better advice, which is positively affecting the yield. In this way, we will be able to narrow the yield gaps.” He further pointed out that, “Adoption of technology is difficult in the early stages but once it is taken up it is adopted at an accelerated rate. Hence, we are expecting more promising results of the project in the days to come”.

Conclusion:

Findings show that the yield of the wheat crop increased in the case of project beneficiaries by a slightly lower proportion, but profitability improved by a larger proportion compared to control group respondents. This shows that project beneficiaries were able to use their resources with greater efficiency than the control group farmers. This suggests that beneficiary farmers have a more optimal utilization of inputs and better crop management practices than control farmers, since, project beneficiary farmers’ profit has increased and that of control group farmers decreased despite the fact that in both cases the yields have increased. It is, therefore, concluded that the **project created positive impacts on the wheat crop of farmers benefitting from the project interventions.**

[2] Pakistan Economic Survey, 2014, p. 22.

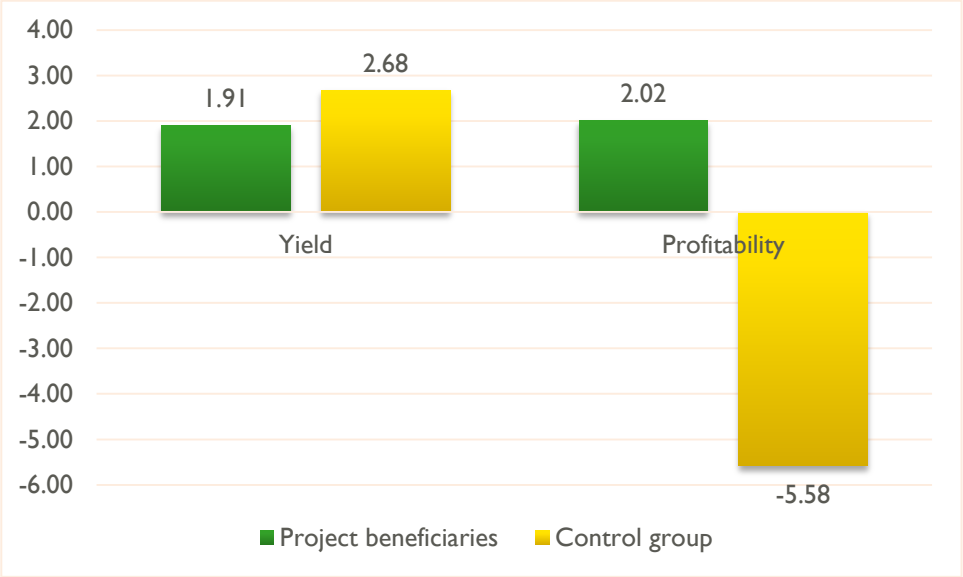

Figure 9: Group-wise change in wheat yield and profitability 2011-2012 (% change/time)

5.2. Benefits for women

The project has had benefits for women in Vehari district. The EDO (Agri) said, "[The] *messaging system is benefiting some women for kitchen gardening. Ladies like Naghmana Langrial, Natasha, and Tehmina Daultana (who are large landholders) have been benefiting from E-Zaraat."* The AO (Vehari) went on to explain: "*There are a limited number of women who are farming. However, many women are engaged in kitchen gardening. Last year, we downloaded some pictures of kitchen gardening from the Internet by using a tablet and developed a training module and delivered it to 25 women, with the help of a local NGO (led by Mrs Uzma) in Sharqi Colony of Vehari city." Similarly, the FA said, "I provided answers to the queries (related to kitchen gardening) of some women farmers (like Madam Saboi in Sharqi Colony) through emails. They have been getting help through the helpline too."*

> *There are a limited number of women who are farming in district Vehari. However, many women are engaged in kitchen gardening. Last year, we downloaded some pictures of kitchen gardening from the Internet by using a tablet and developed a training module and delivered it to 25 women, with the help of a local NGO (led by Mrs Uzma) in Sharqi Colony of Vehari city*
>
> ***AO (Vehari)***

Women are a neglected segment of society in Pakistan. They own a mere 3 percent of the land in the country, while their share in all farming activities is 70 percent[3]. However, there is a need to empower women through capacity building.

[3] Daily Dawn (2014, September, 2014). Women own less than 3% land despite sharing 70% activities. http://www.dailytimes.com.pk/national/18-Sep-2014/women-own-less-than-3-land-despite-sharing-70-activities

Cotton Inspector (Tehsil-Mailsi) added, "*In Mailsi, women are engaged in weed removal, sowing, and cotton picking. Our cotton is not of good quality, as it is affected due to lack of training of farmers. I showed a documentary to 15 women on how to pick cotton in a way that protects the quality of the cotton."*

5.3. Conclusion

The evidence provided here shows that farmers that received project services benefitted from positive impacts on crop production–in the case of both cotton and wheat crops. Hence, it is concluded that the project has started to demonstrate successful results.

Furthermore, the field extension staff are using their tablets to not only feed data but to download content from the internet to train and inform farmers, particularly women, in their areas of operation.

Chapter 6

6. Outcomes of the Project

6.1. Outcome 1

Improved reach and monitoring of extension services to the farming community at lower costs

Baseline value: Before project interventions, as per estimates of the Directorate General of Agricultural extension, government extension services reached 10 percent of farmers in Punjab as a whole.

Target: The farmer helpline to reach 30 percent of farmers in target districts.

Finding:

- At the time of evaluation, it was reported by the Extension Department that extension messages were reaching 50,000 farmers in the district Vehari, i.e., about 28 percent of all farmers.
- The Extension Department has developed a data base of farmers. The DO-A pointed out that, "*We can send messages simultaneously to 50,000 farmers available in the data base. All of them have mobile phones.*" **A review of the E-Zaraat data base indicated that the data of 42,809 farmers was available in it. According to an estimate, there are about 262,780 farmers in District Vehari. Since advisory messages of the Extension Department are reaching 50,000 farmers, hence, coverage of the Extension Department has reached the level of about 19 percent.** How did they manage to develop such a large data base? According to the DO-A, this was accomplished through target setting, where every AO was assigned to add the data of 50 farmers every week to the data base. Data sets available in the system are[4]:

> *Advisory messages are now reaching 50,000 farmers in District Vehari alone. It means extension services are now covering almost 28% of all farmers in the District.*

  - Ag Advisories and User Guides (publicly available)
  - Farmer data: 42,809
  - Dealer Info: 1,084
  - Distributors info: 383
  - Importer info: 72
  - Factories: 137
  - Police Stations: 31
  - Crops: 23

[4] Note the above statistics are for three districts i.e. Vehari, Sargodha and Sialkot

- Fertilizer dealers: 1,665
- Pesticides dealers 889
- Pest species 13
- FAQs 750+
- Text & Voice messages 450+

