Impact of ICTs on Agriculture growth and Development Case Studies from Karnataka Region

About the Publication

The research report is based on the research conducted by Dr. Nagesh as MANAGE Intern under the MANAGE Internship Programme for Post Graduate students of Extension Education.

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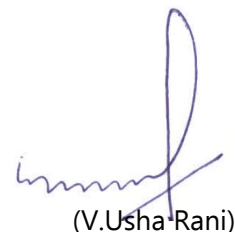
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I congratulate Nagesh N S, MANAGE intern and Ph.D. Scholar, University of Agricultural Sciences, Raichur for selecting relevant topic for the current scenario "Impact of ICTs on Agriculture growth and Development- Case studies from Karnataka region" and collecting good data from field and analysis.

This paper in detail analyses seven case studies which teaches several unique ways in which ICTs can help, build and transform the lives of the farmers. Current needs of ICT is also analysed and recommendations to promote them extensively amongst the farmers is also envisaged. Access, efficiency and affordability of agricultural information continue to be a major impediment for raising agricultural productivity among smallholders in the developing Countries. ICTs can help, build and transform the lives of the farmers. We all know that ICTs can play a very crucial role by disseminating information to farmers to help them make better well informed decisions. Through ICTs people can obtain the latest up-to-date information, learn and practice sustainable farming.

Now-a-days through ICTs people can obtain the latest up-to-date information, learn and practice sustainable farming. ATIC as a single window for information delivery, Digital green's use of video as a tool for disseminating agricultural technologies information, Easykrishi's role in aggregating all the FPO's digitally, e-SAP's solutions for addressing the issues related to pest management, IKSL's call center solutions for all the farmer's queries, Krishi Community radio station for serving the cause of the local community and mKisan's use of messaging have all empowered the farming community. This reminds us of the longer path we need to cover with these few initial adventures, such that they help us reach across the length and breadth of the country, thus making agriculture a profitable venture. The Easykrishi and e-SAP have played a prominent role in reducing / mitigating the impact of pests and diseases. All these studies on different ICT applications specifies the unique ways of it in out reaching larger farmer masses. This current study revealed that ICT initiatives are meeting the selected portions of the population and they have to be popularized to meet the large sections of the community. Use of mobile application is very limited among the farmers and needed to be promoted extensively. E-literacy schools need to be established for this purpose. The number of messages sent is very limited, particularly given the cost factor. So steps need to be taken to increase the number of messages sent. Alternative modes of communication need to be established in places where power and internet connectivity turns out to be barriers. There has to be dynamism in the way, Package of Practices is utilized for information dissemination. Periodical studies need to be undertaken to evaluate the ICT initiatives undertaken for further expansion. Given the potential of youth in utilization of ICT, proper training amongst them will be a great boost for agriculture development. Development of infrastructure is crucial for the widespread dissemination of ICT benefits.

(V.Usha Rani)

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Abstract

Agriculture is the backbone of our country. Though its contribution to GDP is just around 14 per cent, over half of our country's population depends on agriculture for their livelihoods. The rising food prices have pushed people back into poverty. The growing global population, expected to hit 9 billion by 2050, has heightened the demand for food and placed pressure on already-fragile resources. Feeding that population will require a 70 per cent increase in food production. Agriculture faces a range of modern and serious challenges, particularly in developing countries exposed to price shocks, climate change, and continued deficiencies in infrastructure in rural areas. It is in this context that ICTs play a crucial role in helping people meet the demand for increased food production. ICTs can play a very crucial role by disseminating information to farmers to help them make better well informed decisions. Through ICTs people can obtain the latest up-to-date information, learn and practice sustainable farming. It is in this regard that seven case studies have been documented in this report to understand the various unique pathways through which ICTs can play a crucial role in promoting agricultural development.

Executive summery

Agriculture is facing new and severe challenges in its own right. With rising food prices that have pushed over 40 million people into poverty since 2010, more effective interventions are essential in agriculture. The growing global population, expected to hit 9 billion by 2050, has heightened the demand for food and placed pressure on already-fragile resources. Feeding that population will require a 70 per cent increase in food production. Agriculture faces a range of modern and serious challenges, particularly in developing countries exposed to price shocks, climate change, and continued deficiencies in infrastructure in rural areas.

Farmers make decisions every day, in a lot of risky and uncertain situations. These decisions will have to be made with the information available with them at that point of time. Access, efficiency and affordability of agricultural information continue to be a major impediment for raising agricultural productivity among smallholders in the developing Countries. It is in this arena that ICTs can play a very crucial role by disseminating information to farmers to help them make better well informed decisions. It is in the context of globalizing agriculture where the need for information becomes most vivid. Smallholders, who still provide a significant portion of the world's food, need information to advance their work just as much as industrial-scale producers. The five main trends that have been the key drivers for the use of ICT in agriculture, particularly for poor producers: low-cost and pervasive connectivity, adaptable and more affordable tools, advances in data storage and exchange, innovative business models and partnerships and the democratization of information, including the open access movement and social media. These drivers are expected to continue shaping the prospects for using ICT effectively in developing country agriculture.

All the seven case studies documented in this report teaches us unique ways in which ICTs can help, build and transform the lives of the farmers. ATIC as a single window for information delivery, Digital green's use of video as a tool for disseminating agricultural technologies information, Easykrishi's role in aggregating all the FPO's digitally, e-SAP's solutions for addressing the issues related to pest management, IKSL's call center solutions for all the farmer's queries, Krishi Community radio station for serving the cause of the local community and mKisan's use of messaging have all empowered the farming community. This reminds us of the longer path we need to cover with these few initial adventures, such that they help us reach across the length and breadth of the country, thus making agriculture a profitable venture. The Easykrishi and e-SAP have played a prominent role in reducing / mitigating the impact of pests and diseases. For example White tip disease of paddy, Banana skipper, Cotton leafhopper and many others.

The following recommendations are derived based on the above case studies. These ICT initiatives are meeting the selected portions of the population and they have to be popularized to meet the large sections of the community. Use of mobile application is very limited among the farmers. This needs to be analysed and promoted extensively amongst the farmers. e-literacy schools need to be established for this purpose. The number of messages sent is very limited, particularly given

the cost factor. So steps need to be taken to increase the number of messages sent. Alternative modes of communication need to be established in places where power and internet connectivity turns out to be barriers. There has to be dynamism in the way, Package of Practices is utilized for information dissemination. Periodical studies need to be undertaken to evaluate the ICT initiatives undertaken for further expansion. Given the potential of youth in utilization of ICT, proper training amongst them will be a great boost for agriculture development. Development of infrastructure is crucial for the widespread dissemination of ICT benefits.

Agriculture is facing new and severe challenges in its own right. With rising food prices that have pushed over 40 million people into poverty since 2010, more effective interventions are essential in agriculture (Anonymous, 2011a). The growing global population, expected to hit 9 billion by 2050, has heightened the demand for food and placed pressure on already-fragile resources. Feeding that population will require a 70 percent increase in food production (Anonymous, 2009). Agriculture faces a range of modern and serious challenges, particularly in developing countries exposed to price shocks, climate change, and continued deficiencies in infrastructure in rural areas. Climate change has also played an acute role by making prediction of natural events very uncertain. Farmers can no longer rely on timeworn coping strategies when all of their familiar benchmarks for making agricultural decisions— the timing of rains for planting and pasture, the probability of frost, the duration of dry intervals that spare crops from disease—are increasingly less reliable. Severe and unexpected weather is shrinking already-limited yields and promoting migration from rural areas and rural jobs. Weather-related events leave developing-country governments, which lack the resources and the private sector investment to provide risk management instruments, to cope with major crop failures and the displaced victims only after the fact. (Anonymous, 2011b)

Information and Communication Technology (ICT)

ICT considers all the uses of digital technology that exist to help individuals, businesses and organizations use information to make decisions. ICT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form[1].

Information and Communication Technology (ICT) is defined by the World Bank as "any device, tool, or application that permits the exchange or collection of data through interaction or transmission". It "includes anything ranging from radio to satellite imagery to mobile phones or electronic money transfers" (Anonymous, 2011c).

ICT is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning. (Nandeesha, 2016)

ICT in Agriculture

Farmers make decisions every day, in a lot of risky and uncertain situations. These decisions will have to be made with the information available with them at that point of time. Access, efficiency and affordability of agricultural information continue to be a major impediment for raising agricultural productivity among smallholders in the developing Countries (Muriithi et al., 2009). It is in this arena that ICTs can play a very crucial role by disseminating information to farmers

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[1] https://www.tutor2u.net/business/reference/what-is-ict

to help them make better well informed decisions. It is in the context of globalizing agriculture where the need for information becomes most vivid. Smallholders, who still provide a significant portion of the world's food, need information to advance their work just as much as industrial-scale producers. (Anonymous, 2011b)

ICTs can help overcome various bottlenecks present in Agriculture. Firstly, there is a lack of extension facilities available. Secondly, issue of illiteracy amongst farmers. Thirdly, capability of farmers to compete with large farmers is limited. Fourthly, the gap existing between the modern and traditional technologies is widening. Lastly, farmers are disconnected with the latest information available.

ICT can help us meet the demand for food, by collecting and sharing timely and accurate information on weather, inputs, markets, and prices; by feeding information into research and development initiatives; by disseminating knowledge to farmers; by connecting producers and consumers, and through many other avenues (Anonymous, 2011b). ICT services provide critical access to the knowledge, information and technology that farmers require to improve the productivity and thus improve the quality of their lives and livelihoods. (Nandeesha, 2016).

With the advancements in the technology world, the lag that is available between generation and dissemination of information has been reduced drastically. This has enhanced the capability of farmers to manage weather risks, technological risks, price risks and many more such risks. ICTs not only help to disseminate information, rather it also improves the farmer's knowledge base, increase their participation and share the knowledge amongst farmers. The proper use of ICT helps to overcome the time, space, language and illiteracy barriers effectively. Thus ICT has emerged as a core driver of the modern knowledge based economy promoting socio-economic development of the country. Thus, the present study is an effort to understand the role played by the ICTs in improving the lives of the farmers.
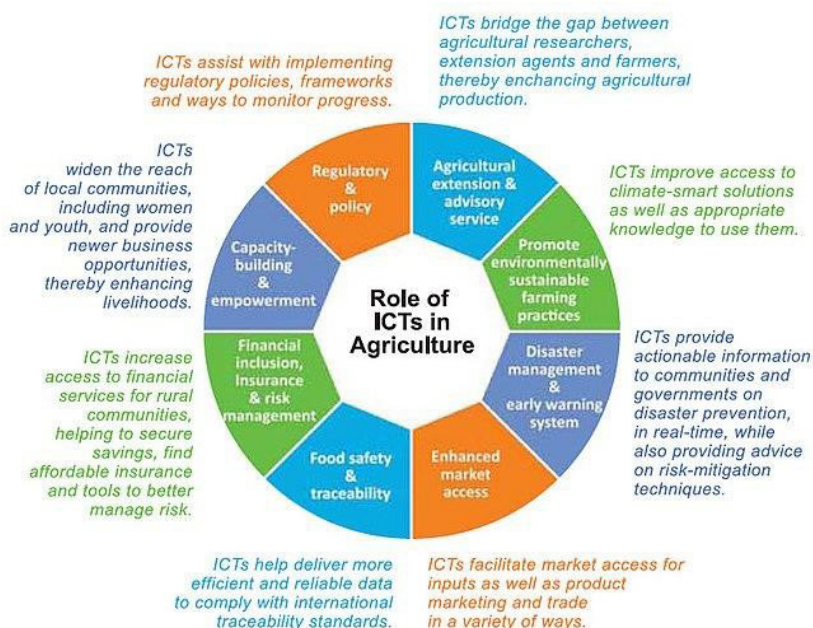
Figure 1. Role of ICT in agriculture

Information needs of the farmers

A national survey of farmers by NSS has found that only 40 per cent of the farmers' households accessed (Table No. 1) information about modern agricultural techniques and inputs. The most popular information source of these households for accessing information was 'other progressive farmers', followed by 'input dealers' (Mittal and Tripathi, 2009).

