CHAPTER 15

Interactive Information Dissemination System

AN ALTERNATIVE INFORMATION & COMMUNICATION TECHNOLOGY MODEL TO MEET THE INFORMATION NEEDS OF INDIAN FARMERS ON ECO-FRIENDLY AGRICULTURE

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List of Abbreviations

AKPS	Annapurna Krishi Prasaar Seva
ANGRAU	Acharya N. G. Ranga Agricultural University
CAU	Central Agricultural University
DAATTCs	District Agricultural Advisory and Transfer of Technology Centers
DIC	Digital India Corporation
ICAR	Indian Council of Agricultural Research
ICT	Information and Communication Technology
IIDS	Interactive Information Dissemination System
IVRS	Interactive Voice Response System
KVKs	Krishi Vigyan Kendras (Agriculture Science Centres)
m4agriNEI	Mobile Based Agro Advisory Services in North East India
MeitY	Ministry of Electronics and Information Technology
MIE	Meghalaya Institute of Entrepreneurship
MIS	Management Information System
NAIP	National Agricultural Innovation Project
1917iTEAMS	1917–Integrated Technology Enabled Agri Management System

PJTSAU	Professor Jayashankar Telangana State Agricultural University
SMS	Short Message Service
USP	Unique Selling Point

Introduction

The Interactive Information Dissemination System (IIDS) has been conceptualized and designed after rigorous field study of various information and communication technology (ICT) initiatives in agriculture in India and information from needs assessments of farmers by the Digital India Corporation (DIC) (formerly Media Lab Asia) under a consortium project awarded by the National Agricultural Innovation Project (NAIP) under the Indian Council of Agricultural Research (ICAR). The partners in the consortium included Acharya N. G. Ranga Agricultural University (ANGRAU); the National Institute of Rural Development and Panchayati Raj, Hyderabad; and the Mudra Institute of Communication, Ahmadabad. The project was taken up with an idea to propose an alternative ICT model based on a study and analysis of the major ICT initiatives in agriculture in India to meet the information needs of Indian farmers in 2009.

Based on the feedback received in several workshops organized across the country, findings from the needs assessments study of farmers through individual surveys, and analysis of major ICT initiatives in agriculture, the appropriate ICT model of IIDS was configured, discussed, and designed to meet farmers' information needs for various selected scenarios considering the infrastructural and socioeconomic conditions. This model is an integration of the toll-free interactive voice response system (IVRS), a smartphone application, and a web-based agro-advisory system for farmers to deliver timely information to the farmers "as and when they require."

Our Approach

The objective of the study was assessment of the major ICT initiatives in agriculture vis-à-vis the information needs of the farmer in various agro-socioeconomic situations. The team followed a logical approach for selecting the ICT initiative samples. Initially, regional workshops were conducted in five regions of India: North, South, East, West, and North-East with the objective of gaining knowledge on the ICT initiatives in agriculture that were in operation in the selected region. This helped the research team to prepare a list of ICT initiatives that were actually in place. The team then used a taxonomical approach to classify ICT initiatives into various categories based on region, modality, technology used, and sectors belonging to agriculture, allied, and both.

Twenty-six ICT-based initiatives representing these categories were chosen for detailed study. Fifty-seven villages were chosen for the sampling of which 23 are control villages in four geographic regions. The data were collected from May 2009 to December 2010. A *participatory village* is one in which the ICT initiative has been implemented and farmers have been using the project and are benefitting from it. A *non-participatory/control village* is one in which the ICT initiatives were not implemented and thus, farmers are not benefitting. The participatory and non-participatory/control villages were selected randomly out of a list provided by the ICT initiators to avoid bias (Gidda Reddy et al., 2011b).

Findings From the Study

The major findings of this study were crucial for choosing and designing the future strategy and system to provide information to the farmers as and when they require. There was a requirement for an integrated approach that would cater to the problems of farmers in using ICT applications in agriculture. Issues addressed would include accessibility, acceptability, simplicity, and timely and useful information in a location-specific manner. The issues involved would range from the choices of inputs in the farming system to marketing of the farm products. The following needs and requirements were envisaged in an ICT-based holistic extension system.

Needs:

- Aggregating farmer queries in multimedia or voice mode in the local language through voice, text, images, and videos.
- Developing a combination push- (experts) and pull-based (farmers) interactive system (essentially pull-based) so that a two-way communication exists from farmers to experts and vice versa.

Requirements:

- Designing and developing farmer-friendly and simple interfaces to access information and advisory services in an effective manner preferably through mobile phones.
- Interlinking location-specific information from various service providers to cater to the specific farmers' needs.
- Maintaining farmers' database with farming details so experts can provide appropriate solutions to concerned farmers' queries by referring to databases.
- Developing and integrating an expert support system with user-friendly interfaces and reference content (for example, State Agricultural University's Knowledge Repository, farmers' details, FAQs from the farmers' queries) for fast and proactive delivery of advice. The system should also facilitate experts to be virtually available by giving farmers anytime, anywhere access to the experts.

