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Trends of Mobile Applications in Farming

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A B S T R A C T

Extension is the ongoing process of transferring the useful information to the people (the communication dimension) and then assisting them to acquire the necessary knowledge, skills and attitudes to utilize this information or technology effectively (the educational dimension). Thus extension is the central mechanism in the farming development process, both in terms of technology transfer and human resource development. Information adoption among farming community is widely acknowledged as one of the critical factors for efficient and effective agricultural decision-making and it has been emphasised that the use of Information and Communication Technology (ICT) tools have potential to change the economy of livestock, agriculture and rural artisans in India. Particularly, mobile is used to disseminate timely information regarding best cultivation practices, seed availability, cropping pattern, weather forecasts, fertilizer usage, market information, organic practices and information about vaccination, insurance alerts, livestock diseases, exotic and indigenous breeds, feeding management, livestock rearing and government schemes on animal husbandry. Mobiles are going to revolutionise farming extension with all its incredible applications and will be great aid to the human resource of the extension system.

Introduction

The challenge for the Indian government and policy makers is to increase the productivity in farming sector and thereby to meet the high food demand in the country. A major dilemma in the present situation – rising food prices and an ever growing population – is to strike a balance between policies for food security and policies to improve income levels of farmers. With agriculture and allied sectors being constrained by the availability of land, improving productivity remains a crucial factor for the future of India's food security.

Research, extension, literacy and infrastructure have been identified as the most important sources of growth in productivity in literature (Mittal And Kumar, 2000; Kumar and Rose grant, 1994). The development of markets improves input-output market

interface and this is important for productivity growth. In agriculture and allied sectors, education and access to knowledge creates conditions that enable farmers to acquire and use information for decision making regarding allocative and technical matters effectively. This leads to growth in the adoption of technology, improved farming practices, market assess etc.

The World Development Report 2008 (World Bank, 2007) emphasized that agricultural extension plays an important role in its development and in promoting sustainable, inclusive and pro-poor economic development. Also access to ICT can have a tremendous positive impact on sustainable development and poverty reduction (Torero and Braun, 2006).

Information adoption among farming community is widely acknowledged as one of the critical factors for efficient and effective agricultural decision-making (Cash, 2001; Galloway and Mochrie 2005; Rao, 2006). Sasidhar and Sharma (2006) have emphasised that the use of Information and Communication Technology (ICT) tools have potential to change the economy of livestock, agriculture and rural artisans in India. But recent stagnation and in some regions total breakdown of extension services has led to large gaps in the farm yield and productivity. Insufficient extension services and poor access to information has impeded the transfer of technology at the farm level. The results of the situation assessment survey of farmers conducted by the National Sample Survey organization (NSSO, 2005), GoI, revealed that only 40% of the farmer households have access to information about the new farming technology.

In India, there are about 120 million farm holdings and the number is growing year by year. To provide at least one village extension personnel to 800-1000 farm families, the requirement of field level extension personnel is estimated to be about 1.3 to 1.5 million, against the present availability which is only about 0.1million (100 000) personnel (PC, GoI, 2007). According to estimates, on an average public extension personnel spends 40 minutes per year for a farmer (Dileepkumar, 2012). With this kind of contact intensity, a complementary service is a non-negotiable need of the country's farmers. And information needs are growing rapidly with the introduction of modern technology, hybrid seeds and changing climatic conditions. Thus, farmers often find that their traditional knowledge, experience and guesswork to make decisions for day-to-day activities are not very effective in changing circumstances.

In this existing scenario, it is expected that the integration of ICTs in agricultural extension will provide much needed impetus to agricultural sector and ICTs can complement the traditional extension system for "Knowledge Resource" delivery to the millions of the farmers (Saravanan, 2010). Among ICTs, impressive penetration of mobile phones in many of the developing countries changing the agricultural communication process and mobile phones have made personal communications readily accessible, for the first time, to women and men, poor and prosperous, rural and urban dwellers in developing as well as in industrial countries (Colle, 2011).

National telephony and mobile infrastructure scenario

In India, increased penetration of mobile handsets, large number of potential users, increased spread of communication, and low cost of usage lead to growth of large number of mobile based information delivery models for the farming sector.