- Access to agricultural knowledge and information has improved. Sources of knowledge and information include:
  - *Agricultural advisories received from the DG Office on a fortnightly basis*
  - *Internet*
  - *Records/reports available on tablets*
  - *Records/reports available through the web application*
- **Higher effectiveness of extension services**: The use of tablets by the extension staff in providing extension services has proved to be very effective. The DO-A (Vehari) reported that, "*Adult education requires empowerment. It can be done more efficiently through technology with tablets. It is an efficient way of transfer of technology to the farmers. Whenever any farmer comes to us for advice, we show him/her pictures of disease affected plants (or parts thereof) to help him/her establish the symptoms and diagnose the problem.*" This is a form of experiential learning and has a powerful impact. The DDO-A (Vehari) stated his experience: *"I believe that experiential learning is a powerful method of extension services provision. E-Zaraat has equipped us with the necessary facilities to apply it. When we find that farmers cannot understand a particular issue, we immediately download relevant pictures from the internet by using the tablets and show these to the farmers. They understand the problem far more quickly."*
- Extension staff reported that they were accessing advisory messages by using tablets.
- Availability of tablets has enhanced efficiency; the EDO (Agri) said, *"Everything is available on the tablets. We don't need to retrieve the files from the cabinets lying in our offices. We hold meetings on every Tuesday, for DOs and DDOs. They don't need to bring files. They only bring their tablets. Everything is available there." The DO shared an incident of inefficiency of the traditional communication system in the Department. He narrated an episode highlighting the need for IT based solutions. He said, "About 20 years back, the Governor of Punjab [in those times] asked the DG (Extension) to report the impact of on-going vagaries of weather on the crops in some selected districts of Punjab province. The DG immediately directed the extension staff in the relevant districts to comply with the orders of the Governor. It took much longer to transmit the message down to the level of AOs. After three days, the Governor called the DG and asked for the report. The DG had no answer. The Governor was very annoyed with the non-compliance. Now, the situation is different. Within no time, messages reach the AOs, at least in Vehari district, as the entire chain of command is connected online." The DDO (Vehari) added, "My posts [mails/letters] used to take at least three days to reach me. Now I get messages instantaneously."*

Conclusion:

The project has made significant advancement towards achieving the target relating to outcome 1. In other words, the project has succeeded in enhancing coverage of the extension services to a larger part of the farming community.

6.2. Outcome 2

Use of the E-Zaraat system by Directorate General of AE&AR office to monitor extension service performance.

Baseline value: Current data collection forms are manually compiled and are prone to manipulation falsification of data.

Target:

- Develop automated data collection that includes a GPS stamp to verify data collector is at site (December 2012).
- Provide Directorate office access to a real-time survey dashboard (February 2013).

Finding:

The evaluation study found that:

- Extension officials were using tablets (E-Zaraat) for entering real time data;
- They had a data base of fertilizer and pesticide suppliers in their tablets;
- They were using tablets to email reports to their superiors on a real-time basis;
- **Preservation and portability of records**: Record keeping has become simpler and safer. The EDO (Agri) said, *"Now we can store a large amount of data in a small space. The old system of filing is becoming obsolete and redundant.* " The AO (Markaz-Pipli) added, "*Earlier, we used to submit reports on papers. Now we simply enter data in the E-Zaraat application. We have access to all information about production technology, diseases, etc. from the internet."* Moreover, retrieval of data has been greatly enhanced.
- **Easy and quick reporting**: E-Zaraat has improved reporting too. DDO (Burewala) said, "*The reporting system has become very quick. AOs feed data directly from the field. It is a time-saving technique.*" AO (Vehari) added, "*Reporting has become easier. Data is being entered at AO level. AOs are submitting reports to DDOs electronically. They are not required to re-enter data. Earlier, reports were submitted manually and, at each level, data had to be re-entered in the system to create summary reports at each higher level."*
- **Improved communication**: Communication has become more effective and efficient. The DO said, "*The DG can email us at any time to ask for any report or information and we send responses immediately. In plain words, now I am on duty 24 hours a day."* The DDO (Vehari) said, "*Earlier we used to transmit reports usually after15 days of the event, now we are able to send reports within two (2) hours of the event/activity."* Similarly, interaction with farmers has also improved. The EDO (Vehari) said, *"The communication gap between farmers and the Department has narrowed down. Farmers send their queries through the helpline or emails. We transmit answers in the least amount of time."*
- **Dealers' data base**: Availability of agricultural inputs in the market remains a source of great concern for the government. The data base of pesticide and fertilizer dealers enables the relevant

officers to quickly get data about any pesticide/fertilizer dealer. The DDO (Burewala) informed us that they could get access to the following information about pesticide/fertilizer dealers:

- Name of dealer;
- Products;
- Location;
- Cases/litigation against him;
- Status of each litigation.

Conclusion: The project has made significant advancement towards achievement of the target relating to outcome 2. However, the full potential of the project cannot be realized unless the project is up-scaled to the entire province.

6.3. Outcome 3

Evidence to show reduction in unit cost of reaching farmers with extension advice.

Background and context:

- The estimated budget for agricultural extension in Punjab as a whole was approximately £14.34m in 2010 figures (R. Shafique, Personal Communication, October 20, 2013).
- The E-Zaraat system has become operational only very recently. Even so, the EDO Vehari believes extension budgetary costs could be reduced by 40 percent if expanded to the entire province.

Target:

- To produce an Increase in percentage of farmers receiving agricultural extension that is significantly greater than the accompanying increase in extension services costs. It is difficult to measure this and move towards a predefined target as disaggregated figures from the government are difficult to obtain. The case study approach may be recommended if baseline data is difficult to come by.

Finding: Evaluation study found that:

- Coverage of farmers has shown a manifold increase. The number of beneficiary farmers has increased from 18,000 (prior to the project) to 50,000 (at the time of the evaluation exercise);
- The budgetary situation has not improved during the corresponding period;
- Number of extension officials has not increased during this period.
- Text messages: The project has succeeded in developing 450 text messages for various crops– primarily for wheat and cotton crops. These text messages are being broadcast to 50,000 farmers in District Vehari alone.

Conclusion: The project has made significant progress towards the achievement of the target relating to outcome 3. The unit cost of reaching farmers with extension advice has been reduced considerably.

6.4. Additional Project Benefits

Several other benefits of the project identified by the extension staff are given in Table 2. The table gives the frequency of extension staff that observed or experienced various project benefits, as listed in the left-hand most column. The highest number of benefits are clustered under the category of "greater effectiveness of extension services", followed by "availability of data" (Figure 10).