Table 1: Sources of agricultural information used by farmers

Source	Per cent of households
Other progressive farmers	16.7
Input dealers	13.1
Radio	13.0
Television	9.3
Newspaper	7.0
Extension worker	5.7

Source: Mittal and Tripathi (2009)

Mittal and Tripathi (2009) reported that the broad categories of information required were common to all of them, irrespective of their location and crops. These information categories were: know-how which provides a farmer with such fundamental information as what to plant and which seed varieties to use; contextual information such as weather, best practice for cultivation in the locality; and market information such as prices, demand indicators, and logistical information. It was found that small farmers prioritized information on weather, plant protection, seed variety and market prices as most important. In Uttar Pradesh and Rajasthan, close to 90 per cent of farmers reported information on seed as their highest priority, while over 70 per cent cited market prices as the most important category. Although farmers were also interested in other categories of information, like best cultivation practices, crop choice, etc., only a small sample prioritized them (Mittal and Tripathi, 2009).

Mobile phones and Agricultural Development

In most developing countries, agriculture is the main source of the population's income. Lack of access to relevant information leads to low yields, famers stress and low income. Nowadays ICTs have the potential to transform agriculture in rural area. Smartphones and it's applications has come with great innovations. The applications have been developed to help farmers reduce stress; acquire relevant information on good agriculture practices, weather, quality input, markets tendency, etc. Through social media, web sites and other applications, farmers can improve their skills, share experiences and even sale their products online using their smartphones. Smartphones and their applications are innovations bringing good solution for agriculture development in order to help farmers to have access to relevant information. It participates in the amelioration of agriculture extension work and advisory services.

The mobile phone had generated positive economic benefits, the nature of that impact can be categorized in three ways: (i) easy access to customized content, (ii) mobility, and (iii) time-saving or convenience. Mobile phones serve as a two-way communication mode and provide access to the information service even in the fields (Mittal and Tripathi, 2009).

Table 2: Various Roles for Mobiles in Agriculture

Goal	Method
Education and awareness	Information provided via mobile phones to farmers and extension agents about good practices, improved crop varieties and pest or disease management.
Commodity prices and market information	Prices in regional markets to inform decision making throughout the entire agricultural process.
Data collection	Applications that collect data from large geographic regions
Pest and disease outbreak	Send and receive data on outbreaks.

Source: Hellstrom 2010.

1. ICT and poverty reduction

Any ICT intervention that improves the livelihoods of poor rural families will likely have significant direct and indirect impacts on enhancing agricultural production, marketing and post-harvest activities – which in turn can further contribute to poverty reduction. There are several pathways through will help alleviate poverty and promote development.

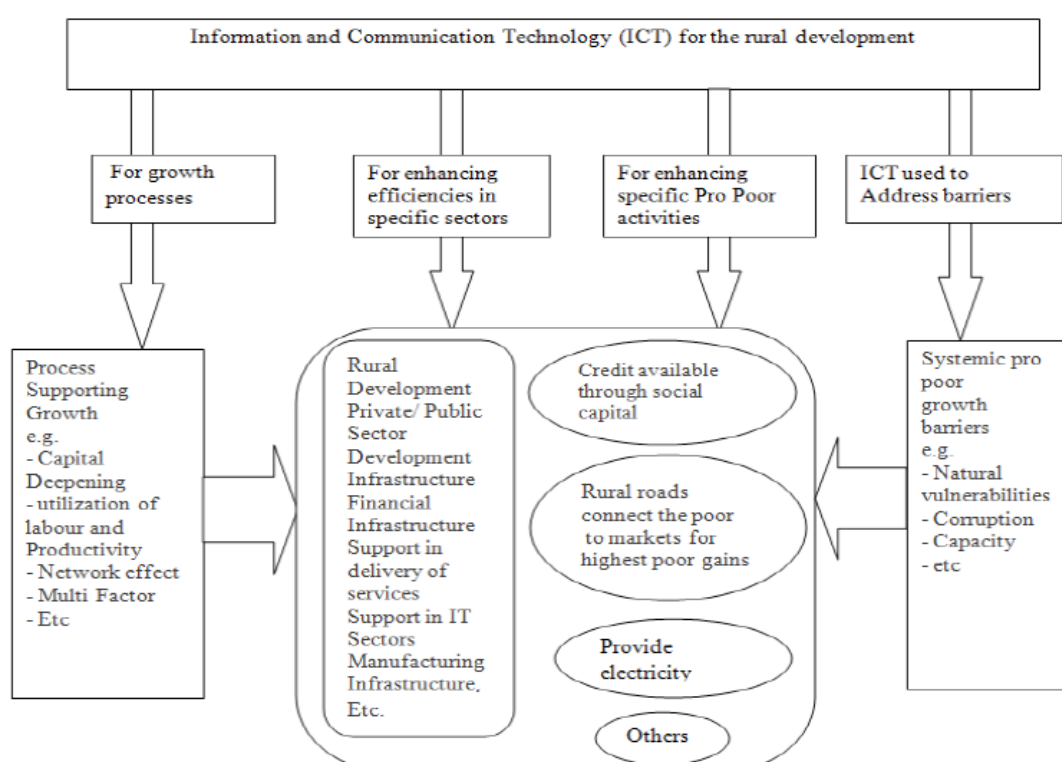Figure 2. ICT for the Rural Development, *Source: Tripathi et al., (2012)*

2. Review of Literature

Traditionally, farmers in developing countries have obtained such information from personal visits, radio and to a lesser extent, landlines and newspapers. Mobile phones, by contrast, can reduce costs of obtaining this information as compared with other information mechanisms. Mobile phones are significantly less expensive than the equivalent per-search opportunity and transport costs or obtaining the same information from a newspaper (Aker, 2010).

Anonymous (2011b) reported five main trends that have been the key drivers for the use of ICT in agriculture, particularly for poor producers: low-cost and pervasive connectivity, adaptable and more affordable tools, advances in data storage and exchange, innovative business models and partnerships and the democratization of information, including the open access movement and social media. These drivers are expected to continue shaping the prospects for using ICT effectively in developing country agriculture.

Labonne and Chase (2009) reported that, purchase of mobile phones in Philippines increased the growth rates of the incomes in the range of 11-17 per cent significantly as evident from the World Bank study. This is due to the stronger bargaining position of the farmers in the existing trade relationships in addition to being able to seek out to other markets. Another study found that purchase of mobile phones in Morocco increased the average incomes by 21 per cent (Ilahiane, 2007).

Aker (2008) found that cell phones reduced the grain price dispersion across markets by a minimum of 6.4 per cent and reduced intra-annual price variation by 12 per cent. Cell phones have a greater impact on price dispersion for market pairs that are farther away and for those with lower road quality.

Climate Change Adaptation and ICT Project (CHAI) was created as a solution for the issues faced by the Ugandan farmers. A study involving 640 households showed that the dissemination of timely and locally relevant adaptation information reduced crop loss and damage by 67 per cent (USD 474 - 573 per household per year) (Enabling Farmers to Adapt to Climate Change: Uganda, 2014).

Casaburi et al. (2014) reported that sending SMS messages with agricultural advice to smallholder farmers increased yields by 11.5 per cent relative to a control group with no messages. Enabling farmers to report input provision delays to the company reduces the proportion of delays in fertilizer delivery by 21.6 per cent.

ICTs have transformed how businesses, people and governments work. The large adoption and integration of ICTs has reduced information and transaction costs, improved service delivery, created new jobs, generated new revenue streams and saved resources (Anonymous, 2017).

Aker and Mbiti (2010) reported a reduction of search costs by 50 per cent in rural Niger, when the

agricultural price information was disseminated through mobile phones. Svensson and Yanagizawa (2009) reported that dissemination of price information in Uganda resulted in a 15 per cent rise in the farm-gate prices of maize.

Syiem and Raj (2015) reported mobile as the most frequently used ICT. According to them, the Mobile phones were widely used by the farmers for social communication, contacting middle men for the marketing of produce and contacting experts on real time basis for getting agricultural advisories. Major problems in the use of ICTs by the farmers were lack of confidence in operating ICTs, erratic power supply, low network connectivity and lack of awareness of the benefits of ICTs. (Syiem and Raj, 2015)

De Silva and Ratnadiwakara (2008) have stated the possibility of dramatic reductions of transaction costs with the use of ICT. This was due to the reduction in information search costs to enable greater farmer participation in commercial agriculture as opposed to subsistence farming that continue to force so many farmers in developing countries in to poverty.

Tettey (2013) examined the usage of the mobile phone in the business of farmers within Akuapem-North District in the Eastern region of Ghana with a sample of 100 farmers. It was found that the use of the mobile phone has improved customer relation, enhanced communication with suppliers, extension officers and customers, and it has also increased farmers profit. The study proved challenges such as inability to have access to calling cards regularly, fluctuation in network receptions and constant energy to charge their mobile phone for rural agriculturalists.

Major barriers for adoption of ICT based extension services were lack of training, poor infrastructural development and poor network connectivity. While the major drivers of adoption of the ICT based extension services were easy to adopt, up to date nature of the ICT based extension services, no requirement of physical presence of expert, useful content of the services, timeliness of the information, and relevancy of the information. Loss of contact with timely information, loss of production, loss of competitiveness etc., were the major perceived consequences of not adopting the ICT based extension services (Naik, 2014).

3. Research Methodology

The study was conducted in the Karnataka state of India. Karnataka is bordered by the Arabian Sea to the west, Goa to the northwest, Maharashtra to the north, Telangana to the northeast, Andhra Pradesh to the east, Tamil Nadu to the southeast, and Kerala to the south. The state covers an area of 191,976 square kilometres (74,122 square miles), or 5.83 percent of the total geographical area of India. It is the seventh largest Indian state by area. With 61,130,704 inhabitants at the 2011 census, Karnataka is the eighth largest state by population, comprising 30 districts.

Karnataka state is endowed with varied agroclimatic conditions with rainfall ranging from 450 mm to 4500 mm. The state is divided into 10 Agroclimatic zones and the crops cultivated are varied.

The ICT initiatives are meeting the needs of farmers on various aspects, making them successful in their venture.

Seven case studies were chosen such that each one concentrates on one unique way of ICT utilization to enhance farmers welfare. The following 7 case studies were shortlisted for the study:

- Agricultural Technology Information Center (ATIC), University of Agricultural Sciences, Bangalore
- Digital Green, Bangalore
- Easykrishi, Bangalore
- e-SAP from University of Agricultural Sciences, Raichur
- IFFCO Kisan Sanchar Limited (IKSL), Bangalore
- Kisan Community radio station from University of Agricultural Sciences, Dharwad
- mKisan, KVK of Raichur district

4. Case studies for ICTs in Agriculture

4.1 Agriculture Technology Information Center (ATIC)

The importance of an appropriate information package and its dissemination as an input has assumed added emphasis in this "information age". The kind of information and the way it is to be used are critical factor to the growth of agriculture. It is also worth noting that it is no longer enough for research to generate information alone. The required information is also to be delivered to the end user at one place. This information must be direct, clear and easily understandable and without any room for distortion.

The facility of a 'single window' approach at the entrance of the ICAR Institute/State Agricultural Universities will enable the farmers to have the required information for the solution to their problems related to the areas in which the concerned institute is involved.

The rationale for establishment of ATIC are:
1. To provide diagnostic services for soil and water testing, plant and livestock health.
2. To supply research products such as seeds and other planning materials, poultry strains, livestock breeds, fish seed, processed products, etc, emerging form the institution for testing and adaptation by various clientele.
3. Providing information through published literature and communication materials as well as audio—visual aids.
4. Providing an opportunity to the institutes/SAU/s to generate some resource through the sale of their technologies.