Strategic reforms in telecommunications sector since 1990's have facilitated strong ICT infrastructure in India. As on august 2015, the number of telephone subscribers was 1014.70 million (988.69 million wireless and 26.01 million fixed land line telephones) were estimated by the Telecom Regulatory Authority of India (TRAI, 2015). The tele-density has reached 80.44 as of August, 2015(number of telephone subscribers per 100Individuals). However, there is huge gap between urban and rural tele-density, 151.09 and 48.64, respectively. But monthly growth rate (August, 2015) in wireless subscribers in rural area (0.59%) is slightly higher than that in urban area (0.54%).

Mobile as an ICT tool over other extension methods

Limitations of traditional livestock extension methods like face to face interaction, farm and home visits, using print Medias like posters, leaflets etc. are

Expensive

It costs a lot of money to produce and print extension materials and to train a whole chain of livestock extension personnel to understand the new technology and to answer the possible queries from the livestock owners.

Time consuming

For a message to pass from a research station / university to the livestock owners, it involves many actors to understand and deliver the message to next layer. The process takes lot of time and efforts on the part of livestock extension machinery.

Distortion

A number of evaluation studies of Training and Visit system indicate that the quality of extension messages gets heavily distorted and eroded when it ultimately reaches the end users. The distortion increases both increase in the number of actors and channels in the communication process.

Poor communication capacity

Most technical staff within State Animal Husbandry Departments (SAHDs) lack the capacity to effectively communicate with both the research system and the stakeholders group.

Very often it has been reported that not more than 30 per cent of the technology reached the farmer.

Mobile as an ICT tool over other traditional ICTs

The common feature of the traditional ICT's like television and radio is that they were purely the one way mode of transmitting information (MITTAL and TRIPATHI, 2009).

Although slowly and gradually the traditional ICT's started disseminating information in localized language, but since their transmission was for a large mass of farmers spread over various districts and villages, the content will not specific needs and is generic for major new innovations and technologies.

Key benefits related to mobile phones and farming livelihoods

Helping farmers to raise their incomes

As mobile phone coverage increased in Kerala, fishermen bought phones and started phoning along the coast to look for beach auctions where supplies were lower and prices higher than at their home beach. Fishermen rapidly learned to calculate

whether the additional fuel costs of sailing to the high-priced auction were justified. Price dispersion was dramatically reduced, declining from 60–70 percent to 15 percent or less.

There was no net change in fishermen's average catch, but more of the catch was sold because wastage, which previously averaged 5–8 percent of the daily catch, was effectively eliminated.

The rapid adoption of mobile phones improved fishermen's profits by 8 percent and was coupled with a 4 percent decline in consumer prices (Jensen, 2007).

Making agricultural marketing more efficient

A study in Indian states in 2012 revealed that, 87.2% farmers felt that, they are better connected to the markets after the introduction of mobile phones.

71.7% farmers have now better access to the price information of various commodities. (Mittal and Mehar, 2012)

Reduces transport cost

Mobile phones act as a substitute to travel which reduces farmers' time and cost burdens. Accurate and timely market information, particularly of perishable items, can significantly reduce transaction and travel costs. (Overa, 2006)

Message delivered will be information rich

Mobile enables multimedia mix that is – combination of text, audio, video, graphics and animation. So provide information to farmers - in an effective, efficient, instant, interactive and in a participatory manner. (Mittal *et al.,* 2010)

Mobile applications are

SMS (Short Message Service)

Information that is delivered will be in textual format

This application is compactable to all phones

Recent application for Bulk messages and Web based SMS are evolved where large number of population can be covered

Information can be store and accessed at any time

Limitations

The characters should be limited to 160, so requires special treatment of the message for complete meaning of information.

The person able to read the message that is he should be literate.

A study on SMS based information delivery in kalburgi district KVK of Karnataka conducted by Sidramappa *et al.,* (2013) where SMS were delivered periodically to the needy farmers regarding pest management, weather forecast, livestock management, cropping pattern market information etc. Result revealed that Farmers are able to save their time, energy and money to the extent of 80 percent by timely accurate information and this system enabled the farmers to react immediately for clarifying any doubts with the scientists.

Here farmers mainly depended on the SMSs pertaining to the weather forecasting (83%), integrated pest management (77%), Disease management (72%), new varieties and seeds (68%), Livestock management (65%) and organic practices (45%).

