



Role of ICT in extension strategies to facilitate doubling of farmers income

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Abstract

Information and Communication Technology (ICT) is transforming the way various sectors operate, with the potential to significantly benefit all segments of society, including agriculture. Indian agriculture, currently facing numerous challenges, including droughts and widespread distress, demands innovative solutions to ensure sustainable growth. While government initiatives aim to improve the livelihoods of farmers, many of these strategies can only achieve their full potential through the effective integration of ICT. ICT has become an essential part of daily life, including for farmers, and offers powerful tools to enhance productivity, access equitable markets, and improve rural businesses. By empowering rural youth, facilitating better market access for farmers, and enabling rural enterprises to provide value-added services, ICT can play a critical role in extension strategies aimed at doubling farmers' income. This paper explores the role of ICT in these strategies, drawing insights from secondary data sources to highlight its potential in driving agricultural development and rural prosperity.

Keywords: Digital agriculture, information technology, smartphone, applications

Introduction

At present 68 per cent of India's population is rural and agriculture is the main source of livelihood for 58 per cent of the population^[1]. Also it can be seen that use of ICT have gained far more importance after Government of India have launched Digital India on July 1, 2015 to create digital infrastructure for empowering rural communities, enabling digital delivery of services and promoting digital literacy. In which digital agriculture has become an important organ to fulfill the initiative of digital India. Digital Agriculture can be defined as ICT and data ecosystems to support the development and delivery of timely, targeted (localized) information and services to make farming profitable and sustainable (socially, economically and environmentally) while delivering safe, nutritious and affordable food for all.

Why doubling farmer's Income?

Past strategies for development of the agriculture sector in India has focused primarily on raising agricultural output and improving food security. The net of which resulted a 45 per cent increase in per person food production, which has made India not only food self-sufficient at aggregate level, but also a net food exporting country but the strategy did not explicitly recognized the need to raise farmers' income and did not mention any direct measure to promote farmers welfare. The net result of it is seen that farmers income remained low, which is evident from the incidence of poverty among farm households. Low level of absolute income as well as large and deteriorating disparity between income of a farmer and non-agricultural worker constitute an important reason for the emergence of agrarian distress in the country during 1990s, which turned quite serious in some years. The country also witnessed a sharp increase in the number of farmers suicides during 1995 to 2004^[5] - losses from farming, shocks in farm income and low farm

income are identified as the important factors for this. The low and highly fluctuating farm income is causing detrimental effect on the interest in farming and farm investments, and is also forcing more and more cultivators, particularly younger age group, to leave farming. This can cause serious adverse effect on the future of agriculture in the country. It is apparent that income earned by a farmer from agriculture is crucial to address agrarian distress and promote farmers welfare. In this background, need has arose to double farmers' income to promote farmers welfare, reduce agrarian distress and bring parity between income of farmers and those working in non-agricultural professions.

Objective of the study:

- To examine the role of ICT in enhancing agricultural productivity through improved access to information, resource management, and decision-making tools for farmers.
- To evaluate the impact of government initiatives and ICT platforms on the goal of doubling farmers' income, using case studies and data from existing digital agriculture programs.

Research Methodology

The research paper adopts a mixed-methods approach to comprehensively examine the role of Information and Communication Technology (ICT) in agricultural extension strategies aimed at enhancing the income of farmers in India. The methodology integrates both qualitative and quantitative data collection techniques, relying heavily on secondary data sources, literature reviews, and case studies to gain a deeper understanding of how ICT tools are being utilized in agricultural extension.

The research employs a descriptive and exploratory design. The study focuses on analyzing existing ICT tools,

platforms, and initiatives that have been implemented in India's agricultural sector. The goal is to understand how these technologies are applied at various stages of the agricultural cycle—from crop selection to harvesting—and their effectiveness in improving farmers' incomes. Data collection is divided into two phases:

Secondary Data Collection: The study primarily relies on secondary data sources such as reports, articles, government publications, and digital resources. Key documents include governmental initiatives like the Digital India program, reports from the Ministry of Agriculture, and international studies on the role of ICT in agriculture. Specific ICT tools like Krishi Gyan, Soil Health Card, Kisan Call Centre, and others are reviewed to assess their impact on agricultural practices and income enhancement.

Case Studies: A few case studies from different regions in India where ICT has successfully been implemented in agriculture are analyzed. These case studies provide real-world examples of how farmers have benefited from using ICT tools, including improved crop yields, better market access, and enhanced decision-making processes. The study explores a range of ICT tools and platforms that farmers are using for different aspects of farming:

Crop Selection: Use of Krishi Gyan and weather apps.

Land Preparation: Adoption of Soil Health Cards.
Seed Selection and Sowing: Kisan Suvidha App and Kisan Call Centre.

Irrigation and Fertilizing: Programs like Pradhan Mantri Krishi Sinchai Yojana and digital tools like Fertilizer Calculator.

Market Access and Price Information: e-NAM (National Agriculture Market) and SMS-based price information systems.