Package of Practices is a book which contains details of all the cultivation practices. It is revised every year with updates from the scientists and feedbacks from the farmers. There are 2 books, one covering Agriculture and Horticultural crops completely while the other book covering Animal

husbandry, Sericulture and other subsidiary enterprises. Many copies of this book are sold out at ATIC and thus this book forms a very important ICT tool in Agriculture development. The other most sold books are those on sheep and goat rearing, dairy farming, poultry, organic farming and others. In addition to books, Brochures, Folders and Leaflets form other sources for agriculture information dissemination. Folders on specific crops with mention of latest varieties are very successful.

In addition to literatures, CDs containing the videos of cultivation of any crop or establishment of any livestock enterprise was available. CDs are most preferred ICT to learn about farming practices. Seeds (latest varieties released by the University), Implements, Bio fertilizers, Vegetable mixtures and many other such products are sold to the farmers at the ATIC counter.

ATIC has the provision for conducting the Video Conferencing for interaction with the various stakeholders like KVK, farmers and many more. The prime minister has recently conversed with the Ramanagara KVK farmers directly using this service. Thus, Distance is not a barrier in connecting to each other.

Figure 3. Screenshot of the Homepage of ekrishi web portal

The Package of practices information is made available online on the e-krishiuasb.karnataka.gov.in web portal. It's available in both Kannada and English language. The portal provides link to various other portals like ICAR, Krishi Maraata Vahini, RKVY, MCPS, Raitha Mitra and others. The link of all the Books, CDs and Seeds available is made online. Apart from the content upload, the news and the weather report will also be updated and uploaded on the web portal.

The information for each crop is available under the following heads:
• Introduction

- Varieties
- Methods of Cultivation
- Nutrient management
- Weed management
- Mechanization
- Plant protection
- Post-harvest
- Related information
- Videos

Under Supplementary topic head, the following topics are available

- Crop production
- INM, IPM, IDM
- Organic farming
- Dry land agriculture
- Apiculture Mushroom cultivation
- Agroforestry
- Post-harvest Tech
- Mechanization
- Soil water conservation

Figure 4. Screenshot of the Success stories web page of ekrishi web portal

There is a Call Center at the ATIC. The doubts not clarified at the first level in the Kisan Call Center will be forwarded to the ATIC call center. The subject matter specialists will try answering the queries. If the Subject matter specialists are not able to answer the queries, they will consult the Professor and Heads of the concerned departments and obtain the answers for the posed queries.

These answers will be forwarded back to the primary caller who had initially posed the Query. Also the farmers send photos to the Whatsapp number 9482477812 and get response to their queries. ATIC also organizes training programmes and interaction meetings to farmers.

The following are some the major issues for which farmers have visited ATIC

- Banana tissue culture plants
- Ragi MR-6, ML-365 seeds purchase
- Tamarind cultivation
- Guava cultivation
- Papaya leaf curl virus
- Tomato cultivation
- Mango cultivation practices
- Tractor and tiller subsidy
- Coconut black headed caterpillar
- Millets
- Organic farming
- French bean cultivation
- Capsicum thrips

4.2 Digital Green

Dissemination of expert agriculture information and technology to farmers was through "Training & Visit" extension system popularized by the World Bank in 1970s. There was Face-to-face interactions of extension officers and farmers. Over 100,000 extension officers are there in India with an Extension agent-to-farmer ratio is 1: 2,000 covering 610,000 villages in India with average 1,000-person population. To overcome the barriers posed by the traditional extension system for disseminating agricultural information, Digital green has come to the rescue with a novel idea.

Digital Green is a technology-supported means of agriculture extension. Inspired by a project

Figure 5. Extension officer "commuting" between farms

called Digital Study Hall it seeks to improve primary school education in rural India. Similarly Digital Green uses video as a basis for disseminating agricultural practices.

Quiet digital revolution has taken place due to the initiatives by digital green. Local farm women with the help of local experts, took agricultural information from open data sources and added it to their video about crop production. This was then uploaded to the Digital Green website to be seen by farmers across the region. Using mini projector systems the films have been shown to audiences in thousands of villages. It is a blend of new digital technology linked to the draw of traditional film-making – all made by rural people for rural people. And it delivers a strong, relevant and change making formula

The mission of Digital Green is to increase the productivity of smallholder farmers by making agricultural extension services more effective. To do this, the organization partners with NGO and government extension agencies to provide training, data management and support services. Their approach centers on supporting the production and dissemination of locally produced videos about low-cost and high-productivity farming methods. In collaboration with partners and local communities, farming needs are assessed and farmers trained in producing videos that address the identified needs through sharing best practices.

The unique components of Digital Green are:
1. a participatory process for content production;
2. a locally generated digital video database;
3. a human-mediated instruction model for dissemination and training; and
4. regimented sequencing to initiate new communities.

Participatory Content Production

- Introduction to innovations
    – Standard extension procedure
- Rough "storyboarding"
    – Repetitive pattern; easy to learn
    – Minimize post-production
- Local farmers on their own fields
    – Reduce perception of "teachers"
    – Promote "local stars"

Video Database

- More than 2,600 videos of 8-10 minutes each
- Quality-control, minor video editing, and metadata tagging
- Indexed by type, topic, locale, season, crop, etc.
- Distributed via memory cards
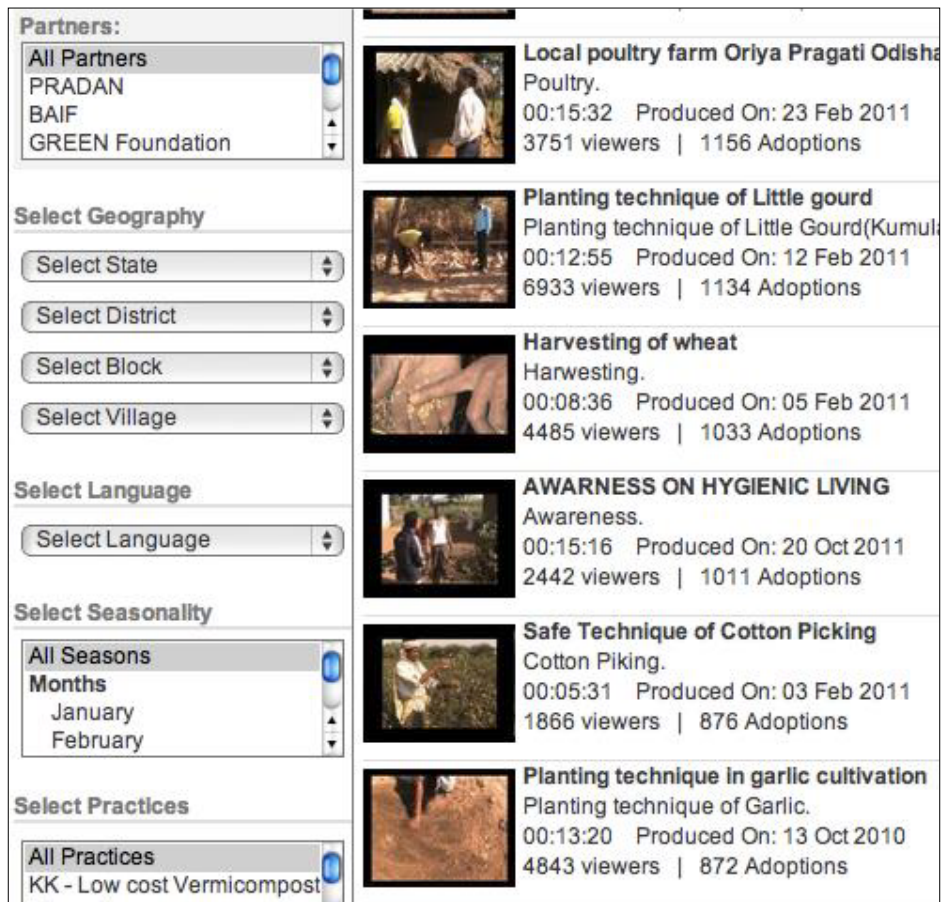
Figure 6. Screenshot of the collection of videos on the Digital Green web page

Mediated Instruction

- Local mediator
    - Performance-based honorarium
- Human engagement
    - Field questions, capture feedback, encourage participation
    - Balance genders
- On-demand screenings
    - Choice time and place
    - Not "stand-alone"kiosk
- Support and monitoring
    - Daily metrics and feedback
    - Official extension staff

Figure 7. A typical night screening with farmers gathered in front of a temple in Yellachavadi, Karnataka

The case study details five lessons learned in working with local stakeholders to provide extension services through alternative methods. These lessons include[2] :

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[2] https://www.agrilinks.org/library/meas-case-study-7-digital-green

Stay flexible, stay relevant
High quality local partnerships matter
It's not just what you're saying, it's also who says it
More information helps make better decisions
Technology isn't a silver bullet

Video is a powerful tool that can help amplify the effective¬ness of extension programs by facilitating communication with farmers. But it should be viewed as just that – a tool – and not a replacement for the hard work of knowing the people being served and delivering high quality, accurate content. Moreover, technology can also hinder programmatic effectiveness if it is not tailored to the social and organizational contexts in which it is used.
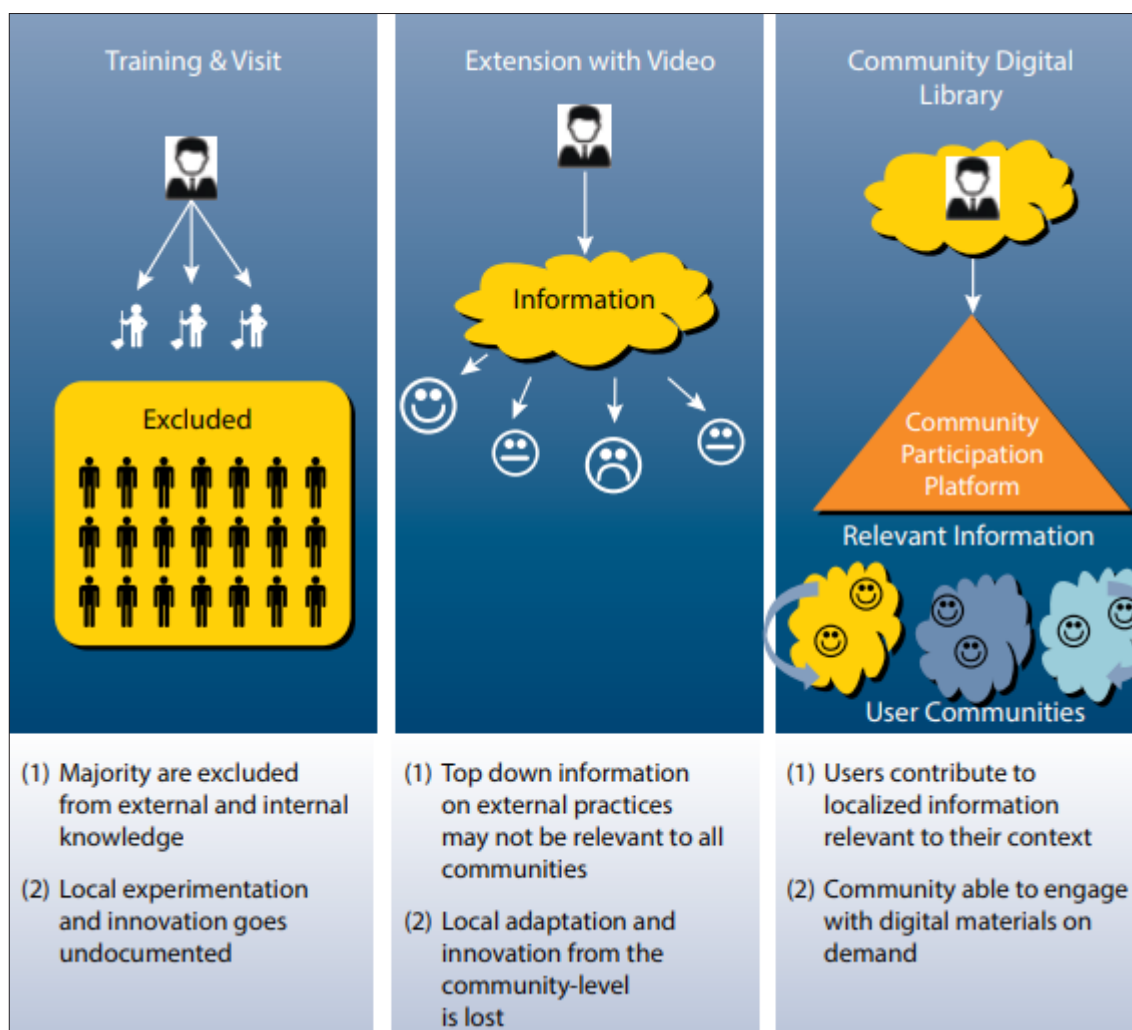

Figure 8. Participatory Bottom up knowledge creation

4.3 Easykrishi

Easykrishi is a young enterprise that uses digital interventions with an aim to change agricultural practices from Reactive Mode to Proactive Mode. It is a consortium of 12 FPOs and 150 Ground Organizations.