The way forward from the findings of the study was not possible without confronting major gaps. These and possible solutions are summarized in Table 15-1, which follows.

Table 15-1. Gaps identified and way forward: basis for designing the Interactive Information Dissemination System (IIDS).

Gaps Identified	Way Forward
Mobile-Based Initiatives: Text SMS (Short Message Service)	
Generic information delivered	Requirement for farmers' specific information
Language/literacy barrier	Requirement for voice and image-based information exchange
Limited records of the farmers and their farming details	Requirement for updated information
No direct interaction with expert (for push-based services)	Requirement for personalized advisory
Mobile-Based Initiatives: Voice Calls	
Largely push-based services and information delivery at undesired time	Requirement of right information at right time as time desired by farmer

Gaps Identified	Way Forward
No direct interaction with expert (for push-based services)	Requirement for personalized advisory
Call Center/IVRS	
Information provided (at both ends) on voice alone is not always complete	Requirement for other modes of information exchange for better understanding
Service available only at prescribed time (that is, office hours)	Service timing required as convenient to farmers
Limited records/database of the farmers	Requirement for complete and updated database of farm and farmers
No/very limited follow-up of services	Requirement for expert's field visit and other feedback mechanisms
Web-Based Initiatives	
Accessibility and adaptability is low	Requirement for user-friendly interfaces
Abundant/generic information is provided	Requirement for region and farmer-specific filtered information
Mass Media Initiatives—Community Radio Station	
One-way communication	Requirement for two-way communication medium
Largely push-based information	Requirement for personalized information

Project Output

Interactive Information Dissemination System

IIDS is a push- and pull-based system where agriculture-related information can be pulled from the farmers using mobile phones. IIDS is a combination of smartphone application, interactive portal, and IVRS. A mobile interface is at the front end and a web interface is at the back end. Data is transmitted through voice, text, images, and videos from both ends (farmers to expert and back). This system provides options to farmers to subscribe to the various services. Farmers will then receive individual needs-based information for only those services to which they have subscribed. Farmers have an option at a later date to either select more services or unsubscribe to some of the existing services. The system is connected to a centralized database, which has all information on the farm, farmer, and previous transactions. The experts at the back end (the web application) have access to the farmers' database while responding to the farmers' queries (Anurag et al., 2014).

IIDS has two major components:

- **Personalized agro-advisory system**: Mobile and web interface for interaction between farmers and experts through multimedia IVRS solutions including voice, text, images, and videos. Farmers can seek advice during pre-cultivation, mid-cultivation, and post-cultivation.
- **Information services**: Mobile interface to receive location-specific information. For example, farmers receive information on input dealers,

local weather, market price, finance/insurance providers, government projects, current news, and other subjects.

Figure 15-1. IIDS framework: pull- and push-based system.

Unique Selling Point of IIDS

The calls from the farmers are received at the centralized server and routed to the relevant expert. The query information is saved for building context for later queries by the same farmer or other farmers in the local area. The agri-expert has access to the knowledge database of information available and linked with the system. In turn, the expert better understands the farmer or the field problem and facilitates an appropriate solution. The benefits of IIDS to farmers include:

- Personalized agro-advisory based on farm and farmer profile
- Personal assistance to raise a multimedia query through a smartphone
- Live interaction with scientists
- Ability to refer critical problems to relevant crop specialist available virtually
- Round-the-clock query registration ability through IVRS, and smartphones
- Anywhere, anytime access on past advisories
- Ability to push emergency message to farmers based on location and crops
- Network independent: accessible from all networks

Technology Components

The IIDS application has been developed using open-source technology such as PHP and MySQL for the web portal; Asterisk, an open-source communication software for IVRS; and Android Platform for mobile application. The major features of the system follow:

- Web, mobile, and IVRS-based solution
- Centralized database
- Role-based access permissions to various operations
- Multimodal: voice, text, images, and videos
- Multiplatform: backend, web-based; frontend, mobile interface, and IVRS
- Domain: agriculture, horticulture, fisheries, and animal husbandry
- SMS alert/notification
- Search and Management Information System (MIS) reports

Pilot Testing

IIDS was launched in 2013 as a pilot by the then secretary of Ministry of Electronics and Information Technology (MeitY), Government of India, in two agricultural universities: (1) ANGRAU, Hyderabad, as Annapurna Krishi Prasaar Seva (AKPS) and (2) Central Agricultural University (CAU), Imphal, as m4agriNEI (Mobile Based Agro Advisory Services in North East India) to test the IIDS in Meghalaya, and piloted IIDS as m4agriNEI in five districts of Meghalaya.

Figure 15-2. Deployment of Interactive Information Dissemination System (IIDS) in Andhra Pradesh, Telangana, and Meghalaya states.