Kissan call centre (Farmer call centre)

The Department of Agriculture and Cooperation (DoA and C), Ministry of Agriculture, Govt. of India launched Farmer Call Centres across the country on January 21, 2004, to deliver extension services to the farming community.

The purpose of these call centres is to respond to issues raised by farmers, instantly, in the local language.

There are call centres for every state which are expected to handle traffic from any part of the country.

Queries related to agriculture and allied sectors are being addressed through these call centres.

An evaluation study by Hanumankar (2011) asserts that there was considerable interest and acceptance among farmers for call based agricultural extension services.

The study shown that 84% of the farmers who called the KCCs expressed overall satisfaction from the advice provided through the helpline.

IFFCO Kisan Sanchar Limited (IKSL) joined hands with the Ministry of Agriculture in 2012 for a total revamp of the infrastructure of KCCs at identified locations (Tiwari, 2012).

Mobile voice message

Information is delivered in Pre-recorded voice/ audio format

Sent on periodic basis

Duration of message varies (usually 1 minute)

When the message is in local language, this application overcomes the literacy barrier and also information delivered can be stored

Limitation

Farmers should have the Supporting mobile for voice messages

Ganesan *et al.*, (2015) studied in Tamilnadu on dissemination of agricultural information through mobile voice messages.

The agricultural extension officials of dept of agriculture, in the state were responsible for preparing the content. Information was sent on a monthly basis and the message duration lasted for a maximum of one minute which covered various aspects such as fertilizer application, pesticide application, best farming practices, seed varieties, insurance and government schemes.

The result revealed that

54% of farmers - did adopt the information disseminated.

52% of farmers - had expressed that either all or most of the agricultural information was useful.

100% of farmers - very satisfied with the audio quality, simplicity of language and content of the voice messages.

Digital Mandi service by BSNL

"Digital Mandi" was launched by the BSNL in collaboration with IIT, Kanpur, in August, 2011. The "Digital Mandi" application is for effective dissemination of mandi (market) rates of different crops, in approximately 3000 agricultural produce markets to the Indian farmers where farmers need to register to nearest APMC and service is available in

three languages(English Hindi, Punjabi and Kannada).

Dynamic Market Information (DMI), TNAU-C-DAC, Hyderabad

The Tamil Nadu Agricultural University (TNAU) and Centre for Development of Advanced Computing (C-DAC), Hyderabad jointly provided daily market information on 161 perishable commodities from 13 markets in South India where information was disseminated to ten thousand farmers through mobile based SMS in the local language at free of cost.

The information was also uploaded in the web portals of India development gateway (InDG) and Tamil Nadu Agritech portal (www.indg.in and http://agritech.tnau.ac.in). Further, it also provides price behaviour and market trends over a period of time (Anandaraja *et al.,* 2011).

Other services (by government organisations)

AGMET (Agriculture metrological services) by IMD (Indian Metrological Department)-deliver weather forecast to registered mobiles by SMS

Role of weather information in farm management

Cultivars Selection

Choosing windows for Sowing/harvesting

Irrigation scheduling – optimal water use

Mitigation from adverse weather events

Nutrient Management: Fertilizer application

Plant Protection: Pesticide/fungicide schedule

Intercultural operations

Feed, Health and Shelter Management for Livestock

Pasuvani (AHVS helpline)

The Department of Animal Husbandry and Veterinary Services (GOK) under 'Strengthening of Animal Disease Surveillance Network' program of Rashtriya Krishi Vikasa Yojana (RKVY) has established a 'Helpline' to obtain information from Veterinary professionals and other subject specialists.

Information available through Helpline

Information about technical services available from the Department.

Information about Socio-economic programs implemented by the Department.

Information about training in dairying, sheep and goat rearing, rabbit rearing, piggery, poultry, etc. regularly conducted by the Department.

Information about livestock diseases, precautionary measures to be followed for control of livestock diseases during outbreak and vaccination programs.

Information about exotic and indigenous livestock breeds.

Information about various diseases against which livestock are to be regularly vaccinated so as to prevent occurrence of such diseases.

Details about loans available from various banks for animal husbandry activities.

Details about approximate value of crossbred cows, sheep and goat, pigs and probable

areas/ places of their availability.

Information about fodder crops necessary for successful dairying.