Sources of Growth in Farmers' Income

The major sources of growth operating within agriculture sector are:

- Improvement in productivity
- Resource use efficiency or saving in cost of production
- Increase in cropping intensity
- Diversification towards high value crops [2]

The sources outside agriculture include

- shifting cultivators from farm to non-farm occupations, and
- Improvement in terms of trade for farmers or real prices received by farmers.



It can be realized from sources of growth in farmer's income that the work to double the income can be done in many different ways in which one way can be by using ICT for farmers benefit and helping them as:

ICT-based agricultural extension brings incredible opportunities and has the potential of enabling the empowerment of farming communities. Information technology can support better crop, fertilizer and pesticide use planning as well as disease monitoring and prevention, both in crops and animal husbandry, besides improving farmers' operational and financial management and to effectively connect them with the markets for better price realization.

Role and Road map using ICT

A farmer performs following eight major steps from crop selection to harvesting:

1. Crop Selection
2. Land Preparation
3. Seed Selection
4. Seed Sowing
5. Irrigation
6. Crop Growth
7. Fertilizing
8. Harvesting

Crop Selection	Krishi Gyan	
Land Preparation	Soil Health Card	

Seed Selection	Kisan Suvidha App	
Seed Sowing	Kisan Call Centre	
Irrigation	Pradhan Mantri Krishi Sinchai Yojana	
Crop Growth	E-Krishi Samvad	
Fertilizing	Fertilizer Calculator	
Harvesting	Harvest Time & Expense Tracker	
Marketing	e-NAM	

The first step is to increase productivity starts from selection of crop. In India big belt of farmers are not aware of practices which will yield best output. So very first step is to make them aware about crop selection practices. We can make them aware by informing them which crop should be selected which would result maximum output as well as increase productivity in terms of their income. This work can be made possible by adopting various beneficial apps which are available. Krishi Gyan- this application enables Indian farmers to connect with Krishi Gyan experts and ask them questions related to farming, and get answers within the application through notifications.



Also information about weather can be sought out by using apps like Weather Underground. After this the second steps which needs to be deal with is preparation of land which can also be sought out by using Krishi Gyan but we must be

able to know about the soil its quality and how to improve it. For this government has taken a good initiative by introducing Soil Health Card (Ministry of Agriculture and Farmers Welfare Government of India).

Cycle 1	Cycle 2	Farmer's Corner	Nutrient Status
Samples Collected 2,53,54,117	Samples Collected 94,46,141	Track your sample	Nutrient Status-Block/Mandal Wise
Sample Tested 2,45,64,199	Sample Tested 50,24,998	Print your soil health card	Micro Nutrient Status - Block Wise %
SHC Printed 10,07,63,997	SHC Printed 96,34,462	Print soil health card for additional Crops	Nutrient Status- Sample Wise
SHC Dispatched 9,91,24,488	SHC Dispatched 79,77,050	Fertilizer Dosage for Crops	Nutrient Status-Village Wise
		Locate soil testing laboratory	Nutrient Status-Farmer Wise
		Directories	Nutrient Status-Grid Wise
		Zonewise Programme Coordinators of KVKs	Micro Nutrient Status-District Wise
		ICAR Institutes	Macro Nutrient Status - District Wise
		Zonal Project Directors of KVKs	Micro Nutrient Status - State Wise
			Macro Nutrient Status - State Wise
			Nutrient Status Dashboard

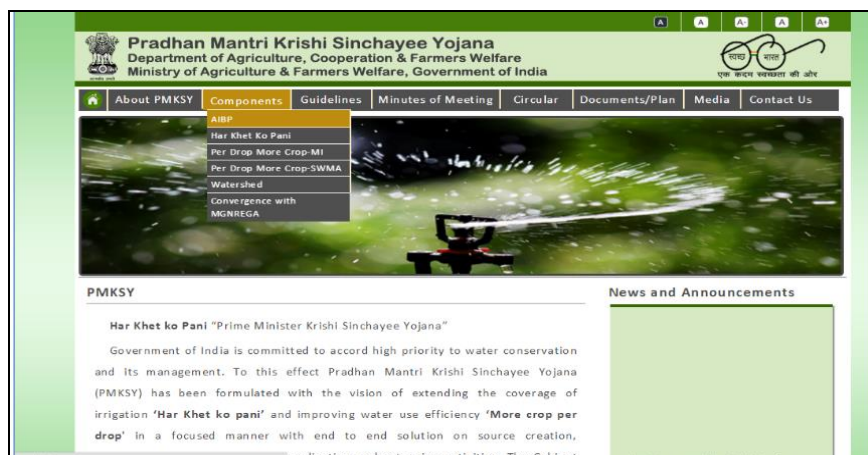
The third factor is effective use of inputs, which means increasing production through improved seeds, planting materials, and other schemes. In this information and advisory services through new technologies such as space

technology and online and telecom facilities can be a major breakthrough also at present it is been done by use of Kisan Call Centre and Kisan Suvidha App also other such type of beneficiary apps must be invented.