In a world of declining land-holdings, we realize aggregation of agricultural resources is the only way to keep this planet sustainable for human survival. Aggregation ensures viability and profitability of Agriculture.

Easykrishi's baby steps in the entire cycle of aggregation of agricultural resources have made significant impact for Food Producer Corporations across Karnataka and they have made a mark on organizations and individuals that are dedicated for the betterment of Agriculture and farmers.

Easykrishi works towards being the India's largest FPO aggregating platform. It aims at passing on the benefits to the farmers & partner FPOs. Easykrishi aims to bridge the agriculture information gap so that farmers can transact on distant markets, buyers can have predictability in supply chain and agriculture financing institutes can have lower operation cost with pre-qualified lending options.
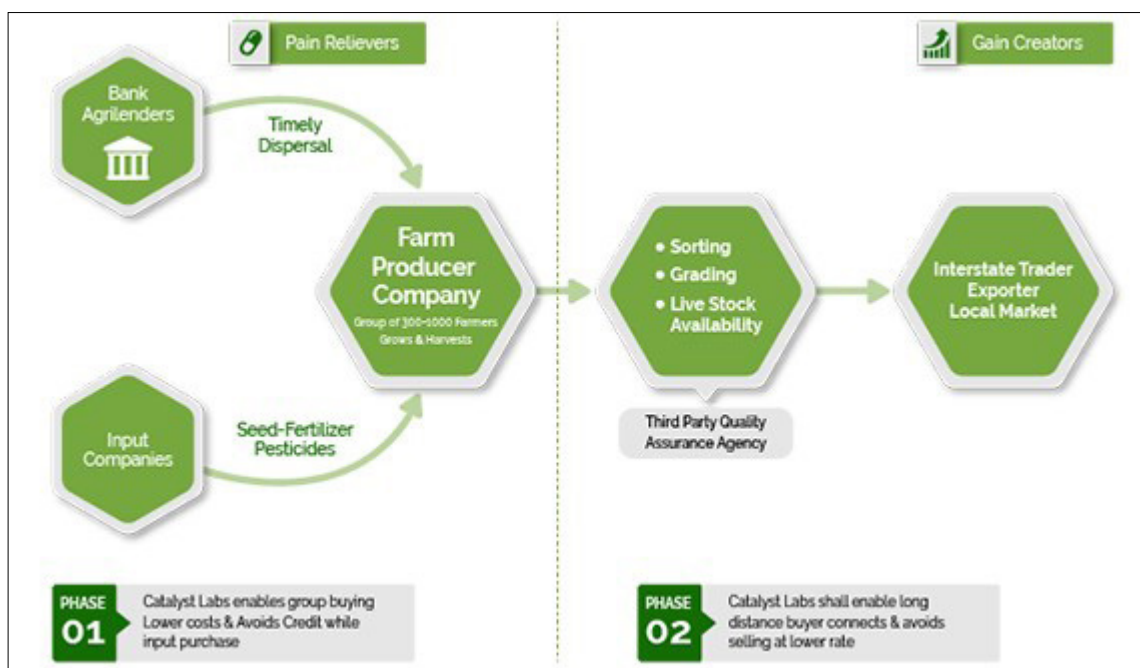
Figure 9. Easykrishi's working model

The Easykrishi app is easy to use and enables real time monitoring of farmer group's activities. The mobile application will be run by a farmer leader who usually handles group 300-1000 farmers. The group can use the mobile application to collect farmer orders (seeds / agricultural inputs) and place a collective order (Demand Aggregation). Production data is entered twice in a season by the village youth who has operational knowledge of internet enabled Smartphone (Supply Aggregation). Supply (agricultural production) information related to:

- Product Variant (Paddy-M5, Pomegranate-Kesari etc.)
- Expected Quantity
- Expected Harvest Date
- Expected Price

This application helps the relevant agencies keep track of all activities in real time and even works offline and has language option.

Benefits of the Easykrishi application

Farmer Group: The mobile application helps the Farmer leader
- Collect all the member orders and collectively buy the agricultural inputs
- Real time production information helps the leader schedule the delivery to the bulk customers
- Monitor the ground activities on mobile and help farmers with agricultural advisories (pesticide/fertilizer application scheduling)

Agricultural Financing Institutions: The mobile application helps the Financing Institutions
- To monitor ground activities of farmer in real time
- To predict the agricultural production and plan for post-harvest activities (warehouse receipt financing)
- To reduce NPAs by having farmer level information
- To build better and newer products for farmers in ever changing agricultural scenario

Policy Makers and Advisory Bodies: The mobile application helps the policy Makers and Advisory bodies
- Creates a massive digital network for cost effective communication at the farmer level
- Helps monitor the effectiveness of the programs in real time
- Helps estimate the right amount of support required down at the farm level
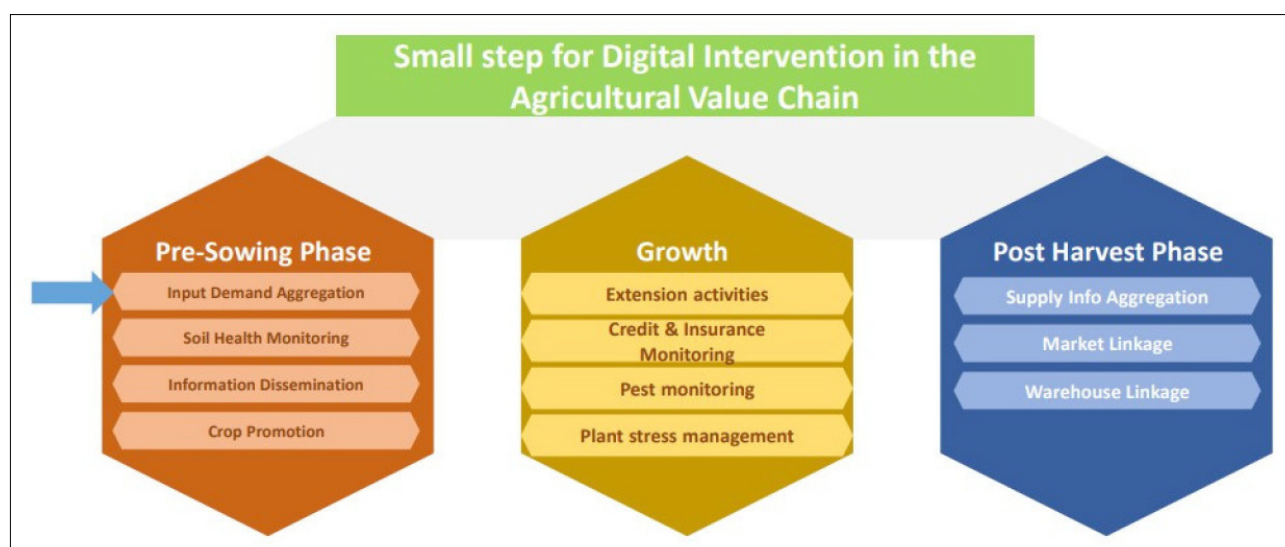- Helps manage the ground assets and monitor its use in real time

Figure 10. Small steps for digital intervention in agriculture value chain

The EasyKrishi Value Proposition

For Farmers
- Credit Facility
- Higher bargaining power
- Reduced Agricultural input costs
- 20 per cent subsidy, over and above the reduced input costs if credit-provisions are closed in time
- Higher margins

For FPOs
- Higher farm produce
- Higher Bargaining Power
- Easier Produce Negotiations
- Higher savings as a result of consolidated transportation costs

For Agri-Product Companies
- Better visibility of demand per geography
- Reduced wastage and inventory losses in Supply Chains
- Bulk sales resulting in transferring portions of their benefits to farmers
- Reduction in reputation risk as the scope for spurious products is eliminated
- Direct access to customers providing them valuable feedback that allows them to tailor their products based on customer needs

For Banks/ Financial Agencies
- Better visibility of financial demands of the agricultural sector by geography
- Increased transparency to monitor and track the use of credit facility provided
- Availability of ground level data that increases the feasibility of development of
- financial instruments specific to Agriculture
- Reduction in potential malpractices possible with credit facilities extended to poor
- Farmers

Group Purchasing

Easykrishi has facilitated the meeting between the input selling companies and the farmer producing companies and helped both of them trade at a competitive price.
Group Selling

EasyKrishi had organized a successful Buyer Sellers Meet in March 2018. The Buyers included Aditya Birla's More, Spar Hypermart, BigBasket and many more. The Buyers were very much interested in knowing which Farmers producer company had which product and at what quantity. This was
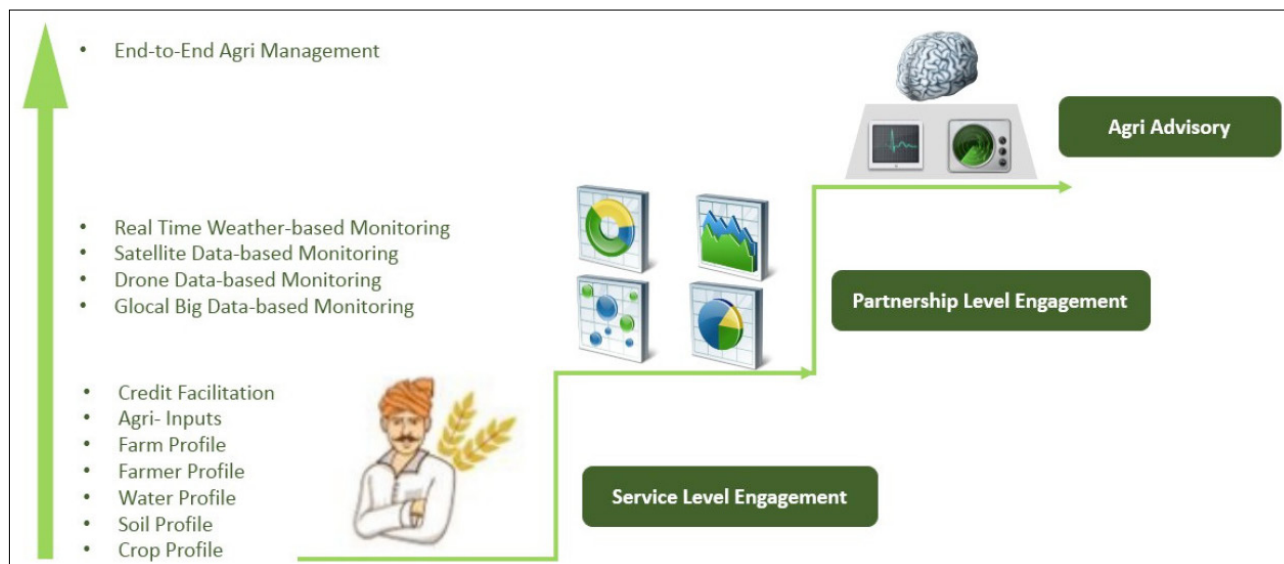
Figure 11. Easykrishi's levels of engagement

the most important information buyers obtained from the meet. The trading happened on a good note and the farmer producer companies were able to obtain a good price for their produce and sell huge quantities of their produce. On the similar lines Hotels Connect was also organized and business worth one and half lakh took place.