	EDO	DO	DDO	AO	CI	FA
Availability of data						
Availability of dealers' data base	1			5	1	
Availability of farmers' data base	1	1		4	1	
Easy access to/retrieval of data and reports	1		2	3	1	1
Easy access to knowledge						
Availability of agricultural advisory	1	1	2	5		
Improved technical knowledge			1	3	1	
Can easily seek solutions to problems for which the extension worker does not have knowledge	1	1	2	1	1	1
Improved communication						
Easy and quick access to superiors	1			1		
Improved communication in the Department		1				
Greater interaction with farmers	1				1	
Increased performance of the Department						
Motivation and commitment of staff	1	1	2	1	1	
Enhancement in performance of extension staff		1		2		

Greater effectiveness of extension services						
Efficient method of adult learning (through tablets)		1	1		1	
Can demonstrate diseases to farmers	1	1	2	3	1	1
Fortnightly agricultural messages for farmers	1	1	3	5	1	1
Provision of weather information to farmers	1	1	2	3	1	1
Availability of helpline for farmers				1		
Easy and quick reporting						
Images/Photos of the activities are communicated on a timely basis	1		1	1		
Time saving in transmission/generation of reports	1	1	2	1		1
We can explore answers to our problems from the Internet			2		1	
Data analysis is easily done						1
Progress report of the department can be easily prepared					1	1
Preservation and portability of records						
Record keeping/preservation of records	1	1	1	1	1	1
Improvement in accuracy of data	1					1
Storage of a large amount of data in a small space	1					1
Easy portability of reports and large amounts of data	1	1	2	1	1	1

Table 2: Benefits of E-Zaraat

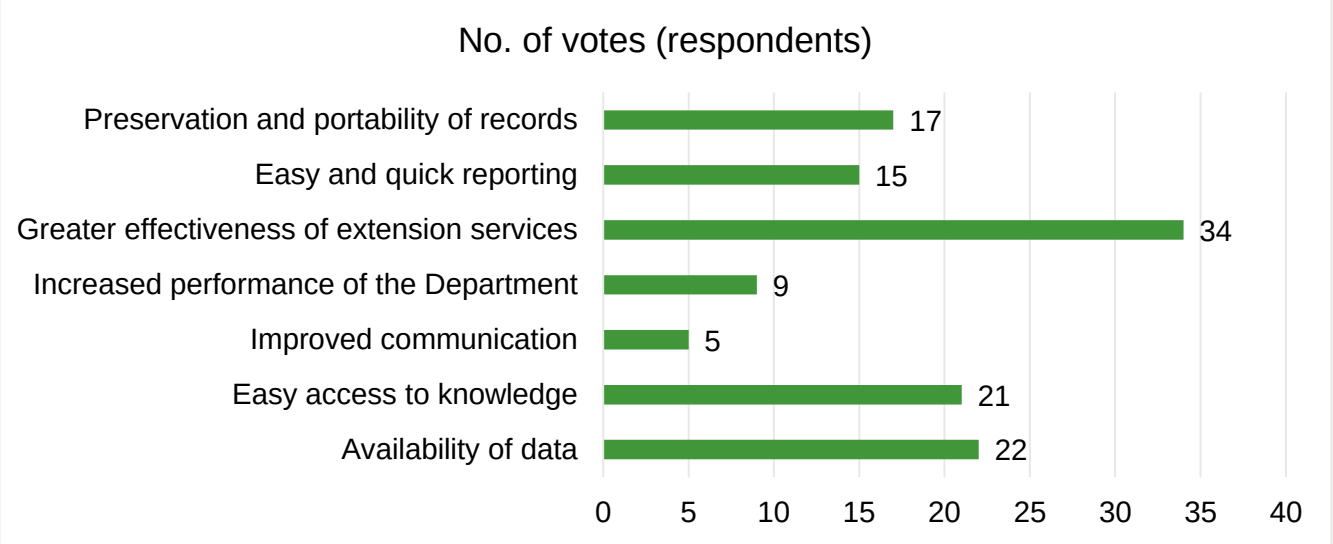

Figure 10: Ranking of benefits (in terms of votes of the extension officials)

NOTE: Note number of votes means number of benefits identified under each category and number of people voting for each benefit in that category. Hence, number of votes, at times, exceeds the number of participants. For example, under the “greater effectiveness of extension services”, five benefits were identified by the participants. The benefits 1 to 5 attracted, 3, 9, 12, 9 and 1 votes respectively, totalling 34 in all.

Chapter 7

7. Usage of the E-Zaraat System

7.1. Usage of the system by farmers

7.1.1. Text Messages

Advisory messages were broadcast to about 50,000 farmers in Vehari district alone. However, half (48 percent) of Group 1 project beneficiary respondents confirmed that they received both text and voice advisory messages through their cell phones.

7.1.2. Helpline

Only 8 percent of the respondents reported that they called the helpline to seek technical advice. This low rate is probably attributable to the cost of calling the helpline, given the low income bracket the majority of Group 1 farmers fall into. If the cost of calling was borne by the project or the government, the helpline might attract greater use by farmers.

7.2. Usage of the system by extension staff

All respondents (except one) reported that they were using E-Zaraat. The results shown in Table 3 indicate the reasons extension staff gave for their use of the system. The table shows the frequency of responses against each reason. Results show that it has been used for a variety of purposes, such as acquiring new knowledge, providing extension services in more effective ways, and meeting official requirements. The biggest reason was to acquire new knowledge. It is an encouraging sign that the extension officials have an appetite for learning. It is expected that with the passage of time, use will grow, as is mapped in Figure 11. It is expected that when more updated, valid and relevant advisory messages are conveyed to the farmers, they will use them in their agricultural operations to produce better results, such as higher yields, and would as a result provide positive feedback to the extension officials. This could motivate extension officials, through positive farmer feedback on the scheme, to use the system more and provide even more benefits to farmers.

	EDO	DO	DDO	AO	CI	FA
Acquiring new knowledge	1	1	2	5	1	1
Providing extension services in innovative ways	1	1	2	4	1	
Official requirement		1	2	2	1	1

Table 3: Reasons for E-Zaraat use

The respondents identified several ways in which they had used E-Zaraat, as shown in Table 4. The uses have been grouped into six categories:

- Data entry;
- Access to knowledge;
- Provision of extension services;

- Monitoring and reporting;
- Office management;
- Tracking trends in agriculture.