Upscaling & Long-Term Sustainability—Annapurna Krishi Prasaar Seva

Based on its utility and demand from the farmers, the pilot of AKPS has been scaled up from 12 villages in 2013 to more than 6,300 villages in 2019 across Andhra Pradesh and Telangana, catering to 70,000 farmers. ANGRAU for Andhra Pradesh and Professor Jayashankar Telangana State Agricultural University (PJTSAU) for Telangana and DIC has entered into a memorandum of understanding for continuing and upscaling the IIDS model through its Krishi Vigyan Kendras (KVKs) (agricultural extension centers) and District Agricultural Advisory and Transfer of Technology Centers (DAATTCs). The AKPS is being continued post-NAIP period without any break in services from April 1, 2014, onward as an independent project without any grants-in-aid from any agencies. The implementation of the services are being taken care of by the respective universities (ANGRAU and PJTSAU), and DIC has been providing all its technical support for hosting and developing modules for IIDS.

The current deployment model is a regionally centralized approach, which happens at the agriculture university or institution. The experts sit in remote locations (in their KVKs, research stations, or colleges). The approach of establishing decentralized agro-advisory labs has been adopted keeping the aspects of language as well as demographic and cultural differences. Currently, there are 24 agro-advisory labs established in the KVKs and DAATTCs to assist all the districts of Andhra Pradesh and Telangana states.

The calls from the farmers are received at the centralized server (DIC Mumbai). The calls are routed to the relevant experts on their smartphones. The farmer's data (farmer and farm profile, soil properties and past queries, and other data) pop up in the expert's laptop or desktop (if the expert is logged in). In return, the expert can understand the farmer or the field problem in a better way (the objective is "KYF, Know Your Farmer," before answering the query) and facilitate in providing an appropriate solution to the farmer. The agri-expert can access the knowledge database of information (crop manuals, advisory content, links with search option, and other information) linked with the system only if they are in front of the system.

Services Offered

Through AKPS, farmers are provided:

- Personalized advice on agriculture, horticulture, animal husbandry, and fisheries from their KVK or DAATTC on the toll-free number (1-800-425-3141);
- The ability to record their queries 24/7 through the toll-free number;
- Text and voice messages in the local language of Telugu;
- Emergency messages and alerts on their smartphones from KVK or DAATTC; and
- The ability to record their best practices and experiences to share with other friends on the toll-free number.

Every farmer must register to get the services offered through IIDS. There is no registration fee. Concerned district KVKs and DAATTCs are attending to this farmer registration process. The IIDS services are also available through the AKPS mobile app under the Unified Mobile Application for New-age Governance of MeitY, Government of India. It can be downloaded free from the play or app store. Through this mobile app, farmers can raise queries in multimedia format (voice, text, images, and videos) from the field itself and can get the solution from the respective district scientists.

Mobile-Based Agro-Advisory Services in North-East India

Digital India Corporation (DIC) has implemented the m4agriNEI project in the state of Meghalaya along with Central Agricultural University (CAU), Imphal, from 2012 to 2017. Based on the success and utility of the m4agriNEI implementation, the project has been completely taken over (including manpower, farmer database, software framework, and other aspects) by the Government of Meghalaya for large scale deployment in the entire state of Meghalaya as of December 27, 2017. The Meghalaya Institute of Entrepreneurship (MIE), Meghalaya Basin Development Authority, and DIC entered into an agreement to upscale and enhance the m4AgriNEI system and its constituents across Meghalaya through a collaborative process by leveraging and building upon the pioneering work done by DIC in piloting the m4AgriNEI platform and network. For this, the Government of Meghalaya has set up a unique farmer-centric innovative project 1917–Integrated Technology Enabled Agri Management System (1917iTEAMS) with MIE as its Project Management Unit, in collaboration with DIC (the technical partner) for the benefit of farmers of Meghalaya. The number 1917 is the national toll-free number provided to the farmers, buyers, and sellers to reach out to the iTEAMS experts for the services.

The 1917iTEAMS is a dedicated supply chain logistics, marketing, evacuation, and advisory service of the Department of Agriculture, Government of Meghalaya, which aims to address the issues of lack of organized evacuation logistics, limited access to remunerative and sustainable markets, knowledge and informational isolation, and the absence of transparent processes and platforms that can facilitate healthy buyer-seller interaction and activities, all major pain points for Meghalaya farmers. The major objectives of 1917iTEAMS as set by the Government of Meghalaya are as follows:

- Provide access to the best markets, information, practices, packaging, and safety.