The following is the list of FPOs with which Easykrishi is currently working with.

Table No. 3: List of FPOs linked with Easykrishi

Sl. No.	Name of the FPO	District	Crops
1	Chintamani	Chikkaballapur	Horticultural Crops, Tomato, Beans, Capsicum
2	Byadagi	Haveri	Maize and Groundnut
3	Channapattana	Ramanagara	Vegetables and Sericulture
4	Magadi	Ramanagara	Ragi and Mango
5	Anekal	Bangalore Urban	Horticulture and Floriculture
6	Sadali	Chikkaballapur	Rose onion (export oriented)
7	Belur	Hassan	Potato and Beetroot
8	Hussainpur	Mysore	Vegetable, Maize and Paddy

There was a pest outbreak of Army worms in the fields of Mysore. A voice SMS was sent to each and every farmer in the area and more than 20 per cent of the farmers took the appropriate precautionary measures. The loss due to Army worms was thus reduced. The pest diagnosis was done in an advanced stage so the impact was low.

EasyKrishi Case Study: Direct Marketing for Srigiripura Horticultural FPO

Location: Sirigiripura, Magadi

Problem Statement: Enabling Direct Marketing of Horticultural Produce

Problem Description: This FPO was looking for a direct marketing channel to increase the margins of small and marginal farmers.

Solution: With clear visibility of the approximate harvest date as a result of the Crop profiles, it was possible to reach out to buyers from Hotel Chains, looking out for fresh farm produce. They converged-in on Biryani Zone that was willing to purchase farm produce directly.
Farm produce was harvested in the evening. Vegetables and fruits were sorted and graded before they were packed into bags and crates and delivered at Biryani Point by 8 AM the next morning. They were able to preserve the freshness produce since the time between harvest and consumption was less than a day.

Benefits for FPO

- A stable buyer was identified
- Payments were made through NEFT/ Cheque
- There was no need for the farmers to give credit
- Sales were based on current market rates
- Scope for Malpractices by middlemen was eliminated

Benefits for Buyer

- Sorted and graded fresh produce was made available at the doorstep at a competitive price
- Reduced dependency on stored and stale produce
- Reduced the need for manpower and transport needed for procurement

EasyKrishi Case Study: Channelizing Supply of Inputs for Chintamani FPO

Location: Chickballapur, Mandya, Mysore, Ramanagara, Haveri, Davangere, and Chitradurga

Problem Statement: Reduction of Agricultural input costs

Problem Description: Higher demand for agri-input products from Syngenta, Bayer, Monsanto and BASF was likely to spike the market price.

Solution: We aggregated demand from the FPOs and contacted the input companies with our demand requirements. These companies were happy to receive orders from pockets of higher demand and agreed to supply for the demand through company appointed distributors.

Benefits for FPO

- Recognition for FPOs from companies as different channel of sales
- Secured greater discounts
- 3 % to 6 % towards Cash Discounts
- 3 % to 6 % towards Retailer Margins
- 2 % towards Volume Discounts
- Scheme discounts over and above the ones listed above
- There was no need for advance payments to book pesticides
- Pesticides were supplied to the nearest supply point to the FPO after the indented amount was paid for
- The indents for pesticides was to be given in agreed advance notice periods
- Distributors were ready to accept stock that was near expiry times

4.4 e-SAP- A complete ICT solutions for crop health management

The challenge

Crop health management is a complex subject. It majorly encompasses problems caused by and solutions for various pestiferous species of insects, viruses, fungi, bacteria, nematodes and weeds, and nutritional deficiencies that decrease crop yield and impact farmers' welfare. There are numerous species of pests that affect each crop, and not all impact in equal propensities at any given space and time. Pests have always plagued agriculture; the numbers of challenges having multiplied following green revolution. After water, pests are perhaps the most worrisome issue to the farmer in India, and, post sowing, they take away a major chunk of his finances. Total crop losses, even suicides by farmers, have been attributed to pests. Modern agriculture has witnessed the rise of many locally unknown pests, or those that once had a 'minor pest' tag on them. Invasive pests, pest resurgence and pest resistance have complicated the issues.

On the other hand, pest management options are equally complex. There are many microbial, botanical, chemical, cultural, mechanical and biological methods, and there are many techniques and tools for administering these methods to affect and influence pest populations. Some of them are ecologically sensitive, while some others are part of the humble natural world; some are economical, while some others are expensive; some methods suit intensively managed agriculture, while some others suit extensive farming systems, and a mismatch could have dire consequences on the society, like large-scale ecosystem poisoning.

Selection of pest management strategies depends on the intensity of the pest problem at a given space/time. However, assessment strategies to decide on pest intensity vary with crops, pests and physiographical features; taking it to the ground level is a difficult task. At most times, one method of management, or one strategy, would not suffice to lower a pest population; it is a combination of strategies that has been proven to be effective in most cases. This can be complicated because some methods are compatible with some others and incompatible with certain others; some methods are applicable only at a particular time of the day and some others at particular positions above/below the ground. Further, it is often observed that farmer preferences play a significant role in selection of management strategies.

Some look for organic methods, some for inorganic, some prefer cultural and biological, while some others are open to any effective management action. All such variations should be taken into consideration while suggesting remedial actions. Moreover, there is a constant influx of new pest management tools and molecules into the market. These too need to be used appropriately so that farmers and the Nation obtain the maximum benefit. Therefore, pest management is an extremely challenging and complicated section of agriculture.

Adding to the challenges posed by the diversities of pests and their management strategies is the delivery mechanism of pest management solutions to farmers. The social fabric of our farming community, the economic position of our farmers, their level of education, the infrastructure at their disposal and their sheer numbers have erected tall hurdles along the routes of the delivery channels. Of course! This is additional to the complexities of pests themselves and their management strategies. Therefore, there has been little notable success obtained in the field of crop health management, unlike other subjects of agriculture, where there has been measurable amounts of achievements made since the 1970s.

e-SAP Features that assist field workers

- Pest identification
- Pest surveillance
- Pest management
- Pest information

Features that assist policymakers/researchers

- Farmer database
- Data analyses
- Decision support system

Micro-level decision support system is provided on the field device for taking decisions on adopting pest management strategies. e-SAP also makes provision for macro-level decision support in the web application. Based on the data generated across space and time, and built-in

analyses, alerts for various scenarios can be customized by each web-user, which would warn in several ways – on mobile phones, emails, etc. for taking immediate actions on a larger scale.
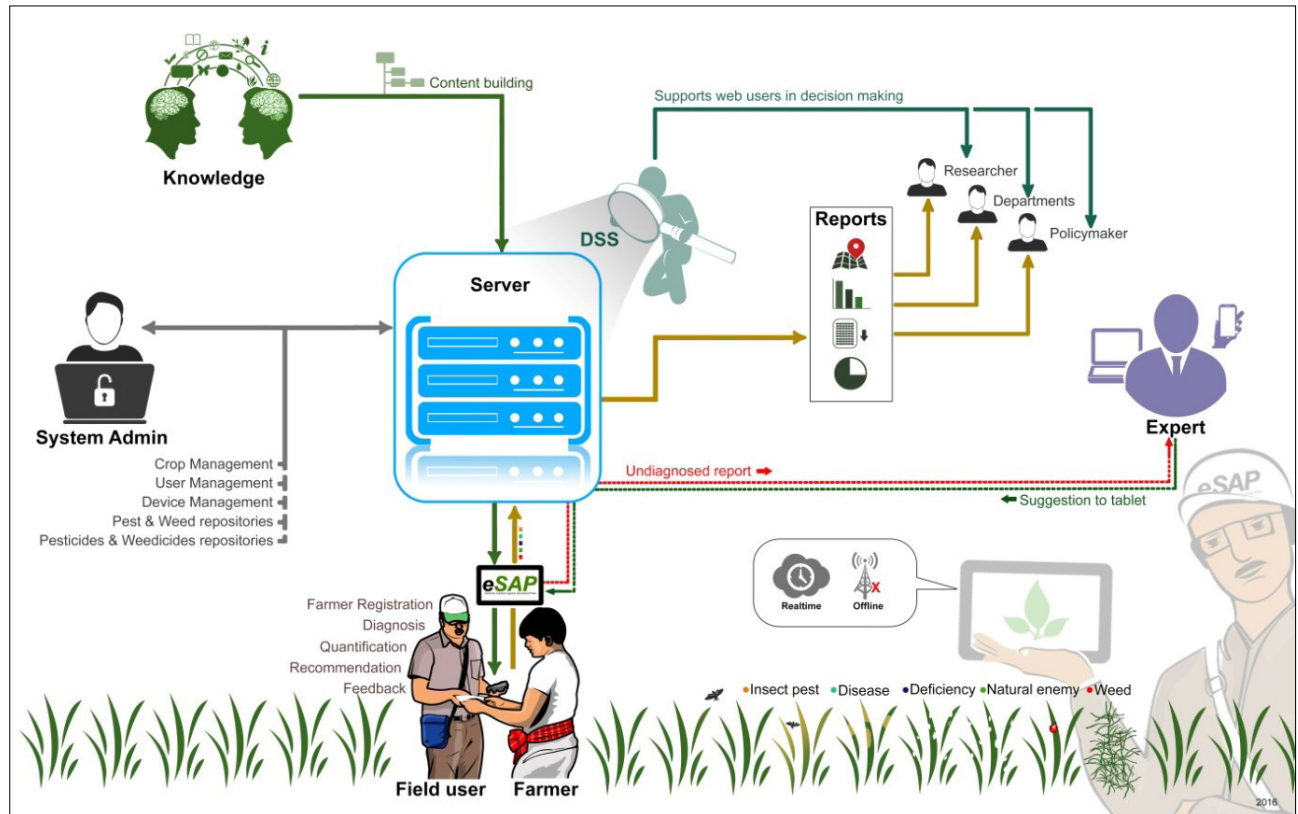
- Content management
- Device management

Figure 12. eSAP workflow

Key result/insight/interesting fact

- e-SAP has reached over 1,00,000 farmers covering 26 crops in all 6 districts   of Karnataka.
- More than 50 extension workers recruited under various projects have received employment opportunities.
- The opportunities for selling ineffective (and sometimes, spurious) substances has drastically come down. The quantity of pesticides applied has also been according to the prescription, which has reduced indiscriminate usage of pesticides.
- e-SAP has helped farmers overcome a major difficulty - reliable identification of their crop pest problems. Further, e-SAP has effectively driven the concept of quantification of the pest problem and has introduced the concept of pest-intensity based management system. Today, many farmers receiving printed prescriptions carry it to the retailers and demand the same to be given to them. It has had a significant impact on the interactions between the pesticide retailers and farmers.   Their confidence levels for tackling pest problems have increased. This is largely because of the fact that they are completely involved in the identification and quantification process by the extension functionary.

Impact

A study on "Perception analysis of e-SAP by farmers in the districts of implementation of e-SAP" conducted by the Extension Department revealed highly positive response from the farmers (70% of the sample farmers gave positive response) regarding the power of the technology in all aspects of crop protection. e-SAP has helped farmers overcome a major difficulty - reliable identification of their crop pest problems. Further, e-SAP has effectively driven the concept of quantification of the pest problem and has introduced the concept of pest-intensity based management system. Today, many farmers receiving printed prescriptions carry it to the retailers and demand the same to be given to them. It has had a significant impact on the interactions between the pesticide retailers and farmers. Their confidence levels for tackling pest problems have increased. This is largely because of the fact that they are completely involved in the identification and quantification process by the extension functionary.

Three more fellow agricultural universities in Karnataka have adopted e-SAP. Together, there are more than 1,00,000 farms in Karnataka who have benefitted from e-SAP till date. More than 100 extension workers recruited under various projects have received employment opportunities. The opportunities for selling ineffective (and sometimes, spurious) substances has drastically come down.