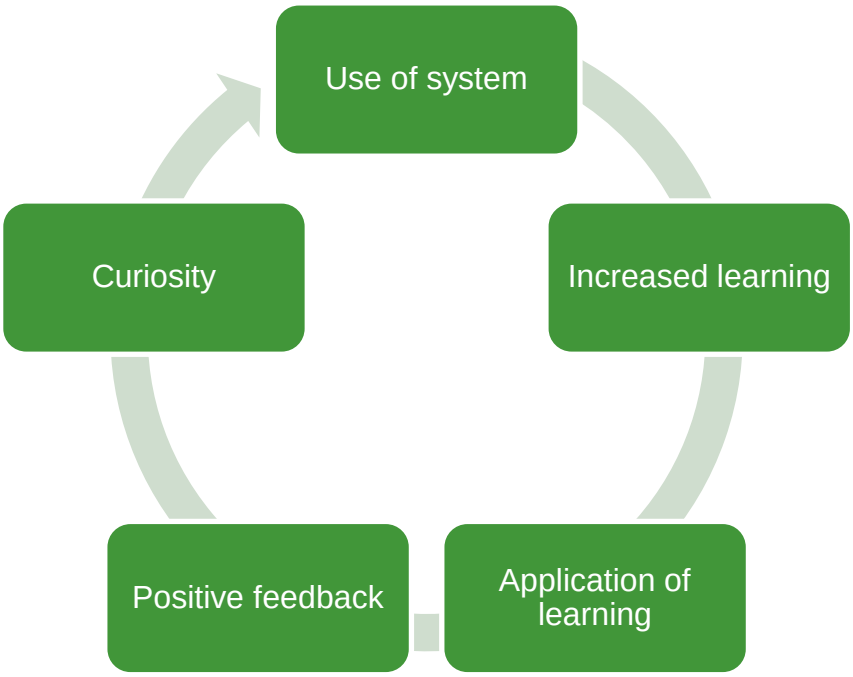

Figure 11: Cycle of use of system and learning

Each of these categories are discussed in the following sections:

	EDO	DO	DDO	AO	CI	FA
Data entry						
Real-time entry of data			1	4	1	
Access to knowledge						
Easy access to agricultural advisory	1	1	2	4	1	

Exploring answers from the Internet		1		3	1	
Access to local weather information		1	2	2	1	
Extension services						
Accuracy in diagnosis of plant health		1		1	1	
Demonstrating disease symptoms to farmers		1	2	1	1	
Monitoring and Reporting						
Monitoring of the performance of staff		1				
Fertilizer/biological control reports			1	4	1	
Access to dealer profiles			1	4	1	
Preparation of cotton ginning reports			1	3	1	
Capturing field events/pictures			2	2	1	
Keeping a record of reports			1	2	1	
Keeping a pictures of disease-affected plants			1	1		
Monitoring of diseases				2		
Generation of reports	1	1	2	2		
Office management						
Skype meetings with other fellows/seniors		1	1			
Mobile office: Increase in portability	1	1	2			
Emails	1	1	2	2	1	
Tracking trends						

Tracking trends of diseases	1	1	1	2	1	

Table 4: Uses of E-Zaraat

7.2.1. Entering data

Tablets have been used for entering data falling into the following categories:

- Profiles of farmers: In Vehari, the data of 50,000 farmers has been entered into E-Zaraat. However, it accounts for only a small proportion of all farmers. AO (Vehari) said, "*In Vehari, there are more than 262,780 farmers, while data is available for only 50,000 farmers.*"
- Cotton ginning factories: The number of cotton ginning factories in production, arrival dates of cotton to the factories, number of bales that have been produced and how many sold.
- Fertilizer dealers: Information about Fertilizer dealers in Punjab.
- Plant protection: All four pesticide inspectors were regularly entering data regarding pesticide sampling, and AOs were entering data about the diseases. One AO (Pipli) said, "*As far as data relating to pest attack is concerned, we feed in only those cases where the attack has exceeded the Economic Threshold Level (ETL) to assess the trend in the area."*
- Canal status: Data about irrigation canals was entered into the system on a weekly basis. FAs have collected data and provide it to the AOs, who are responsible for feeding it into the system.
- Weather data: Data relating to weather is entered into the system including: rainfall, temperature and humidity data.
- Sowing status: Data on various crops is entered on a periodic basis to assess the total area sown in the district and to predict the expected yields.
- Usage of seed grader: Data is entered on a weekly basis in each season
- Pest scouting: Data is entered on a weekly basis in each season regarding new pest observations or sightings.

The DO pointed out that entering farmers' data into the system was a real challenge as it is a very large set of data. When asked how they motivated staff to accomplish this task, the DO replied, "*We provided certificates of recognition and appreciation to those who entered more data of farmers.*"

7.2.2. Access to knowledge

7.2.2.1. Access to Agricultural Advisories

The DG (AE & AR), Government of Punjab issues an agricultural advisory on a fortnightly basis to facilitate extension staff in remaining current and updated with recommended extension advice pertaining to each seasonal crop. Conventionally, the Agricultural Advisory takes weeks to trickle down to the level of AOs. However, the introduction of E-Zaraat and availability of tablets has made this

process far more efficient as it reaches the level of AOs immediately. The EDO (Agri) stated that, *"The Agricultural advisory is received in no time and is being used by all extension staff."*

7.2.2.2. Non-conventional means of seeking expert advice

An extension officer typically has specialist knowledge in any one of the following areas:

1. Agronomy
2. Soil Science
3. Plant Breeding and Genetics
4. Plant Pathology
5. Plant Entomology
6. Horticulture
7. Forestry
8. Agricultural Extension
9. Agricultural Economics

Traditionally, whenever an extension officer confronts a problem not falling under the domain of his/her expertise, the problem is referred to other colleagues or seniors. It can often take some time to receive this expert advice on the matter. However, with the availability of tablets, the extension officers do not need to refer the issue to others, and can search for the answer on the Internet themselves. The DO-A said that, "*AOs are no longer referring problems to us. Rather, they get solutions from the Internet themselves. Every AO is building his knowledge repository*." The DDO (Vehari) shared his way of doing things thus: "*I take pictures of affected parts/diseases and keep a record of them. I use such pictures for educating farmers."*

Some farmers are also using email services. They contact extension workers to seek advice on their problems. The CI (Mailisi) said, *"I have sent several emails to three farmers. Whenever they send me emails, I call them too. Sometimes, I forward them useful information as well."* Some women also (such as Madam Saboi) have sought technical advice from the department through emails.

7.2.2.3. Exploring innovations

Some tablet users are using them to explore more innovative practices too. The DDO (Burewala) reported that, *"I have used the Internet to explore innovative practices of farming in areas like tunnel farming, diseases of tunnel farming, diseases of citrus etc."* Similarly, the AO (Vehari) reported: *"The tablet is being used for exploring technical areas. I have explored multi-coloured varieties of maize. I have gathered information about diseases and symptoms and varieties of three crops; wheat, maize, and peas."*

7.2.3. Provision of extension services

7.2.3.1. Easy and effective demonstrations

With the availability of tablets, the extension staff feel better equipped, with more effective ways of conducting demonstrations. The CI (Mailsi) said, *"They [farmers] ask questions on how to use a nozzle/spray machine. We demonstrate it on the tablet."*

7.2.3.2. Efficient diagnosis

Tablets are being used for diagnostic purposes too. Whenever a farmer comes to an extension officer for help, the latter asks the farmer about any symptoms of disease he has observed in his crop and then shows him images/pictures (stored in the tablets) of symptoms that resemble those described by the farmer. When the farmer identifies similar symptoms from the device, it helps the extension officer to, not only diagnose the problem with greater accuracy, but also to educate the farmer. The DO-A shared his experience of this process with us: "*When I show images of different problems to a farmer, he easily identifies a situation similar to the one that has affected his crop. It helps in the diagnosis of diseases with higher accuracy. It gives more confidence to the farmers.*" The CI (Mailsi) said, "*Farmers are very impressed with this technology. They sometimes show interest in the tablet and express their desire to own one."*