- Facilitate organized aggregation and evacuation logistics across the state.
- Provide transparency in all transactions and a state-wide trade facilitation platform with highest governance standards to facilitate healthy and competitive buyer-seller interaction and activities.
- Provide universal access to market intelligence using Artificial Intelligence technology so that buyers and sellers can make informed choices of where, how, and how much to buy or sell for.
- Provide quality, security, and minimal wastage for consumers, and higher returns for farmers.
- Converge farmers' needs, markets' needs, technology trends, and development.
- Open up opportunities for the growth of enterprises and entrepreneurs in the value chain.
- Be the first in the country to set up and operate an integrated technology enabled agri-management system in a convergent framework combining public sector commitment and experience with private sector expertise.
- Enhance the visibility and credibility of government for all citizens.

Enhancement of IIDS for 1917iTEAMS

Since the signing of the agreement and based on the requirements of 1917iTEAMS, DIC has enhanced the IT platform (IIDS 2.0) by adding many additional and new features: the ability to register farmers and buyers on call through the toll-free number (1917) and the ability for farmers to book a vehicle for transportation of their produce or crops, to take requests and share information on buyers and sellers, and to provide technical advisories on agriculture, horticulture, livestock, and fisheries.

Table 15-2. Enhancement of Interactive Information Dissemination System (IIDS) for 1917iTEAMS.

Serial No.	Major facilities	Previous application	New application
1	Open for all	X	✓
2	Registration of farmers on toll-free number	X	✓
3	Registration of buyers on toll-free number	X	✓
4	Agro-advisory services on toll-free number	✓	✓
5	Booking of agriculture resource vehicle on toll-free number	X	✓
6	Request for selling produce on toll-free number	X	✓
7	Request for buying produce on toll-free number	X	✓
8	Reports and dashboard	X	✓

The following new logins with specific roles and features have been created in IIDS:

- Member Secretary 1917iTEAMS
- Program Manager
- Agri Resource Center Coordinator
- Incoming Communication Officer—Level 1

- Incoming Communication Officer—Level 2
- Business Development Executive
- Dispatch Officer

Certain new modules have been incorporated in the new portal for 1917iTEAMS apart from a new look and feel. Table 15-2 shows the differences between previous and new IIDS application.

Efficiency & Improvement (2013–2019)

The IIDS model is useful in enhancing the extension outreach through KVKs and DAATTCs. The implementation of IIDS has elevated the images of the ANGRAU and PJTSAU extensions in terms of increased direct interaction of farmers with scientists through the toll-free number, dissemination of farm information through mobile phones (text and voice messages in Telugu) and AKPS information corners, and functional linkages among the Indian government departments of Agriculture, Cooperation and Farmers Welfare; Animal Husbandry and Dairying; and Fisheries; and the Indian Council of Agricultural Research (ICAR).

Scientists are using IIDS and providing farm- and farmer-specific information and solutions to farmers' queries in real-time or offline mode. The scientists used ICT tools in wider dissemination of information services to the farmers.

Challenges Faced & Lessons Learned

The following challenges were faced in implementing process change:

- Getting farmers to disclose their complete information to maintain the farm database
- Not having the availability to the complete soil data for each farm as well as other parameters to maintain the farm history for each farmer
- Making the agri-scientist habitual in attending the farmers' queries through phone calls on the computer system and in referring to the farmer database while responding to the queries
- Getting farmers accustomed to using a multiple-option-based IVRS

The following lessons were learned from the process re-engineering exercise:

- Requiring continuous training and feedback sessions for field force to understand their issues
- Increasing sensitization meetings and linkages with various service providers for need-based services
- Minimizing the options for farmers to become accustomed to the IVRS
- Sensitizing farmers to use a multiple-option-based IVRS to get the solution from experts on their daily agricultural practices

The following challenges were faced in change management and capacity building:

- Changing the mindset of villagers and creating enthusiasm among the farming community that using the information is more important than receiving subsidies through government programs

- Not having the availability to the field data to maintain the farm history for each farmer

The following lessons were learned from the change management and capacity-building exercise:

- Requiring location-specific data on crops, weather, soil, markets, and other areas from various authentic knowledge institutions
- Requiring linkages with service providers such as those involving input, finance, insurance, procurement, and other issues to meet the farmers' requirements apart from the agro-advisories

The following challenges were faced related to technology:

- Dealing with irregular service of internet, primary rate interface lines, and electricity due to weather and other local conditions such as road construction specifically in the North-East region for m4agriNEI
- Dealing with high network fluctuation rates in rural areas
- Dealing with 2G/3G connectivity in rural and hilly areas causing difficulty in uploading the images and videos of crops from smartphones
- Dealing with high operational cost due to the necessity for a virtual private network (VPN) to connect the central server to each node to receive the voice calls on desktop and simultaneously view the farmer data

The following lessons were learned from technology choices and the implementation strategy adopted:

- Minimizing the dependency on wired communication lines to achieve uninterrupted services
- Requiring development of sync-based offline applications for capturing the farm data and queries in multimedia mode
- Developing mobile-based applications to reduce the size of high-definition images and videos to enable uploads in poor connectivity areas

Specific Steps Taken to Address Digital Inclusion

Throughout the project, care was taken to make sure all the interested farmers were included digitally. The following actions were taken to ensure inclusion.