The fourth step is to increase productivity is by means focusing on irrigation. India has 159.7 million hectares agriculture land, out of which only 48% is under institutional irrigation [4] which indicates that the rest has not been covered yet, although government has released

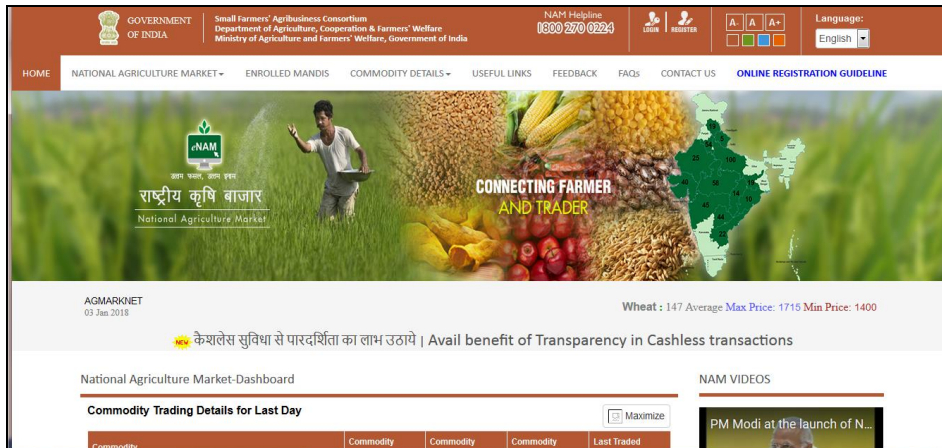
schemes such as Pradhan Mantri Krishi Sinchai Yojana but effectiveness can only come when farmers gets aware of it which can be done by using ICT by having simply a Smartphone and good 3G/4G connectivity.



The next critical factor is reducing post-harvest losses. One of the biggest problems of farmers is storage after harvesting; as a result, they are forced to sell their products at a lower cost. Harvest Time & Expense Tracker application good solution to tackle the problem. For preventing losses the focus is now been shifted towards storage facilities and integrated cold chains in rural areas. Here an application naming Cold Chain can be invented which can inform farmer about nearby cold store which is in working condition and thereby saving loss due to

transportation as well as for agriculture produce getting rotten.

In agriculture marketing, e-marketing can be launched like one as electronic-National Agriculture Market in which mandis can be linked and online trading can be started. Addition to it a model like APMC Act must be passed, which includes private market yards and direct marketing. This helps farmer achieving economy of scale and increase bargaining power.



Other than above mentioned factors few other initiatives can be done such as implementing ambitious Agribusiness Hubs Model, operating on a national platform and establishing multi-functional Agribusiness hubs in all the Gram Panchayats of the country. This will revolutionize the farm economy and create jobs ultimately improving farm incomes. Along with it linking of production with processing can be done which can benefit farmer a lot and making the backbone strong.

Use of Digital Green which uses participatory videos that have farmers explain best management practices to other farmers. This type of approach can be ten times more cost effective than traditional extension services as farmers trust other farmers more given they can better relate to someone like them who are building a livelihood under similar circumstances. It can be helpful in capacity building.

In India as paper money is expensive and risky to rural consumers but mobile money is safer, especially for women, and costs less to transfer. Government of India has initiated *direct cash transfer to farmers' Jan Dhan accounts* which also allows rural consumers to bypass poor infrastructure to support savings and access credit.

Price information- ICT can be used effectively to communicate daily prices to farmers and he can decide when to sell the produce. Even weekly trends also can be communicated to him Via SMS etc. Satellite tech and drones can be used to constantly monitor farms for pest attacks and other diseases. This information can be communicated to farmers soon to nip the trouble in the bud and prevent crop loss. Cultivation of crops – can be improved technologies such as automation, decision support system and agriculture robots. E-Krishi Samvad enables farmers to directly approach ICAR (Indian Council of Agricultural Research) with their problems for effective solutions. Connecting to agricultural universities- Farmer

can constantly communicate with researchers and experts in agricultural universities to help them with their troubles and enabling faster trouble shooting. Kisan help lines can be used for this. Financing of agriculture- by knowing about public welfare schemes, MSP prices, insurance schemes, subsidies, compensations farmers can easily access government benefits through online wallet system.



Fig 1: in single picture depicts the use of ICT helping farmer which can ultimately result in doubling the income.

Conclusion

The research paper explores the transformative potential of Information and Communication Technology (ICT) in the agricultural sector, particularly in the context of India's rural economy. Given the challenges faced by Indian agriculture—ranging from low productivity to market inefficiencies—the paper argues that ICT can play a critical role in improving farmers' livelihoods and achieving the government's goal of doubling farmers' income. The paper

highlights how digital agriculture, enabled by ICT tools such as mobile apps, digital platforms, and advisory services, can significantly enhance agricultural productivity, resource use efficiency, and market access. It examines various ICT-based tools like Krishi Gyan, Soil Health Cards, Kisan Suvidha, and e-NAM that provide farmers with timely information about crop selection, land preparation, irrigation, and market prices, thereby facilitating informed decision-making and better price realization. In conclusion, the paper asserts that ICT holds immense potential to revolutionize agricultural extension services, improve farm incomes, and reduce agrarian distress. However, the success of these strategies depends on overcoming existing challenges and ensuring widespread access to digital tools for farmers across India.

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