To facilitate delivery of emergency Veterinary services by diverting calls to the nearest available technical personnel of the Department

Mobile advisory services by the private sector

IFFCO Kisan Sanchar Limited (IKSL)

Bharti Airtel Limited, India's leading integrated telecommunications services provider, and Indian Farmers Fertiliser Cooperative limited (IFFCO) launched a joint venture company IFFCO Kisan Sanchar Limited (IKSL) in 2008, that is set to provide a major boost to Indian agriculture and the rural economy at large.

The joint venture company will harness the power of telecom to add value to the farm sector and empower the rural farmer by giving him access to vital information, which will enhance his livelihood and quality of life.

Innovative telecom products and services, especially created for the farming community, will enhance their productivity and play a bigger role in India's growth story (IFFCO, 2008).

Reuters Market Light (RML)

Micro-information Services designed specifically for the farming community was launched by RML in 2007.

It currently covers over 450 crop varieties, over 1300 markets and 3500 weather locations in 9 local languages

Over 1.3 million registered farmers across 50,000 villages in 17 Indian states RML (www.reutersmarketlight.com).

Highlights of telecom subscription data as on 31st august, 2015 by TRAI

Particulars	Wireless	Wireline	Total (Wireless+ Wireline)
Total Telephone Subscribers (Million)	**988.69**	**26.01**	**1014.70**
Net Addition in August, 2015 (Million)	5.48	-0.09	5.39
Monthly Growth Rate	0.56%	-0.35%	0.53%
Urban Telephone Subscribers (Million)	**570.33**	**21.20**	**591.52**
Net Addition in August, 2015 (Million)	3.04	-0.04	3.00
Monthly Growth Rate	0.54%	-0.21%	0.51%
Rural Telephone Subscribers (Million)	**418.36**	**4.82**	**423.18**
Net Addition in August, 2015 (Million)	2.44	-0.05	2.39
Monthly Growth Rate	0.59%	-0.96%	0.57%
Overall Tele-density*	**78.37**	**2.06**	**80.44**
Urban Tele-density*	145.67	5.41	151.09
Rural Tele-density*	48.09	0.55	48.64
Share of Urban Subscribers	57.69%	81.48%	58.30%
Share of Rural Subscribers	42.31%	18.52%	41.70%
Broadband Subscribers (Million)	**101.34**	**16.00**	**117.34**