- Because users of IIDS are mainly farmers who interact with the system on their mobile phones, simple IVRS navigation guides the farmer in their local language. Alternatively, farmers can also approach project staff for the agro-advisory facilitation through the farmer coordinator.
- Agro-advisory labs are decentralized, keeping the aspects of language, demographic, and cultural differences.
- Location-specific content was developed based on the baseline and needs assessments of the farmers from the project locations. Farmers' location-specific needs are met in their native language.
- Sensitization meetings were organized in regular intervals, and the farmers were given training on use of their smartphones to receive advice for their day-to-day farming practices.
- Needs-based training and awareness programs were organized on crop cultivation and livestock management.

Farmers' Feedback—AKPS

Farmers benefited from AKPS in the following ways:

- Farmers can talk to the scientists directly over a smartphone.
- Farmers receive the messages in their local language, even with basic phones.
- Farmers receive text as well as voice messages on their smartphones.
- Farmers use the text messages as references, directing them to the input dealers to get the right pesticides from the shops.
- Timely information helped in reducing the number of chemical sprays and applications of excessive use of fertilizers.
- Farmers who cannot read are also comfortable in receiving messages since information is given through voice messages.
- Messages related to production, protection, post-harvest, and weather are sent to farmers' smartphones.
- The text and voice message facility in IIDS helped the farmers of Srikakulam, Andhra Pradesh, during the Phailin and Hudhud cyclones.
- The weather forecasts helped the farmers to avoid irrigating unnecessarily before rains, postponing crop harvests, and other related activities.
- Farmers have access to short films loaded in their smartphones, allowing accessibility to the information with a multimedia experience.
- Production costs are reduced.
- Farmers have increased awareness about use of ICTs in agriculture.

AKPS Farmers' Perceptions

While interviewing the respondents regarding the perception of IIDS through the AKPS program, 98% of the respondents agreed that the IIDS service is giving clear information on the subjects they required; 91.7% of the respondents agreed that the IIDS service is providing the farmers with timely information; and 98.3% of the respondents agreed that information provided by the IIDS service is easily understandable (Gidda Reddy et al., 2011a). In addition:

- Scientist-farmer interaction was appreciated by 66.2% of the respondents.
- Only 46.4% of respondents agreed that field diagnostic visits are useful since respondents didn't get much exposure to them.
- The interaction between the innovative farmers and other farmers has been accepted as a useful system by 69.3% of the respondents.
- The majority of the respondents were informed that usage of chemical fertilizer (88.8% of respondents) and pesticides (91.2% of respondents) has been reduced due to the fertilizer and pesticide management information provided by the IIDS model.
- A shift in the "source of information" was found among the IIDS farmers. It was noted that 92.5% of farmers who were earlier dependent for agricultural information on their friends and neighbors is now reduced to 56%; and 68.7% of farmers who were dependent on input dealers is now reduced to 35% due to the provision given to the farmers to directly interact with the KVK and DAATTC scientists on the toll-free number.

Figure 15-3. Perception about the AKPS (Annapurna Krishi Prasaar Seva) model.