The tablets are helping the extension officers in overcoming their own capacity constraints too. The DO-A said, *"In Vehari, more than 15 crops are being grown. Everyone can't have expertise in all areas for all crops. Rapid changes are taking place in agriculture, which are making the situation more challenging for us [the extension staff]. Now, when I am equipped with technology, I can more easily diagnose diseases, whether I am in the field or in office. Earlier, my assessments were not always accurate. Now they are more accurate. Images of the symptoms of all diseases are available on the internet. The limitation of my knowledge is no longer a constraint for me. Tablets now allow me to quickly make more accurate assessments."* The AO (Vehari) added that, *"Disease symptoms are sometimes very complex and confusing, even for experts. Hence, a pictorial aid is certainly of great help to us."*

7.2.3.3. Weather forecasts

Extension officers are reportedly using tablets for providing weather forecast information to the farmers. The CI (Mailsi) said, "*During farmers' gatherings, they often ask questions about the weather forecasts. Earlier, we used to ask them to watch TV. However, such information was always quite general and broad, with less applicability to local settings. Now, we immediately get the information by using tablets and inform the farmers. It works like a magic box."* The DO pointed out that such information is available up to Markaz level.

7.2.4. Monitoring of trends/patterns in diseases

Monitoring trends of pest outbreaks has become easier and more effective. Staff bring pictures taken in affected fields and show them during meetings for discussions.

Tablets have been used for some other purposes too. One such use was the pictorial coverage of the damage caused by floods. The AO (Vehari) said, "*Last year when floods caused damage in some areas in Vehari, we carried out a pictorial survey of the area and emailed it to senior management.*"

The AO (Vehari) explained that "We email pictures of diseased portions of plants and keep them in our records for monitoring and future reference. Besides, I also take pictures of the fruits and vegetables being sold out in the vegetable markets for monitoring purposes."

7.2.5. Office Management

7.2.5.1. Use of tablets as mobile offices

Extension staff are also using tablets as mobile offices. For meetings, they do not always bring files and records, they only bring their tablets, as they contain almost all of their necessary records. EDO (Vehari) said, "The *DO and DDOs are using the tablets extensively. Even when they are attending meetings, they use their tablets for presenting reports, referring to documents, and discussing various*

issues. In some cases, they also carry images of some field problems, such as pest attacks, etc., which helps everyone to easily understand the nature and extent of the problem."

Staff also use tablets as reference tools, allowing them to access various documents on their tablets. The DO-A said that, "*Whenever and wherever any extension officer is asked for advice or information, he no longer feels the need for visiting the office, taking out files, searching for the required information. He simply uses his tablet and retrieves required information in time*."

Tablets have made the extension officers accessible 24/7 to their seniors. The DO (Vehari) said, "*I receive an email from the DG Office in the evening, at night or early in the morning, and I have to respond at the earliest. Usually, immediately after offering the early morning (Fajr) prayers, I reply to all emails received during night.*" The DDO (Vehari) said, "*You are carrying your office along with you. It seems as if you are in office 24 hours a day."*

Previously, AOs did not have computer facilities. Hence, whenever, they had to email a report or document urgently, they had to get it done from a nearby internet cafe. The AO (Vehari) explained the problem thus: "*Before the availability of tablets, AOs used to get data entered from the market (internet café), which was a cumbersome, painstaking, and costly process. Now, we can do it easily by using our tablets.*"

7.2.5.2. Monitoring, reporting and supervision

One of the uses of tablets in E-Zaraat is performance monitoring and supervision. The DO-A stated: "*I monitor the use of tablets by the AOs. It also helps me in monitoring their performance.*" Almost all of the DDOs and AOs also said that they regularly send field reports and other reports to their seniors. The DDO (Vehari) said, "*I take pictures of all activities. I keep all reports in my tablet. On request, I can send them to anyone."* Similarly, The AO (Vehari) reported that, *"We take pictures of ongoing training activities and email them to the DO's office for the record."*

Chapter 8

8. Competence of the Extension Staff in Using the System

8.1. Competence of the users

Has the project succeeded in developing adequate capacity to run E-Zaraat? The extension staff respondents were confident about their ability to use the system. Only one respondent (a Cotton Inspector) indicated that he could not use it. In other words, the level of self-sufficiency was high. The EDO and DO (Extension) also rated the capability of the users as high. The EDO (Vehari) said, "I am *satisfied with capacity building of staff/users."* Almost all of the respondents reported that they had gained the ability to enter data and generate reports in the system. Table 5 shows that almost all of the respondents utilised tablets for all 6 of the specified tasks.

The DDO (Vehari) reported that, "*I was zero in the use of computers before training in E-Zaraat; now I consider myself at 70 percent."* Similarly, The AO (Pipli) spoke to us of his perception of staff self-sufficiency in tablet use: "*We did not know how to use computers and the Internet. Now we can use both."*

Another question asked of extension staff was: "Do you need any more training in the use of E-Zaraat?" This question was asked to further verify adequate competence. Almost all of the respondents (except one) indicated that there was no need for any more training in the use of E-Zaraat. For example, the AO (Vehari) said, "*No more training is needed in E-Zaraat. We are well equipped with the necessary skills and we are very confident about them."*

How were they able to develop the required level of competence in areas related to E-Zaraat? All of the respondents agreed that adequate guidance and technical support was always available. The AO (Vehari) said, "*Whenever we needed help, we approached the experts of CABI and got the advice and support we needed.*" Similarly, the CI (Mailsi) added, *"The training was very effective. All support was made available to us whenever needed. No more training is needed in the use of this technology."*

Still another perspective came from the DDO (Vehari), who was of the opinion that the availability of technology itself creates pressure on the people around it to use the system. He said, "*If some technology is available, people automatically learn how to use it."*

Hence, it can be concluded that the project succeeded in developing adequate capacity in the department to run E-Zaraat. It was made possible through a series of training activities, coaching, and uninterrupted technical support.

	EDO	DO	DDO	AO	CI	FA
Entering data in E-Zaraat	1	1	3	5	1	1
Generating reports	1	1	3	5	1	1
Sending/emailing reports	1	1	3	5	1	1
Weather forecasts	1	1	3	4	1	1
Using Internet		1	3	4	1	1
Photography		1	3	4	1	1

Table 5: What functionalities can extension staff perform with higher proficiency?

8.2. Training Needs

All of the respondents (except two) indicated that they did not need any more training in areas relating to E-Zaraat. The EDO (Vehari) and DO-A also expressed complete confidence in the capability of their team to run the system. However, the EDO (Agri) pointed out that, *"The staff only needs a short training in the use of E-Zaraat, just to sort out minor operational difficulties; otherwise, they are fully capable of using it."* The DDO (Vehari) suggested that they should be given training in innovative extension methods.