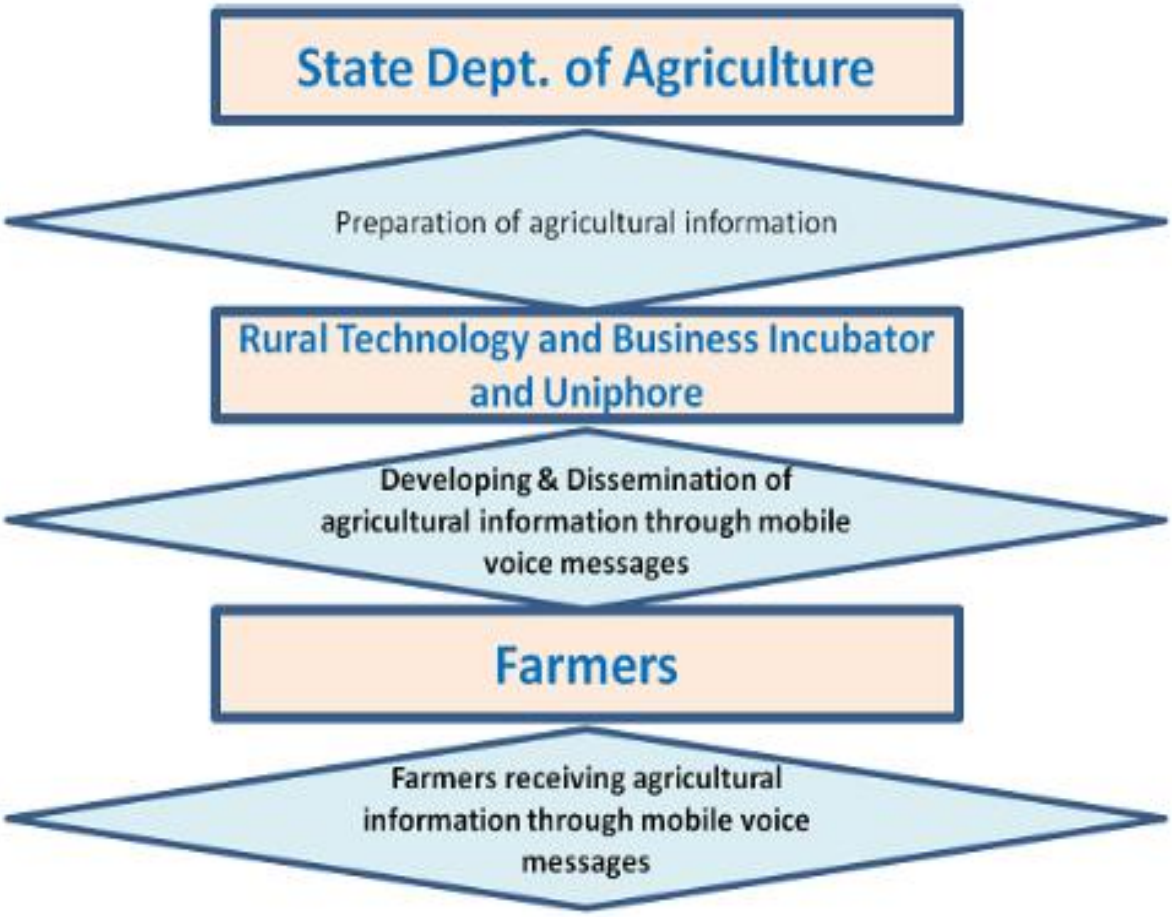
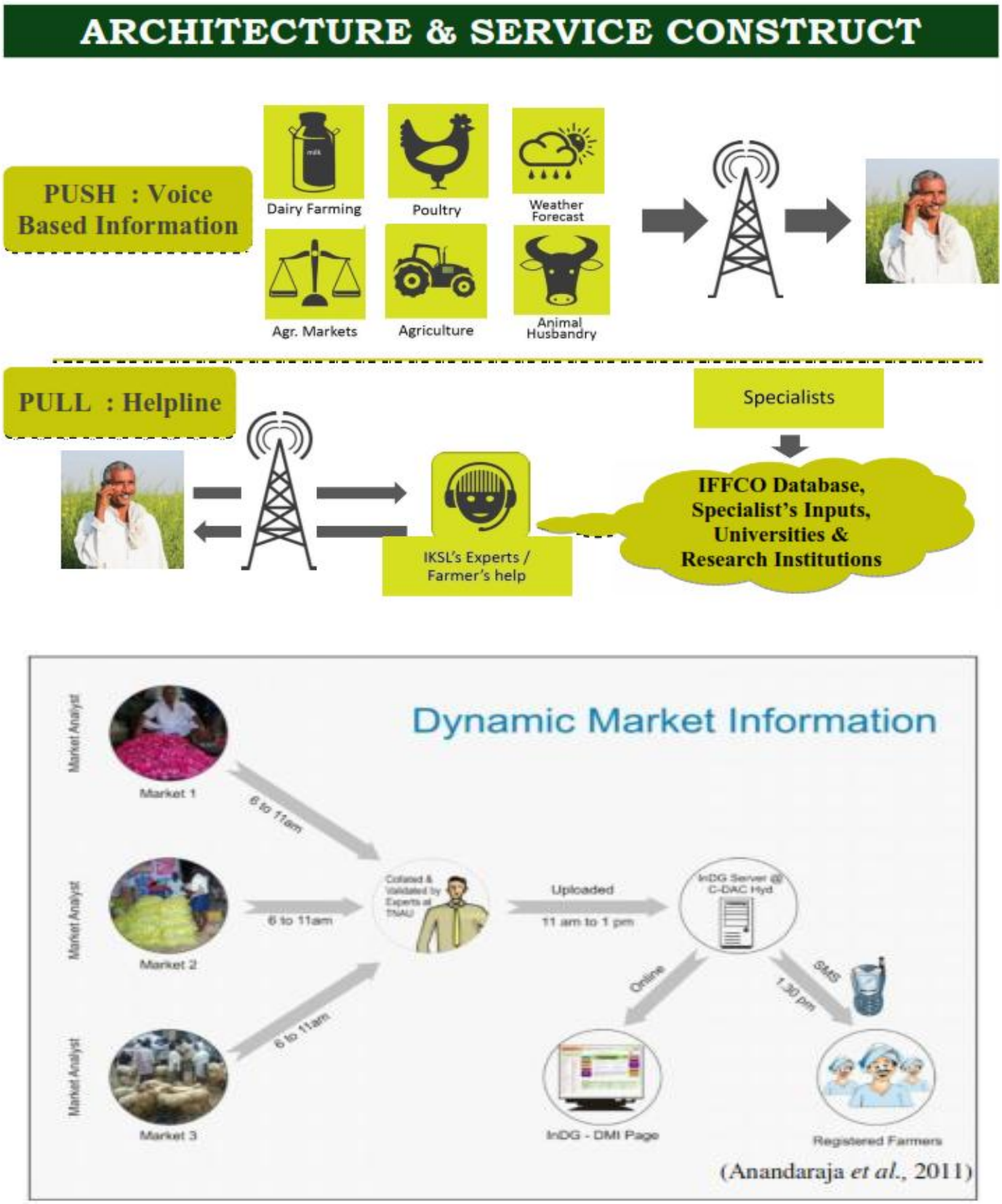
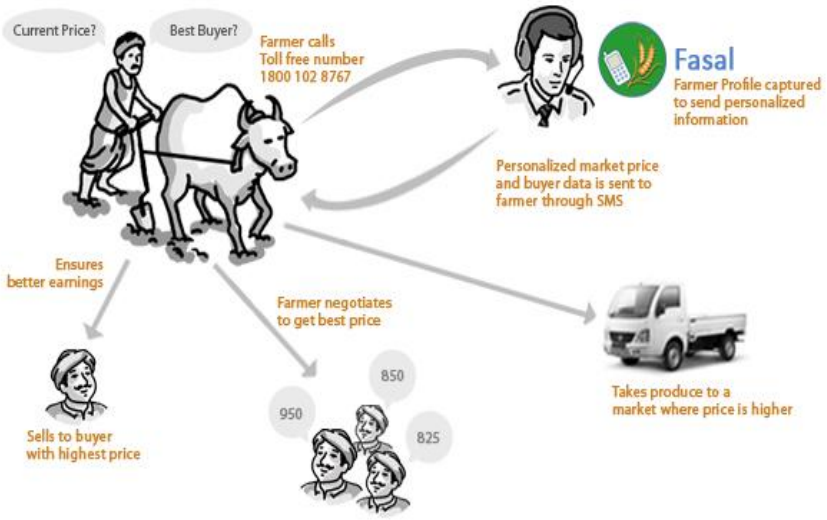