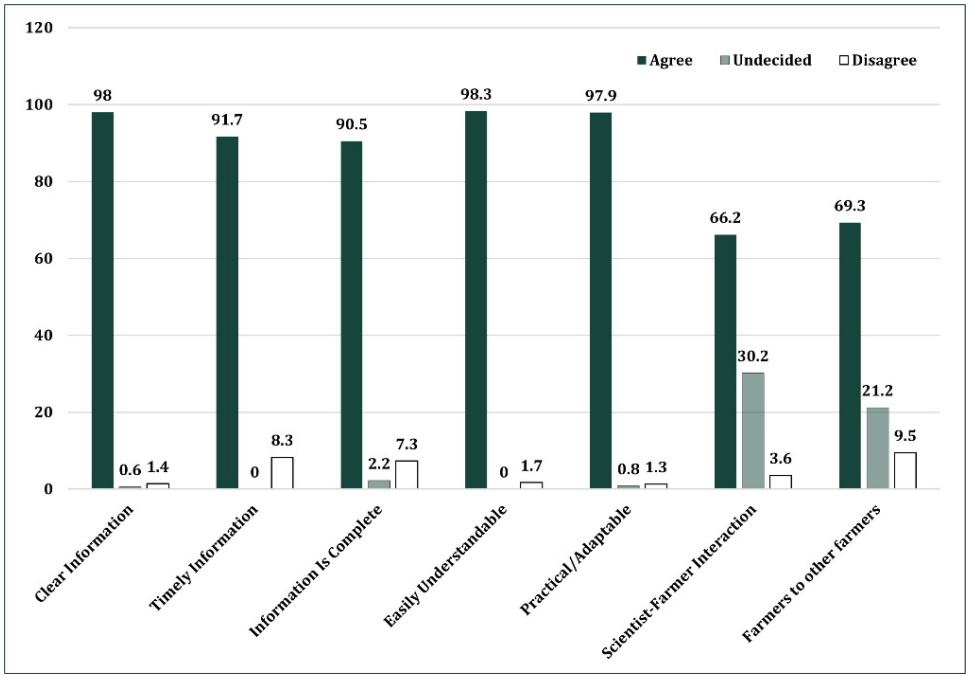


Figure 15-4. Progress in agriculture due to the AKPS (Annapurna Krishi Prasaar Seva) services.

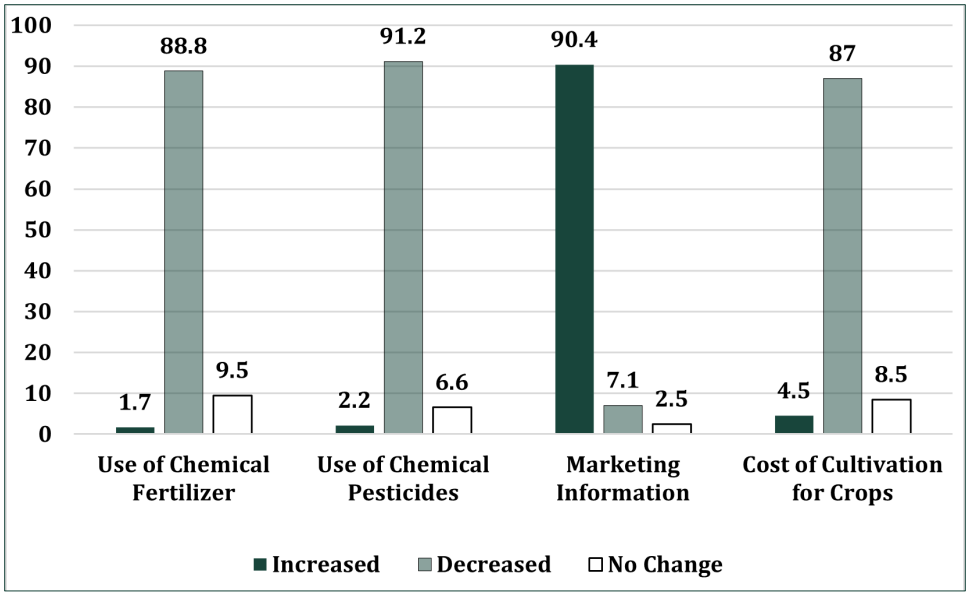
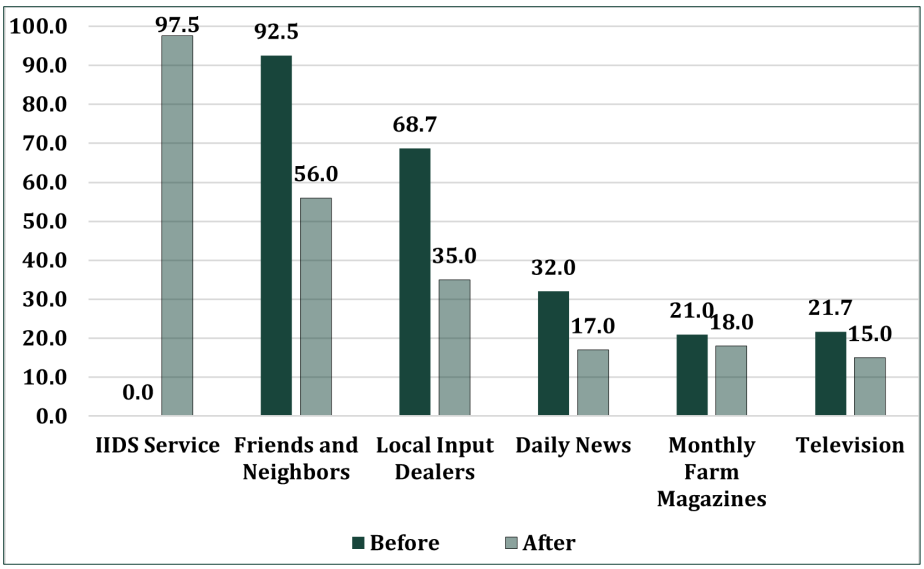


Figure 15-5. Source of farm information before and after the initiation of the AKPS (Annapurna Krishi Prasaar Seva) service.



Case Studies of Farmers

Case studies of farmers in the Indian states of Andhra Pradesh and Telangana follow.

Andhra Pradesh

Sri. S. Bali Reddy, Diguvapalli Village, Tadipatri Mandal, Anantapur District

ID: 16214854, number of calls made: 347. Registered in IIDS through KVK, Reddipalli.