In view of the above discussion, it is suggested that:

- Use of the system by the extension staff should be monitored. Those who are struggling to use the system may be provided online technical assistance
- The Extension Department may be requested to make arrangements to provide training in innovative extension methods to the extension staff

Training needs	EDO	DO	DDO	AO	CI	FA
Refresher courses	1			1		
Extension methods–how to deliver		1	1	1		
Report generation: separate training for DDos and AOs			1			
MS Word, Excel, and PPT			1	1		
Other areas						
Nutrition management		1				
Climate management		1				
Irrigation management		1				

Table 6: Identification of E-Zaraat training needs by extension staff

Chapter 9

9. Reaction of Extension Staff

9.1. Opinions about usefulness of E-Zaraat

In order to explore answers to this question, dimensions such as motivation and commitment level of users and management of the Extension Department were studied. The findings are discussed below:

9.1.1. Motivation and Commitment of the Team

Resistance to change is inevitable, but can also be detrimental to project success. Hence, a decision was taken to assess the nature and magnitude of resistance to change resulting from E-Zaraat. In order to assess this, all respondents were asked one question: How did they feel about the project?

Development of extension staff capacity in using the E-Zaraat system seems to have led to a significant reduction in resistance to the new technology being used. The DO shared his experience on the subject: "*Initially, we were reluctant to use the system. We lacked confidence. The reason was that when we were undergoing education, there were no computers. We were expecting it would take us at least 6 months to become computer-literate. However, it took far less time.*"

On an overall basis, the respondents had very positive feelings about the project. They highlighted the need for adopting new technology and innovative practices in the provision of extension services. The DO (Vehari) said, "*If we fail to adopt new technology, we will fall behind and ultimately become irrelevant. The equation is quite simple: delayed availability of technology means delayed benefits.*"

Extension officers/officials showed high motivation and commitment to the project. The EDO (Vehari) also said, "My *team is very excited and committed to the E-Zaraat project. It is a high priority for them.* He further added, "*I fully own the project.*" Similar sentiments were also shared by other respondents. The DDO (Vehari) stated, *"E-Zaraat has developed our confidence."*

What are the drivers of their high motivation and commitment to the project? The EDO (Agri) said, "***Engagement in the IT environment*** *has led to improvement in the motivation and they are proud of their skills."* The AO (Pipli) added, *"We are connected to the Internet. We can keep abreast with changing technologies and keep pace with a fast-changing world."* The AO (Markaz-Jamlera) shared his views about the project as follows*, "Technology is now a necessity. It is a very good project. It should be extended to all other districts."*

One of the major drivers of project motivation is the **urge to lead other districts**. The DO said, "The f*armers of Vehari remained at the top among cotton producers of the country, in terms of cotton yield, till the 1980s. In the late 1980s, when Vehari achieved an average yield of 27 maunds per acre, against a national average of mere 12 maunds, it gave a sense of pride to the extension staff of Vehari district. However, the district lost its distinction and pride in 1990s. Today, the average yield in Vehari is just 25 maunds per acre, while farmers in other districts, such as Sanghar district, have a much higher yield. E-Zaraat has now given us a new ray of hope that we can regain our lost pride."*

Another driver is the **quest for learning**. *The* DDO (Burewala) narrated his views: "*It gives me great pleasure when I explore new information, such as diseases in vegetables or when I use pictures downloaded from the Internet and use them for diagnosis." Similarly,* the CI (Mailsi) stated his feelings thus: "*It has been a dream in the Department to have a comprehensive data base for quick access and reference. This dream has been materialized through E-Zaraat."* Like the DDO (Burewala), many of the officers had an urge to learn. The DO-Asaid, "*We cannot afford to stop learning in this fast-paced world. The truth is complacency has become a sin.*"

In short major drivers of the motivation and commitment of the team for using the system include:

- *High desire to learn and grow*
- *Desire to earn recognition*
- *Desire to earn distinction and take lead*
- *Need to make their work more meaningful and impactful*

9.1.2. Meeting Expectations

Another question to assess staff feeling about the project was, "Did the project meet your expectations?" The EDO (Vehari) said, "*We had high expectations from the project. Our vision was a paper-free environment; data entered in the system by the field staff; screened at various levels–AOs, DDOs, DOs, and EDO; report generation and transmission to be done electronically; reminders issued automatically to the officers not meeting deadlines, and so on. We envisioned a system with a database of all pesticide and fertilizer dealers, containing all relevant details such as their profiles, products, cases against them, and so on, so that we could check the status of each dealer." He further added, "Our expectations have been largely met."* Similar views were expressed by other respondents too.

9.1.3. Vision for the future

The EDO (Agriculture) said, "*Everything should be documented: e.g., coverage of field activities*."

9.1.4. Most useful areas of the project

In order to gain further insights into extension staff reactions to the project, the respondents were asked w*hat areas they found most useful in the project.* The project has managed to produce a powerful database of farmers, technical knowledge, inputs, etc. Table 7 shows that leading areas in terms of frequency of usage include databases, generation of reports, and access to technical knowledge.

	EDO	DO	DDO	AO	CI	FA1
Developing databases in E-Zaraat	1	1	3	4	1	
Generating reports	1	1	3	3	1	1
Access to technical knowledge	1	1	3	3	1	1
Communicating through technology	1			1	1	1

Table 7: Most used aspects of E-Zaraat

The above discussions make it evident that the project has succeeded in:

- Aligning project objectives with the needs of the Department;
- Effectively managing resistance to change and creating motivation and commitment for the project;
- Sustaining the interest of most of the key actors in the project.

Chapter 10

10. Issues and suggestions

The respondents identified several issues and challenges which are constraining the potential optimal benefits of E-Zaraat. The issues and recommendations can be grouped into two categories: 1) perspective of farmers; and 2) perspective of extension workers. They are presented below:

10.1. Farmers' perspective

How have farmers responded to the newly introduced extension services? This is a critical question. It appears that farmers more likely to use those services which are freely and easily available to them. This is why use of the helpline was low, while use of text messages has shown promising results. In view of this attitude of farmers, it is suggested that the helpline should be made free to call. The cost of calling the helpline should be borne by the government.

There is a strong linkage between innovative behaviour of farmers and their productivity. A farmer having greater interest in learning and advancement is more likely to adopt innovative crop production and management practices than others. Hence, there is need for creating greater awareness about E-Zaraat, among the farmers.

10.2. Extension workers' perspective

According to extension staff respondents there are several issues) that need to be addressed in order to ensure the adoption of new information technologies as part of E-Zaraat. For the purposes of discussion, these have been categorised as: Behavioural, denoted by 'B', technological denoted by 'T', and economic denoted by 'Eco'.