Figure 1: Dissemination process of mobile voice messages on agricultural


ARCHITECTURE & SERVICE CONSTRUCT
PUSH : Voice Based Information
Dairy Farming
Poultry
Weather Forecast
Agr. Markets
Agriculture
Animal Husbandry
PULL : Helpline
Specialists
IFFCO Database, Specialist's Inputs, Universities & Research Institutions
IKSL's Experts / Farmer's help
Dynamic Market Information
Market Analyst
Market 1
Market 2
Market 3
6 to 11am
Collated & Validated by Experts at TNAU
Uploaded
11 am to 1 pm
InDG Server @ C-DAC Hyd
Online
SMS
1.30 pm
InDG - DMI Page
Registered Farmers
(Anandaraja *et al.*, 2011)



Other services (by private sectors)

mKRISHI by TATA Consultancy Services having applications of Interactive Voice Response System (IVRS), mobile based and automatic weather station information integrated service to the farmers.

Nokia Life Tools is a range of services aim to plug the information gaps and needs of farmers by providing information on seeds, fertilizers, pesticides, market prices, and weather (temperature, rainfall, wind conditions) via their mobile phones.

Behtar Zindagi was conceived by the Handygo' product team and based on Interactive Voice Response System (IVRS) on mobile in the regional languages to reach the rural population to deliver voice based information services on improved package of practices in agriculture.

Information on commodity prices (mandi rate), weather forecast and agro-met advisory, advisory for fisherman and management of inland fisheries, managing livestock, women and child health.

Fasal is a free SMS based product connecting rural farmers to buyers and provides them up-to-date price information. Fasal, which started in 2008, establishes buyer-seller connection using SMS. The service is currently available in Gujarat, Andhra Pradesh and Karnataka.