Scientists have discovered many new pest problems in their areas of operation through e-SAP. Notable has been the white-tip disease of paddy and banana skipper. e-SAP has a provision for flagging difficult to identify problems in the field, which has resulted in these discoveries. More important has been the fact that identification of the new problems and their pest management strategies can be disseminated to the field devices in just minutes, such that the field users can henceforth manage these problems by themselves.
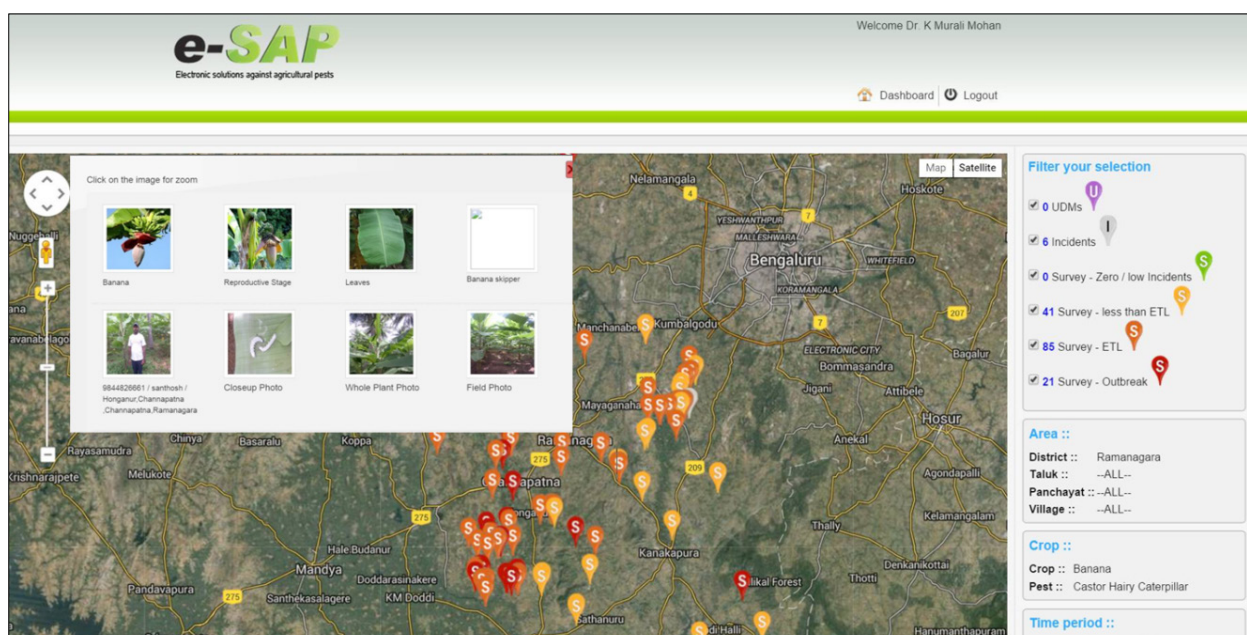

Figure 13. Field captured images of banana skipper from Ramanagara district

Certain area-wide decisions have been taken by managers on the basis of data made available in real-time through e-SAP system. Notable example has been management of cotton leafhopper resistance in Raichur area. Real-time data showed that the pest population was not declining in the area despite adoption of management strategies. Soon, the expert team found that the population had developed resistance to the pesticide. Administrators, with the help of researchers, decided on changing the strategy. The new strategy was made available on the field devices in real-time, which resulted in successfully managing the pest population before it got escalated to serious levels. Such has been the impact of e-SAP.
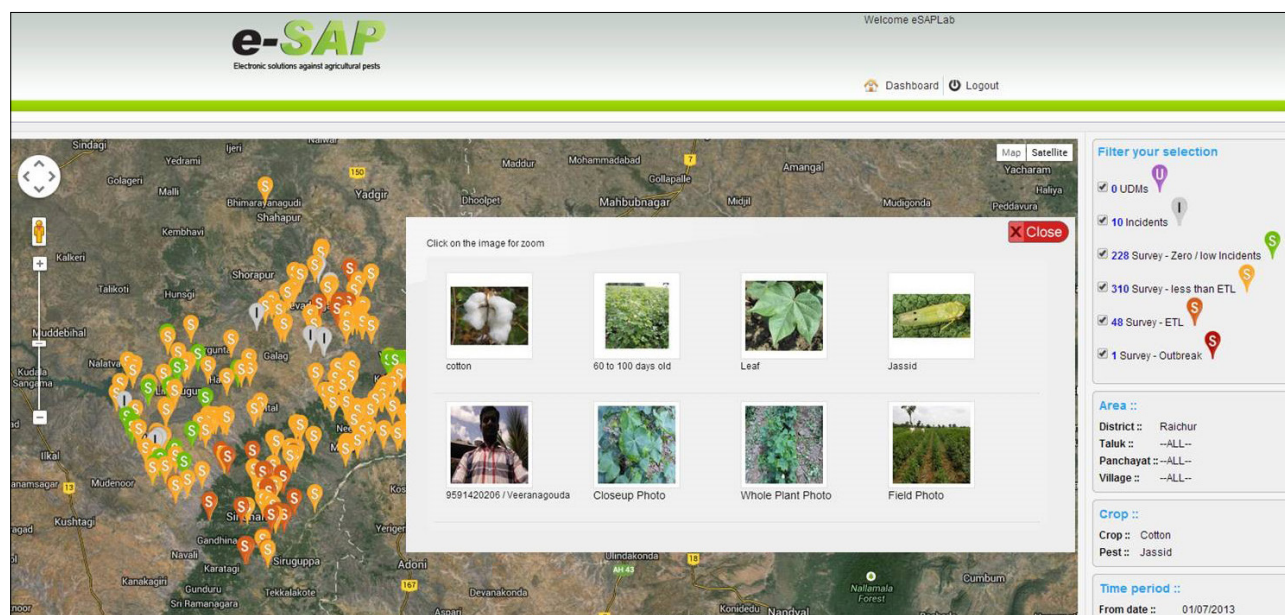

Figure 14. Cotton leaf hopper scenario in Raichur district during 2013-14

4.5 IFFCO Kisan Sanchar Limited (IKSL)

Evolution

In order to harness the potential for ICT in Agriculture, Ministry of Agriculture, Cooperation and Farmers Welfare, launched the scheme "Kisan Call Center" on January 21, 2004. Main aim of the project is to answer the farmer's queries on a telephone call in their own dialect. These call Centres are working in 14 different locations covering all the States and UTs. IFFCO Kisan is managing the Kisan Call centre service on behalf of Department of Agriculture & Cooperation (DAC), Ministry of Agriculture (MOA). IKSL is a Company registered under the Companies Act 1956 and promoted by IFFCO and Others as Joint Venture.

This scheme provides agriculture related information to the farming community through toll free telephone lines. A countrywide common eleven digit number 1800180-1551 has been allotted for Kisan Call Centre. The number is accessible through all mobile phones and landlines of all telecom networks including private service providers. Replies to the farmers' queries are given in 22 local languages. Kisan Call Centre agents known as Level 1 agents respond to the farmers queries

instantly, who are graduates or above (i.e PG or Doctorate) in agriculture or allied disciplines and excellent communication skills in respective local language. Queries which cannot be answered by Level 1 Agents are transferred to higher level experts in a call conferencing mode. These experts are Subject Matter Specialists of State Development Departments, ICAR and State Agricultural Universities.

Nearly 30000 calls are received daily through KCC at 14 locations which are handled by close to 600 Farm Tele Advisors (Agriculture Graduates/Post Graduates) and senior Agriculture experts. The mission of IFFCO Kisan Sanchar Limited (IKSL) is:

To empower Indian farmers:
* With timely and relevant and high quality information and services by leveraging mobile phone.
* To improve informed decision making by farmers which could result in reduction in costs.
* Improvement in quality, increase in income and enhanced opportunities for livelihoods.
* To work with like-minded institutions for transformation of rural India.
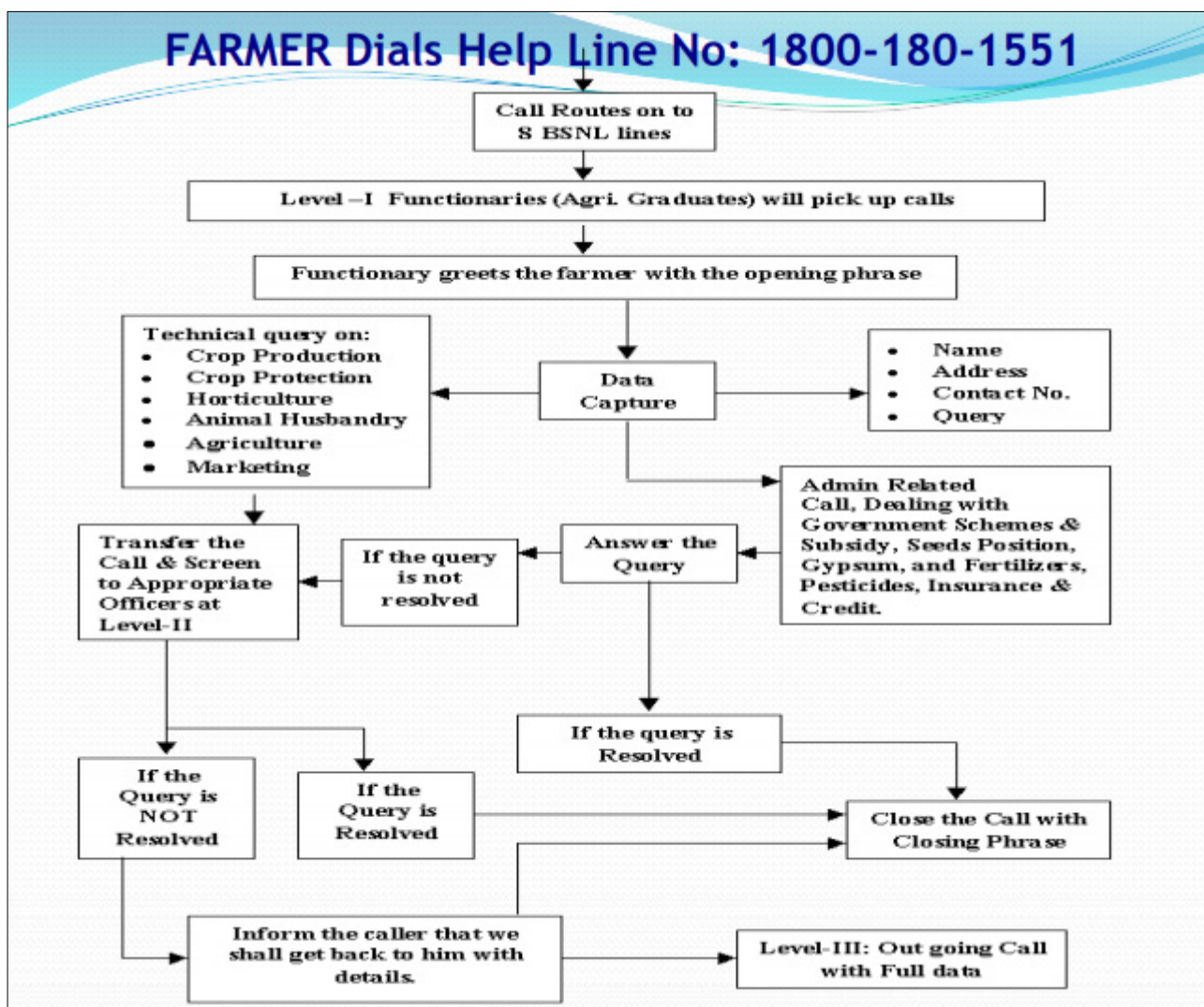

Figure 15. Kisan Call Center Structure

A Kisan Knowledge Management System (KKMS) has been developed to facilitate correct, consistent and quick replies to the queries of farmers and capture all the details of their calls. KKMS has its independent web site http://dackkms.gov.in . The Kisan Call Centre (KCC) Agents working at various KCC locations throughout the country have access to this web site through their specific ID's & Pass-Word provided to them.