Sri. S. Bali Reddy has cultivated Bengal gram crop on 20 acres, cotton on 3 acres, and jowar (sorghum) on 2 acres. He received advisories on management of *helicoverpa larvae*, wilt and root rot, fertilizer management, chemicals for seed treatment, weather and market information on Bengal gram crop, and management of sucking pets and pink bollworm in cotton crop as well as others. He has used the text messages as reference to buy the pesticide from dealers' shops. He has reduced the number of pesticide sprayings (from four to two) and applied the recommended dose of fertilizers reducing the cost of cultivation up to Rs. (Indian rupees) 1500 per acre in Bengal gram crop. Also, he has received market rate information from time to time though this IIDS, and because of that, he sold his produce for a better price and finally received the extra income of Rs. 19,200 per acre in Bengal gram crop.

He was able to reduce two sprays against sucking pests and one spray against pink bollworm in the cotton crop and thereby, he has reduced the cost of cultivation of Rs. 2000 per acre.

Sri. T. Venkata Ramana, Chettupodilam Village, G. Sigadam Mandal, Srikakulam District

ID: 10113731, number of calls made: 303. Registered in IIDS through KVK, Amadalavalasa.

Sri. T. Venkata Ramana has cultivated rice, maize, Bengal gram, and Greengram crops. He received advisories on weather forecasts, high-yielding

varieties, weed management, fertilizer management, and management of stem borer, BPH, sheath blight, and zinc deficiency as well as other issues. He has used the text messages as reference to buy the pesticide from dealers' shops. Voice and text messages are helpful to protect the crop from time to time. He has reduced the cost of cultivation of Rs. 3000 per acre in rice crop by reducing two sprays against pest and diseases and reduced three bags of urea per acre and finally got a yield benefit of five bags per acre.

The maize crop grown was severely infested with shoot borer. He followed timely advice given by scientists of KVK through IIDS and sprayed the recommended chemicals compared to other maize farmers of the village who are not registered under IIDS. He was able to reduce the cost of cultivation from Rs. 5,200 to Rs. 4,680 per acre and reduced sprays from two to one with an increased yield of 200 kg/acre. It is quite interesting to note that Mr. Venkata Ramana brings up the problems of fellow farmers also through IIDS.

Sri. N.V.V. Challa Rao, Kuppanapudi Village, Akiveedumandal, West Godavari District

ID: 14234247, number of calls made: 536. Registered in IIDS through KVK, Undi, West Godavari district.

Sri. N.V.V. Challa Rao was growing the rice crop on 6 acres. He received the advisories on soil testing, weed management, fertilizer management, management of zinc deficiency, BPH, and other issues. He has used the text messages as reference to buy the pesticide from dealers' shops. He was able to reduce the cost of cultivation of Rs. 4,500 per acre (by reducing two sprays against BPH, two sprays against weeds; by reducing four bags urea per acre) and finally received the yield benefit of two bags per acre.

He has a 7-acre fishpond and practices polyculture. He received the advisories on fish species selection, water quality management, plankton improvement practices, feed management, disease management, harvesting, and post-harvesting practices. He got a yield advantage of 360 kg/acre (before IIDS: 2200 kg/acre and after IIDS: 2560 kg/acre and 16.4% of yield increase) and reduced cost of cultivation of Rs. 17,200 per acre (by reducing cost on feed and pesticides) and finally received a net income of Rs. 72,000 per acre.

Sri. K. Sai Babu, Gangireguvalasa Village, Komarada Mandal, Vizianagaram District

ID: 16182538, number of calls made: 258. Registered in IIDS through DAATTC, Vizianagaram.

Sri. K. Sai Babu has cultivated rice, tomato, cabbage, guava, and apple-ber crops. He received advisories on management of stem borer, BPH, sheath blight, fertilizer management, weed management in rice crop, intercropping in guava with tomato and cabbage, and other issues. He has reduced the cost of cultivation from Rs. 8,400 to Rs. 7,400 per acre in rice crop by reducing the number of sprays from six to four and increasing the yield from 2600 to 3200 kg per acre in rice crop. Finally, he received the net income of Rs. 11,800 (Rs. 8,400 before IIDS) in rice crop.

Sri. C. Chandrasekhara Reddy, Tadigotla Village, C.K. Dinnemandal, Kadapa District

ID: 23413708, number of calls made: 270. Registered in IIDS through KVK, Utukur, Kadapa district.

Sri. C. Chandrasekhara Reddy cultivates the rice crop on 5 acres. He received the advisories on weather forecasts, seed availability, seed treatment, management of stem borer, BPH, zinc deficiency, and other issues in rice crop. He was able to reduce the cost of cultivation of Rs. 1700 per acre by reducing two sprays against pest and diseases and reduced two bags of urea and finally got a yield advantage of five bags per acre.