- **User friendliness [B, T]**: Some of the respondents were of the view that the software was not very user-friendly. The EDO (Agri) highlighted the issue: "*Software should be more user- friendly. This issue will become prominent when we integrate field assistants, who are not technically qualified."* Field assistants usually have less education than extension officers, usually 12 years, up to high school level. The Government of Punjab would have to take this issue into consideration, when extending the E-Zaraat system to them.

- **Flexibility in the formats of reports [T]**: Some staff pointed out the need to produce non-standard report formats, something that is currently not available in E-Zaraat. The DO-A pointed out that "*It is not easy to change the format of reports, addition or deletion of a column.*" However, the AO (Vehari) said, "*We have gradually improved E-Zaraat based on our experience. Changes are made whenever needed*. *The format of cotton ginning has changed and we have requested changes in E-Zaraat.*"

- Many of the respondents suggested that complete authorization should be given to the Extension Department for making amendments in E-Zaraat, whenever the need arises. The AO (Vehari) suggested that, "*Somebody in the Department should be deputed and authorized on a permanent basis to make changes in the formats or designs of the reports, whenever the need arises.*" The AO (Vehari) suggested that, "*The reporting system can be refined further. The database of E-Zaraat should be strengthened by including more indicators such as farm enterprise, socio-economic data, etc*."

- **Control over the Server [B, T]**: The respondents indicated that control of the server was with CABI, and the Extension Department had no authority over it. Hence, they were not able to derive maximum advantage of E-Zaraat.

- **Inadequacy of integration [B, T]**: Field Assistants (FAs) provide grassroots level interface between the Department of Agricultural Extension and farmers. However, FAs have not yet been integrated into the E-Zaraat system. They prepare reports manually and bring them to the AOs, who then have to feed the data into the system. It does not only cause a delay in reporting, but also overburdens AOs. The EDO (Vehari) stated the problem thus: "*Since FAs don't have access to the tablet, they cannot enter data, so all of the data entry activity has to be performed by the AOs."* Similarly, the DO–A pointed out that, "*the full benefits of IT cannot be optimized unless all extension officers are integrated in the system.*' The AO (Pipli) added that, "*Due to the lack of integration of FAs in the system, paperwork is still continuing at their level. Tablets should be provided to them to optimize the benefits of automation of the extension services system."* At this pilot stage of the project it was financially not feasible to provide tablets to the FAs as there are a large number of FAs in a district.

- Almost everyone highlighted the need for extending the facility of E-Zaraat to the level of FAs. The DO (Agriculture) said, "*Tablets should be available at the FA level, as they are at the first level. It will reduce the load on the AOs, each of whom supervises 5-7 FAs, covering 50 villages, within a radius of about 20 km. Meetings are usually held on a weekly basis*." Some of the respondents (such as the CI Mailsi) also suggested that all AOs should be provided with laptops.

- **Strength of human resources in extension [B, Eco]:** Some of the respondents indicated that the department was suffering from an acute shortage of staff and that the department is not fully catering to the needs of extension services. The DO explained the problem, saying, "*At the FA level, we can't approach each farmer. An FA has to visit each village every week. AOs are given a 45-day schedule, i.e., they have to visit each village after every 45 days. Improvements have taken place in every sector except the Extension Department. For example, 30 years ago, high schools were located only at tehsil level. Now every union council has a high school. Similar developments have taken place in the healthcare sector too. But no improvement has taken place in the extension sector. So we need greater human resources for the provision of extension services to a greater number of farmers. We need to enhance our outreach. Besides, we are operating in a more difficult and challenging environment than other sectors. The need for extension services is an unfelt need, unlike the need for healthcare and education services. So farmers have different priorities. Agriculture is given the lowest priority. Hence, we need to fulfil the needs of the agriculture sector, which can be done by posting FAs in each village. "*

- **Online Speed/connectivity [T]:** Most E-Zaraat users complained about low speed and connectivity issues with regards to E-Zaraat utilised technologies. The DDO (Burewala) said, "The *speed is very slow and dis-connectivity is frequent." The* CI (Mailsi) said, *"Sometimes, it is not possible to log in to the system. Sometimes, the server does not respond."* Some of the respondents suggested that internet dongles like EVO-Wingle should be provided to the tab-users.

- **Lack of synchronization between Punjab Information Technology Board (PITB) database and E-Zaraat database [T]**: PITB has a database of farmers with very basic information such as their name, National ID card numbers, phone numbers and addresses. The primary purpose of this database was to provide information to PITB Call centre. This is also used for any government raffle schemes (free tractors scheme etc.). This database was initially designed for the Livestock Department and the same has been handed over to the Agriculture Extension Department. The E-Zaraat database on the other hand is very comprehensive and in addition to the basic farmer information that is contained in the PITB database as well, includes data on area

under cultivation, land owned and land leased, crops cultivated etc. E-Zaraat database is more extensive and useful but since it is available for only Vehari and not for the whole of the Punjab province, this cannot be used for such purposes as government raffle schemes (usually launched when elections are around and the ruling political party wants to use it as a political instrument for attracting voters). The AO (Vehari) said, "*The database of farmers is being developed in different places, i.e. E-Zaraat and PITB. The two databases lack synchronization; hence, the AOs have to enter data twice.*" The AO (Sahuka) further added, "The *size of the E-Zaraat database means it contains profiles of just 42,000 farmers, however these profiles are detailed, the PITB database contains 50,000 farmer profiles but the profile has only very basic information. If the issue of synchronization is resolved, then the data will have to be entered only once.*"

- **Data synchronization [T]:** The CI (Mailsi) highlighted the problem of synchronization of data. He said, "*Data is sometimes not synchronized when it is entered through connecting tablets through a sim [card]. However, there is no such problem when it is connected through wi- fi".*

- **Increase in workload [B]:** Some of the respondents were of the view that the project has overburdened the AOs. The AO (Machiwal) said, "*AOs work as data entry operators. All the day, they have to enter data."*

- **Server is not accessible beyond 5 pm (T):** Almost all categories of respondents indicated that the server was not accessible from 5 pm to 9 am. However, CABI team has indicated that the issue has been resolved and the server is now accessible 24 hours a day.

- **Need for better quality tablets (T, Eco):** A couple of respondents indicated that "tablets are of poor quality". Many of the respondents suggested that they may be provided with better quality tablets. Initially the extension staff were provided with a few Samsung TAB 2 models. As this model was more expensive, the rest of the extension staff were provided with IBM Lenovo Tablets. Apparently in comparison to the Samsung tablets the Lenovo tablets when used in field conditions tended to provide shorter battery time and also heated up sooner.

- **Additional functionalities (T)**: One of the respondents suggested that updated canal status information should be available in the database so that extension staff can readily check the updates and provide it to the farmers. Another respondent suggested that facility of missing (messages) alerts should be included in the E-Zaraat system. Another one suggested addition of compilers for data analysis.