On average 1500 calls are received at the call center every day, during season period. Most of the phone call queries are related to weather information (around 13000 calls per month), followed by price information, pest and disease information (around 5000 calls) and varieties of the crop. With respect to schemes, most of the phone call queries are related to Pradhan Mantri Fasal Bima Yojana (around 800 calls), Soil health card (around 300 calls) and dairy loan (around 200 calls).

All the details of the call will be recorded in the KKMS portal. Weather information will be disseminated to the farmers based on IMD website, Accuweather and other local websites. Crop management information will be provided based on the information from the package of practices uploaded in ekrishiuasb web portal. Accurate Price information is obtained from Krishi Marata Vahini and disbursed onto the needy farmers to help them make well informed decisions. Advisories through SMS will be provided at regular intervals to the registered farmers. The following is the classification of the Agricultural query types in detail:

1	Field preparation	14	Organic farming
2	Plant protection diseases	15	Postharvest preservation
3	Plant protection pests	16	Power and roads
4	Water management	17	Seeds
5	Agricultural mechanization	18	Soil health card
6	Bio pesticides & Bio fertilizers	19	Soil testing
7	Credit	20	Sowing time and weather
8	Crop Insurance	21	Storage
9	Cultural practice	22	Training and exposure visit
10	Fertilizer use / availability	23	varieties
11	Government scheme	24	Weather
12	Market information	25	Weed Management
13	Nutrient management		

The major topics handled by KCC experts are as follows
- Disease and pest control for different crops grown in the region
- Good agricultural practices livestock management etc.
- Crop related information in Agriculture, Horticulture, Animal husbandry, Aromatic, spices, plantation crops, cash crops etc.
- Vermicompost, organic farming including organic plant protection etc

- Information on HYV seeds and nutrient management for different crops
- Market related information for different crops in the state
- Farmers support programme which are being implemented by the Government of Karnataka
- Agriculture related information that impact farmers, farming practices etc.

Green Sim

IFFCO Kisan is providing daily 3 free voice based messages in local vernacular language to all the customers with the help of Green Sim Card and empowering farmers with timely, relevant and high quality information and services. The duration of the messages is 60 seconds and it covers a variety of topics relevant to the farmers like agriculture, animal husbandry, weather, market rates, education, health,Government schemes etc. specially created and tailor-made to suit the local requirement. There are approximately 3 million farmers who are getting benefitted by these services on a pan India basis.

Samadhan Services

IFFCO Kisan has launched a unique service for the farmers already using Airtel number to avail the agro advisory services of IFFCO Kisan. The farmers opting for the Samadhan Services would be getting personalized Voice and Text messages for the opted crops as per their sowing date. As an additional feature they will be activated with the premium services in IFFCO Kisan Agriculture app where in the Voice Clips and Text messages meant for them will be available in their Samadhan account of IFFCO Kisan Agriculture app. The Samadhan subscribers are recommended to download IFFCO Kisan agriculture app and get registered with the mobile number activated for Samadhan Services. To activate the Samadhan Subscription the farmers need to go to the nearby IFFCO Kisan Retailer or Airtel Retailer and can activate the services by paying nominal amount as per the pack chosen. The personalized advisory voice clips will continue to be featured in IFFCO Kisan Agriculture app even after the Voice/Text Message credit as per the subscription pack is consumed. The farmers once registered in Samadhan Account of Mobile app can change their crops and sowing dates in order to get relevant personalized message in every crop season. IFFCO Kisan team is working towards rapid expansion of retail network to ensure serviceability to the farmers with availability of Samadhan Balance in their vicinity.

Sampark Services

IFFCO Kisan is launching a new feature named "Sampark Services" in the IFFCO Kisan Agriculture app to benefit the farmers in India by enabling them to choose the right dealer with best pricing and offerings on agro inputs such as fertilizer, pesticide, agro equipment etc. As a part of Sampark Services IFFCO Kisan is putting hard effort to register various government and non-government agencies giving schemes and subsidies to the farmers. The farmers do have search option to identify the dealers in their vicinity with necessary filter features. The willing dealers can contact

IFFCO Kisan to get registered under the Sampark Services by paying a nominal registration fee and a very nominal monthly maintenance fee to get featured in the digital platform of IFFCO Kisan. The services will no doubt enable the dealers to reach the larger user base of IFFCO Kisan and will increase their engagement with farmers. The farmers will be saving their cost by choosing the best price and best dealer with multiple options.

Kisan suvidha

Figure 16. Kisan Suvidha

Kisan Suvidha is an omnibus mobile app developed to help farmers by providing relevant information to them quickly. With click of a button, they can get the information on weather of current day and next 5 days, dealers, market prices, agro advisories, plant protection, IPM Practices etc. Unique features like extreme weather alerts and market prices of commodity in nearest area and the maximum price in state as well as India have been added to empower farmers in the best possible manner.
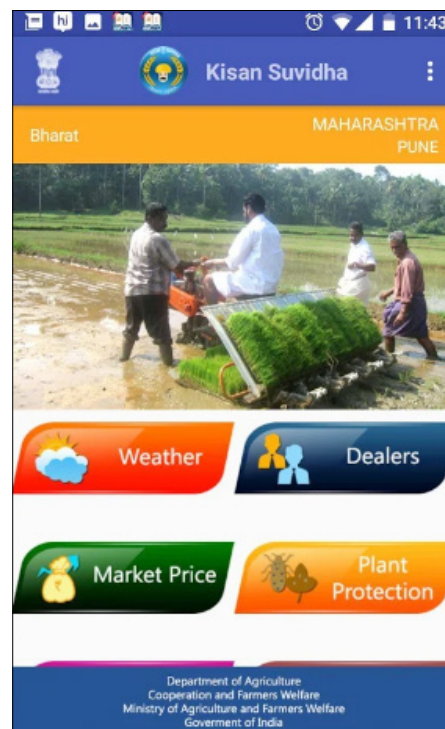
IFFCO Kisan

Figure 17. IFFCO Kisan

"IFFCO Kisan" is an Indian agriculture farmer suvidha App, which helps the Indian farmer/ Kisaan to take informed decisions by accessing customized agricultural information related to their need. The app provides the latest mandi prices, weather forecast, agricultural advisory, best practices tips related to agriculture, animal Husbandry, horticulture; a buyer and seller platform, and all agriculture related news and government schemes. This app is to provide
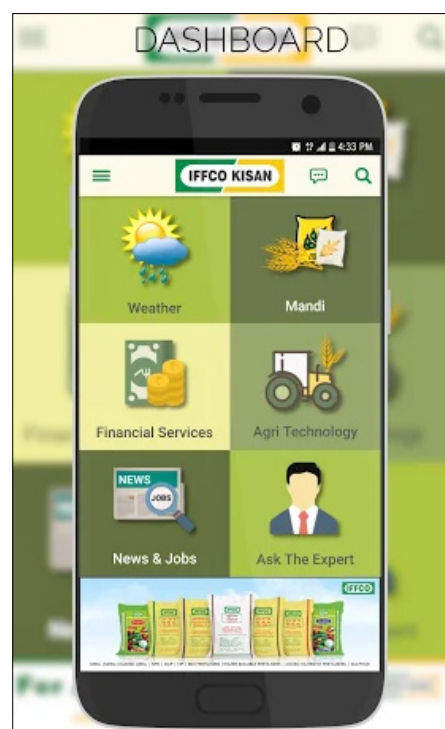
agriculture alerts and agriculture advisories in 11 Indian languages in text as well as agriculture audio clip for the convenience of the farmers who are most comfortable in their own language.

Weather- This section provides instant access to weather forecast for next 5 days with temp, RH, rainfall possibility, expected wind speed & its direction in the set preferred location. Farmers may add and remove preferred locations for weather forecast. It will help farmers to plan and take corrective action for agricultural & farming related activities. At a time, 2 districts can be selected as preferences for weather data access. Data source-IMD

Market or Mandi- Farmers can get instant access to mandi prices for their produce, market status and prevailing trade prices along with quantities. Farmers can also view price trends for their produce and plan sale of their produce. Farmer can get last 3-updates on transactions in the market on any agricultural commodity at any point of time. Data source- AGMARKNET & NCDEX.

Agricultural Advisories- This is the crop specific advisory service for various agro-climatic zones. These advisories and alerts are provided based on research by industry experts; our agricultural advisories guide rural farmers to initiate necessary & corrective actions based on prevailing weather conditions.

Ask our experts- Through this feature, farmers can talk to industry Agriculture experts and get agricultural advice on 1-click. It is very useful for those farmers who have difficulties in writing, they can just take a photo of the plant or concerned area/ disease and can send it to our experts to study the issue through the app. Our experts will provide personalized agriculture solutions through voice call.

Gyan Bhandar- An agriculture information library for the farmer to get all important agriculture information related to crops, agriculture cycle, agriculture field preparation, water management, agriculture diseases management and agriculture proactive actions.

Helplines- Farmers can access the exclusive IKSL '534351' agriculture helpline service through the "IFFCO Green SIM card" to get access to IKSL experts and also get OneTouch connectivity to Kisan Call Centre Services "18001801551" number from the IFFCO Kisan app.

Market place- This feature is the buyer and seller meeting platform, where a buyer or a seller can register his/her buying or selling requirement/s. It will help them to buy or sell faster, with higher profitability.

The 2nd green revolution will come in the country based on science, technology in the agricultural sector. Prime Minister Narendra Modi launched the Kisan app for the farmers, benefits of which can be obtained through the IFFCO Kisan app.

IKSL Successs Story[3]

Farmer Name: Nagappa
State: Karnataka (Southern India)
Problem faced: Plants are not flowering
Region: Kudarimothi (Koppal)
Crop: Crossandra Flower crop
Solution given: Spray of Calaxin @0.5 ml/litre water
Benefits obtained: Started getting 5-6 kg flowers every day from 0.2 ha area
Net increase in income: INR 14874.09/month

4.6 Krishi community radio station

Community radio means broadcasting with the objectives of serving the cause of the community in the service area by involving members of the community in the broadcast of their programmes. Community radio is a people's venture which reflects the hopes, aspiration and concerns of a community, generally ignored or overlooked by the mainstream media. People decide and articulate their communication needs and priorities themselves. It is a democratic mode of communication which enhances the participation of the people in the development process and helps in capacity building.

The University of Agricultural Sciences, Dharwad, has been catering to the needs of the farming community of Northern Karnataka. Despite rapid technological changes in telecommunication in the last few decades radio broadcasting remains the cheapest mode of information dissemination, catering equally to the needs of the rich and poor, rural and urban masses and reaching the remotest parts of the country. Needless to say, it plays a vital role in the country's socio-economic and cultural development. In view of this the University of Agricultural Sciences, Dharwad on 17th May 2007 launched the Krishi Community Radio Station, FM 90.4 MHz exclusively for the overall development of farming community in the area immediately surrounding the University.

It is the first Community Radio Station in India, under the State Agricultural Universities setup and first community radio station in Karnataka. The effective coverage of this Community Radio Station is around 15-20 kms airing programmes for six hours each in the morning three hours and evening three hours. The evening programmes are aired from 5.00 pm to 8.00 pm while the morning programmes aired from 6.00 am to 9.00 am and are a repetition of the evening programmes.

The station is broadcasting talks on the latest agricultural technologies under the guidance of expert agricultural scientists and successful farmers. The station committee includes all the divisional heads of the University, development departments, input agencies, NGOs, farmers and farm women. This committee chalks out the programmes that catch the attention of the rural people. The programmes are broadcasted in the North Karnataka style.