Mobile APPs (software applications)

Message that can be delivered will have combination of information mix (audio + video + text + graphics + animations)

Recent apps are in local languages that too in audio and video format so illiterates can access information anywhere and at any time.

Internet- some apps requires internet and some don't require

For easy operations-appropriate icons which are recognizable by farmers are developed with simple touch screen technology.

Limitations of this application are

Android mobile or supporting smart mobile is mandatory

For initial installation of apps requires internet

Farmers may feel difficult to operate apps

Examples

Jayalaxmi agrotec, a private AgriApp developer company– developed many farmers' friendly agriculture based apps on 14 crops in multiple languages (Kannada, Telugu, Marathi, English)

Vimal *et al.,* (2014) designed android based app, "Farmer Helping Services" - Horticulture information related to fruits, flowers and vegetables in Gujarati language in voice form without use of internet.

Vimal *et al.,* (2014) android application that will give the Agriculture crop diseases information to the farmer in an audio format**.**

Trends of mobile application when applied to livestock sector

The recent developments in the field of communication media and technologies can possibly provide information to farmers in an effective, efficient, instant, interactive and in a participatory manner (Singh *et al.,* 2003).

To make the farming communities better informed in the use of innovation, the extension worker requires suitable communication devices that can overcome the barriers of illiteracy and traditions which are prominent among the resource poor farmers and drive home the message effectively (Hai *et al.,* 2003).

Tiwari *et al.,* (2010) argued that the livestock sector should come up with the need based, location specific and local language contents in the form of computer software's and other electronic material.

In regards to livestock disease control, herd management, livestock production and for marketing of livestock and livestock produce. The correlation between information, communication and economic growth are well known, making the significance of networks apparent.

Example

Through various mobile applications - the information needs, service delivery can be undertaken for livestock sector growth

Through SMS option- for example vaccination and deworming alerts, insurances and diseases outbreak alerts can be made possible for ensuring livestock health.

CALL option -call to veterinarian for treatment, suggestion and other experts for emergency guides, advices, information about market prices of various commodities, for assessing government schemes etc.

Various APPS like

Herd management software

Where we can upload the stock of the herd, date of calving, feeding parameters like feed intake, etc; health parameters like vaccination, deworming, disease history etc; reproductive details like AI date, PD report, calving details etc. Ex: - NDDB developed Mobile App called, "Dairy husbandry practices"

Feed resources and balanced feeding

Which helps to calculate to different feeds that need added in appropriate proportions for balanced diet. Ex: - "PASHU-POSHAN" developed by NDDB

Livestock rearing

Ex:- sheep rearing, goat rearing apps developed by jayalaxmi agrotec in kannada language, which provide information about

housing, breeds, feeding, health management etc of sheep and goatin audio-visual format

Challenges of mobile applications in farming

Lack of mobile friendly and locally relevant digital content in local languages

Rural mobile infrastructure limitations like network/signal connectivity problem, internet problem, High cost of internet, electricity problem

Digital Illiteracy and lack of awareness among the rural people.

Large number of local languages which made difficult for preparing content repository.

Greater customisation and frequent updating of information is required

Frequent criticism is that the information provided is 'old and routine'

Mobile has added personal touch through voice calls, made understanding easier through pictures and videos and instant communication with experts anytime and anywhere, a reality obtained through mobile communications.

To leverage the full potential of information dissemination enabled by mobile telephony along with supporting infrastructure and capacity building amongst farmers it is essential to ensure the quality of information, its timeliness and trustworthiness.

By analyzing trends of mobile application in dissemination of agricultural information, we can say there is paradigm shift from mobile texting and calling option to multimedia format.

Mobile phone which helps in improving awareness, education among farmers will act as a catalyst for rural development and country's economic growth.

A true revolution in farm sector to happen the farmers must be able to get information which is need based, location specific and individual oriented which is made possible by mobile

As of mobile, which are "Accessibility, Affordability, Applications" will make mobile as an omnipresent tool in future extension.

Research Institutes, agricultural and allied universities need to develop appropriate repository regarding farming need to develop in local languages

Public Private Partnerships should be initiated for digitalization of content which could be in voice, image, audio, graphic and text integrated format for dissemination of useful information among the millions of farm families.

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