- **Free helpline (Eco)**: One of the respondents suggested that the helpline should be free. There should not be any financial burden on the part of callers, as currently, the caller has to pay the cost of calling the helpline, which often proves costly for the farmers. Another respondent suggested that waiting time on the helpline should also be reduced. Currently, when a farmer calls the helpline, he/she is put on hold after getting basic information on his/her question/query. Then the helpline attendant searches the question in the existing database of FAQs. If it is found there, the helpline attendant immediately responds to the caller and gives the answer. Otherwise, he/she contacts the relevant expert and gets his reply on the query. This involves considerable amount of waiting time on the part of caller, and often results in frustration. However, it is worth-noting that with the passage of time, the size of the existing database of FAQs will grow, and will reduce waiting times.

- **Message broadcasting at tehsil level (T, Eco)**: one of the respondents suggested that advisory messages should be broadcast at tehsil level to achieve higher degree of relevance and validity.

- **Others (T,Eco):** The AO (Machiwal) said, *"The battery storage capacity is low. It runs for a maximum of one hour. After charging, it cannot take even two pictures." The* DO-A suggested the inclusion of a message alert facility in the tablets, i.e., upon receipt of any message/mail, a

message should pop up to alert the users. The respondents also gave some suggestions which don't fall under the domain of E-Zaraat which include: 1) training in innovative extension methods; 2) development of documentaries for use in extension work; 3) development of manuals for tractors and spray machines; 4) provision of tabs to the farmers; 5) training in computer programming to the extension staff; 6) designing and launching of e-learning courses;

Issue	EDO	DO	DDO	AO	CI	FA
Lack of user-friendliness	1	1				
Inability to compile reports	1	1				
Inflexibility in the formats of reports		1				
Lack of control over server	1			1		
Non-integration of FAs in E-Zaraat system	1	1	1	1		
Inadequacy of HR		1				
Low speed and poor connectivity		1	2	2	1	1
Synchronization issue					1	
Server is not accessible from 5 pm till 9 am	1	1	1	1	1	1
Complete list of farmers does not show up in list				1		
Project has overburdened AOs				1		
Users will have to pay bills of tablet sims themselves , after conclusion of project				1		
Tablets are of poor quality				2		

Table 8: Issues in E-Zaraat

Suggestion	EDO	DO	DDO	AO/CI	CI	FA
User-friendliness of E-Zaraat	1	1				
Facility of missing alerts		1				
Provision of tablets to the level of FAs		1	2	1	1	
Addition of compilers (data analysis tools) for E-Zaraat	1					
Training in innovative extension methods		1	1	1		
Documentaries should be developed			1			

Technology manuals should be developed for 1) Spare parts of tractors; and 2) use and parts of spray machines[5]			1			
Provision of high speed internet: EVO/Wingle			2		1	1
Provision of tablets containing E-Zaraat to paying farmers			1			
Training in programming					1	1
e-training programmes						1
Improvement in connectivity	1	1	1	2	1	1
Helpline should be free; no liability on callers				1		
Waiting time on helpline should be reduced				1		
Messaging should be broadcast at tehsil level				1		
Provision of funds for operational cost of cell phones					1	
Farmers need canal status information			1			
Better quality tablets		1	2	2	1	

Table 9: Suggestions for improvement in effectiveness of E-Zaraat

10.3. Proposed organizational structure

The next step for E-Zaraat would be to upscale the system to the entire Punjab. In order to institutionalize this change and to ensure the DG AE&AR is able to run the system on its own once it is up scaled to the rest of Punjab, it is imperative that they have the right human resources in place to run this system. The proposed organizational structure required to support the introduction of new technologies under E-Zaraat is presented below:

- An oversight body to be constituted at the provincial level proposed to be headed by the Secretary of Agriculture. The proposed body may be entrusted with the task of reviewing the pace and direction of the introduction of new technologies in the extension system
- In order to ensure availability of technical help to the users of E-Zaraat, it is suggested that a post should be created for an IT specialist. As it is a relatively long process to create new positions in

[5] This issue is not pertaining to E-Zaraat. However, manuals can be placed at the portal of E-Zaraat.

the government the following course of action may be taken: 1) The Department of Agriculture to prepare a project PC-I and gets it approved for institutionalization of E-Zaraat with provision for IT specialists. The proposed minimum structure would be: Head of the unit, and teams for application development (2 people), Infrastructure deployment and maintenance (2 people) and Training (1 person with support from development and infrastructure). The DG AE&AR has certain data that is collected from all districts i.e. it is standard for the whole province (e.g. farmer information, supplier information, rainfall data, canal status, pests etc.) then there is some other data that is exclusive to districts depending upon the crops and the cropping pattern. The former type of data can be input into E-Zaraat now, whereas for the latter type of data, some new input forms and corresponding reports will have to be added to the system during the upscale phase of the project. It is suggested that in the interim period while the new staff are added to the DG AE&AR office , two or three AOs/DDOs who are particularly accomplished at using E-Zaraat and other computer systems could be trained as champions at the provincial level who would train the staff in the other districts to use E-Zaraat.

Chapter 10

11. Conclusion

Results of the evaluation show that the component of the project which has been used the most by farmers is the advisory messaging service (both text and audio). However, other components have been used less by the farming community, particularly the helpline because of the cost involved in calling. The effectiveness of the project can be enhanced considerably by offering the helpline service free of cost. As text messaging is a supply-driven strategy, while the helpline service is a demand-driven initiative, it is very likely that the project's impact would gain a big boost if the helpline service were available free of cost to the farmers. Evidence is available to support the conclusion that farmers benefiting from the services of the project were able to manage their operations more efficiently and effectively.

The project has helped the extension department in improving their processes and performance through automation of practices, availability of technology, development of databases, greater access to knowledge, more effective methods of extension service provision, improved reporting, and integration of activities. However, such benefits are available only in Vehari district. Hence, it is not possible for the Extension Department to exploit the full potential of the project.

The capacity of extension officials has considerably increased in Vehari. They are serving the farming community with more reliable, updated and valid advisory information. Moreover, they are also using the technology in enhancing the ability of farmers to diagnose diseases and other problems. Level of commitment to the project is very high amongst the extension officials. It is expected that the more they use the system, the more effective extension services they provide will be , which would yield higher farmer satisfaction rates. More positive feedback would encourage staff to learn more and use the system more. In addition to the above, the extension officials are using the tablets for two other purposes: 1) preparation of field and other reports and transmitting to their seniors; and 2) feeding data relating to agricultural inputs and their suppliers into the database.

Major areas needing improvement, highlighted by the respondents are: 1) Tablet speed/connectivity; 2) A more user friendly interface; 3) compilation of reports; and 4) flexibility of reports formats.

Moving forward, the project needs to be extended vertically as well as horizontally, in order to produce maximum results from the intervention. Vertical extension means, integrating the field assistants into the system, so that they can feed data on a real time basis directly from the field and submit field reports on timely basis. As far as horizontal integration is concerned, it concerns replication of the E-Zaraat system to other districts of the province. Horizontal integration will help the extension department in standardizing the system of reporting across the districts and aggregating reports automatically.

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