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[3] http://direct2farm.org/Success_stories.aspx
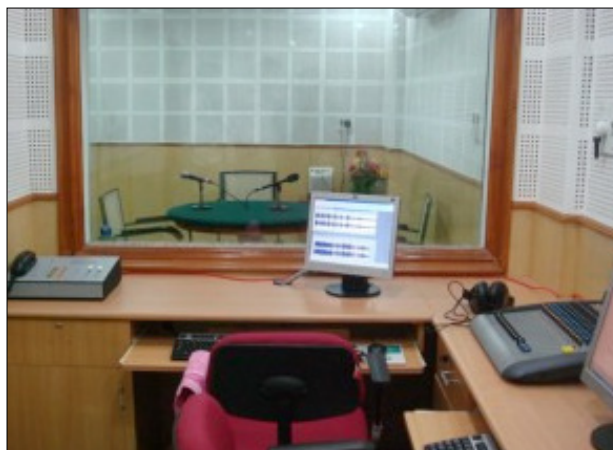
| Figure 18. Krishi Community Radio Tower | Figure 19. Control room of Krishi FM 90.4 MHz |

Features and objectives of Community radio

- Community radio is restricted to specifically identified community
- For all happenings, Community radio shares partnership
- In its activities pertaining to the subject matter it considers community problems, aspirations and cultural interests
- The community members have the right to direct, act and suggest regulations. The ownership rests with the community
- In any programme there is support for participation of more and more community persons
- Regulation and broadcasting time will be decided according to convenience and interest of community
- Whenever outsiders are giving the programme community interests are given main focus
- Mainly entertainment is given a main focus besides covering aspects in information, guidance, education, awareness, self confidence and confidence building
- Community's community interests are more prioritized than commercial interests
- Equality is given to all participants irrespective of different groups, sex, age and other considerations

Working principle of Community radio

- Community radio licence is given to non profit making community based NGOs, KVKs, Society's and Voluntary Organizations.
- Registered society's should provide at least three years useful service to local community
- Community radio should provide specific service to specifically identified local community
- The management and ownership of radio should be represented by local community
- Radio programmes broadcasted should cover community education, development, social and cultural necessities of community
- Community radio shouldn't broadcast politically oriented news items
- In one hour programme, five minutes advertisement is permitted, covering local programmes, commercial business and other items.

- Atleast 50 per cent of the programmes should be based on community participation
- Programmes should be based on local languages

Programmes of Agricultural Community Radio Center

- Fortnightly suggestions to farmers
- People friendly programme Weekly Basanna discussion
- Instruction to farmers
- No cost / Least cost agriculture
- Soak pit
- Save water
- Cleanliness in towns
- Seed Germination indicates growth – A proverb
- Tips in insect management
- Ayurvedic method of insect management
- Folklore (Janapada geethe)
- Gigi pada
- Children's world
- Vachanagalu
- Devotional songs
- A laughing injection for a serious life
- Kitchen palace
- Beautification
- Interview with scientists
- Village aroma
- Agriculture lessons
- Farmers – Scientists interaction
- Problems of women folk
- Confidence building among farmers
- Village view
- Phone in and phone out programmes
- Kannada lessons of Agriculture community radio center

According to Panchapakesan (2018), Community radio can be an agent of change:

- As friend, companion and counselor
- By fostering
- As enterprise
- By incubation
- By practices
- By sharing and caring

- As hand-holding and guiding
- Technologies transfer and guidance
- To touch, reach out and possibly reverse the change of the depleting agricultural communities across India
- By education – both in the formal and informal sectors

According to Panchapakesan (2018), Community radio particularly in Agricultural extension is suited to:

- Share and pass on new and traditional information
- Debate and ratify model and new practices
- Archive local and value based traditions
- Be a repository of knowledge that can be shared
- Preserve ancient customs and folklore, the music and its genres
- Encourage blossoming and new, promising talent
- Tap potential and inspire the next generation
- Most importantly, sharing and caring with real experiences

While designing the format of the programme every member of the rural community is considered to maximize benefits to the rural population. Regular feedback of the community is also taken to develop need-based programmes. Out of two hours, one hour programme is on agriculture and one hour programme is equally distributed for health, education, rural development and local culture.

A needs assessment survey was carried out based on which programme schedule and format has been developed. Local youths, working on freelance basis, were trained through specially developed courses by KVK to develop the content for Community radio station. Each representative covers 25-30 villages. These Community radio station representatives, also working as announcers, are trained such that they are conducting interviews on all the subjects and issues related to the community. KVK has also developed interactive phone-in-live programmes and discussion oriented programmes engaging the local community.

Signature Programme: Out of 60 minutes agriculture programme, 30 minutes programme is Krishi Vani programme where agriculture technology and success stories developed by KVK and other line departments are the focus. Another 30 minutes programme is reserved for live interactive and dramatic programme on agriculture. Special programme like Hello Yashwant (successful farmers), Hello Scientist, serial discussion on particular theme/concepts, panel discussion on recent/current issues, weekly review of agriculture activities and agriculture technology dissemination through local culture are being developed. All these formats help us develop more interesting programmes.

4.7 mKisan

Under the National e-Governance Plan-Agriculture, an SMS Portal was inaugurated by the Hon"ble President of India in 2013 which provides mobile based services to farmers. While mobile phones have deeply penetrated into rural India, the use of internet facilities is still very limited. In this context, mobile messaging is a very effective tool which can reach the interiors. Hence m-Kisan-SMS Portal for farmers was created which enables all central and state government organizations in agriculture and allied sectors to give information/services/advisories to farmers by SMS in their language on agricultural practices and specific needs of farmers[4]. The main objective of mKisan is the use of mobile technologies to strengthen farmer-extension-expert linkages in India. mKisan is part of the mAgri initiative and it looks at issues of dissemination of information without intermediaries to focus on scale and content quality management.

Figure 20. Screenshot of mKisan web portal

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[4] http://www.gipe.ac.in/admin//uploads/1522213367_KCC_Full_Report_with_cover-March_28-18-min.pdf

The SMS Portal was conceptualized to give a quantum leap in coverage of farmers and geographical area in a timely, specific, holistic and need based knowledge dissemination among the farmers. This is done by leveraging the power of mobile telephony in such a way that all sectors use this platform to not only reach out to the farmers but also resolve their problems and queries.

The main objective of the project was to first create a centralized knowledge base from the perspective of farmers which was termed as Farmer's Portal (www.farmer.gov.in) in Hindi and English language. It was observed that while over 800 websites of various departments and Organisations related to agriculture and allied sectors in the central and state governments and 80 portals of the department pertained to agriculture and allied departments, there was not a single portal for the farmers. This created the need for a portal especially for farmers and SMS portal was introduced. This portal became very popular by all users and a third level domain was created for all mobile based services for farmers on a Unified Portal namely, www.mkisan.gov.in.

The purpose of the Portal is mainly:
a. To make SMS and other mobile based services as a tool of two way agricultural extension so that not only specific information/advisory services are provided to farmers in a broadcast mode but the farmer can also raise specific queries through Pull SMS or USSD.
b. Since mobile phones have penetrated in the interiors at a rapid pace and there is wide coverage the portal aims at covering every farm household and bringing a level playing field for small and large farmers also.
c. To bring about a centralized system wherein different modes of information flow are channelized and spread to the farmers in their own language.
d. To make an integrated portal which ensures storage of previous advisories/messages and also effective monitoring.
e. Since internet penetration is very limited, sending text messages to bridge the gap.
f. Providing web based services through SMS is also an important goal.
g. Integration with other farmer-centric services such as Kisan Call Centres, Common Service Centres, Web Portals for extracting relevant information and also for feeding data from remote locations where internet services are not available or are unreliable.

The SMS portal has unique features like database to shift farmers to block level and to select specific agricultural commodities/ correction of messages by supervisory officers, searchable of data base of previous advisories, etc. Nearly 3000 officers and experts from central and state government have been activated and are using the portal in 12 languages by using easy phonetic typing.

About 7 million farmers have already opted to receive advisories & services on their mobile phones. The farmers have been put in groups depending upon the state, district, block and the crop /activities selected by respective farmers. Nearly 20 web based services across the country have been integrated with the SMS portal and many more are in the queue. Some of these include

buyer-seller interface, choice of machine & dealer, Kisan Call Centre, market prices, agromet advisories, farm mechanization, micro-irrigation, animal husbandry, fertilizer testing, etc.

As per TRAI data of May, 2014, though there are about 38 crore mobile telephone connections in rural areas, internet penetration in the countryside is still abysmally low (in single digit percentage). Therefore, mobile messaging is the most effective tool so far having pervasive outreach to nearly 8.93 crore farm families.

As part of agricultural extension (extending research from lab to the field), under the National e-Governance Plan - Agriculture (NeGP-A), various modes of delivery of services have been envisaged. These include internet, touch screen kiosks, agri-clinics, private kiosks, mass media, Common Service Centres, Kisan Call Centres, and integrated platforms in the departmental offices coupled with physical outreach of extension personnel equipped with pico-projectors and hand held devices. However, mobile telephony (with or without internet) is the most potent and omnipresent tool of agricultural extension.

The project conceptualized, designed and developed in-house within the Department of Agriculture & Cooperation has widened the outreach of scientists, experts and Government officers posted down to the Block level to disseminate information, give advisories and to provide advisories to farmers through their mobile telephones. Since its inception nearly 327 crore messages or more than 1044 crore SMSs have been sent to farmers throughout the length and breadth of the country. These figures are rising ever since.

These messages are specific to farmers' specific needs & relevance at a particular point of time and generate heavy inflow of calls in the Kisan Call Centres where people call up to get supplementary information. SMS Portal for Farmers has empowered all Central and State Government Organizations in Agriculture & Allied sectors (including State Agriculture Universities, Krishi Vigyan Kendras, Agromet Forecasts Units of India Meteorological Department, ICAR Institutes, Organization in Animal Husbandry, Dairying & Fisheries etc.) to give information/services/ advisories to farmers by SMS in their language, preference of agricultural practices and locations.

USSD (Unstructured Supplementary Service Data), IVRS (Interactive Voice Response System) and Pull SMS are value added services which have enabled farmers and other stakeholders not only to receive broadcast messages but also to get web based services on their mobile without having internet. Semi-literate and illiterate farmers have also been targeted to be reached through voice messages.

Officers from different departments and organizations of Central and State Governments can register themselves for sending advisories to farmers through this portal. On approval of registration request by superior/designated officer of the intended user, he can commence using this application for reaching out to the farmers under his/her jurisdiction.

Farmers can register themselves for receiving these messages on their mobiles as per their specific needs & relevance at a particular point of time. They can register themselves for this service through any of these channels:

- Web Registration at http://farmer.gov.in/Advs/WebRegistration/WebReg.aspx
- Kisan Call Centers (KCC) - by calling on Toll free number - 1800-180-1551
- Sending SMS at 51969 or 9212357123
- Common Service Centers (CSCs)
- State/District or block agriculture offices

Recommendations

- These ICT initiatives are meeting the selected portions of the population and they have to be popularized to meet the large sections of the community
- Use of mobile application is very limited among the farmers. This needs to be analysed and promoted extensively amongst the farmers. e-literacy schools need to be established for this purpose.
- The number of messages sent is very limited, particularly given the cost factor. So steps need to be taken to increase the number of messages sent.
- Alternative modes of communication need to be established in places where power and internet connectivity turns out to be barriers.
- There has to be dynamism in the way, package of Practices is utilized for information dissemination
- Periodical studies need to be undertaken to evaluate the ICT initiatives undertaken for further expansion
- Given the potential of youth in utilization of ICT, proper training amongst them will be a great boost for agriculture development.
- Development of infrastructure is crucial for the widespread dissemination of ICT benefits.

Conclusion

All the seven case studies documented in the above report teaches us one unique way in which ICTs can help, build and transform the lives of the farmers. ATIC as a single window for information delivery, Digital green's use of video as a tool for disseminating agricultural technologies information, Easykrishi's role in aggregating all the FPO's digitally, e-SAP's solutions for addressing the issues related to pest management, IKSL's call center solutions for all the farmer's queries, Krishi Community radio station for serving the cause of the local community and mKisan's use of messaging have all empowered the farming community. This reminds us of the longer path we need to cover with these few initial adventures, such that they help us reach across the length and breadth of the country, thus making agriculture a profitable venture.

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