Telangana

Sri. V. Husya Naik, Turuputhanda Village, Damarcherla Mandal, Nalgonda District

ID: 76208990, number of calls made: 46. Registered in IIDS through KVK, Kampasagar, Nalgonda district.

Sri. V. Husya Naik received the advisories on pest and disease management, fertilizer management, seed treatment chemicals, weather information, and other areas. He has used the text messages as reference to buy the pesticide from dealers' shops.

He has reduced the cost of cultivation by Rs. 3,500 per acre of rice and got an increased yield of six bags per acre, with the net benefit of Rs. 8,000 per acre.

Sri. Gopal Rao, Lingala, Village Kamepalle Mandal, Khammam District

ID: 10437669, number of calls made: 67. Registered in IIDS through KVK, Wyra, Khammam district.

Sri. Gopal Rao received advisories on seed selection, management of viral diseases in chilli crop; management of BPH rice crop, and management of sucking pest and pink bollworm in cotton crop. He had followed the expert's advice and finally, he received a 30% increase in yield, reduced cost of cultivation of Rs. 1500 per acre in cotton crop by reducing three sprays against pest control and received a total benefit of Rs. 6000 from 6 acres of cotton crop.

Sri. Suresh Shetti, Atmakur Village, Gadwal Mandal, Mahabubnagar District

ID: 24148436, number of calls made: 51. Registered in IIDS through KVK, Palem, Mahabubnagar district.

Sri. Suresh Shetti received the advisories on management of pink bollworm, flower dropping in cotton crop; management of root rot in redgram crop; management of viral diseases in chilli crop; and fertilizer management in castor crop. He had followed the expert advice, receiving the net benefit of Rs. 6,250 per acre and a total benefit of Rs. 50,000 from 8 acres of cotton crop.

Sri. Kurlepu Prabhu, Rampur Village, Kotagiri Mandal, Nizamabad District

ID: 17185160, number of calls made: 66. Registered in IIDS through KVK, Rudrur, Nizamabad district.

Sri. Kurlepu Prabhu received the advisories on fertilizer management, control of stemborer, brown plant hopper, and blast in rice. The information received on the importance of alleyways in rice, soil test-based fertilizer management and its importance in soil health management, and judicious application of pesticides enabled him to attain 250 kg of higher yields than earlier with cost savings of up to Rs. 2,500 per acre.

Sri. Kamatam Venkanna, Aparaju Palli Village, Gudurmandal, Warangal District

ID: 17228436, number of calls made: 43. Registered in IIDS through KVK, Malya, Warangal district.

Sri. Kamatam Venkanna received the advisories on management of sucking pest, pink bollworm in cotton crop; and management of thrips, mites in chilli crop. He has used the text messages as reference to buy the pesticide from dealers' shops. He was able to reduce the cost of cultivation of Rs. 3,000 per acre by reducing three sprays in cotton crop and two sprays in chilli crop.

Conclusions & Recommendations

The primary use of IIDS as envisioned was for the agro-advisories. As time has progressed, we see the use of the framework not only for agriculture but also for animal husbandry and fisheries. Apart from the farmers, the research institutes in the country can use this system for accessing the current data and for increased outreach to the farmers regarding research for specific crops and geographies. IIDS can be implemented and upscaled through the research institutions and agriculture universities in India. The usefulness of IIDS in extension and research has been proven in AKPS and m4agriNEI. IIDS is relevant for academics and research institutions as the system can create and maintain the crop history and the history of queries being received from the field. Also, analytics can be produced on location, season, farmer, and crop queries based on the data being generated on IIDS. ICAR has 706 KVKs, 64 state agricultural universities, two central agricultural universities, 60 All India Coordinated Research Projects, 19 network projects, and 10 other projects in which IIDS can be implemented as their IT mediated outreach platform.

Going forward, IIDS can be deployed in a centralized, "plug and play" and "anytime and everywhere" model. The advantages of having a centralized IT is optimization and efficiency of both financial and operational aspects. Centralizing IIDS with the appropriate technologies increases the ability to scale the size of IIDS deployment. This model will also allow the operations to introduce new hassle-free services in the system with one installation. The "plug and play" model would decrease the time to deploy and scale with the use of the right technologies.

References

Anurag, T. S., Punna Rao. P., Madhavarao, M., & Simha, A. (2014). *Final IIDS Project Report* submitted to the NAIP, ICAR, New Delhi.

Gidda Reddy, P., Punna Rao, P., Mallika, M., & Aruna Sri, I. (2011a). Farmer's perception on usefulness of ICT initiatives in agriculture. *Journal of Agricultural Extension Management*, *XII*(1), 37–47.

Gidda Reddy, P., Punna Rao, P., Mallika, M., & Aruna Sri, I. (2011b). Information needs of farmers. *Indian Journal of Agricultural Library and Information Services, 27*(2), 25–30.