JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

E-AgriculturePracticein Marginal Farming Section through Production and Marketing: A Review of Rural Development

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Abstract: Indian agriculture includes a mix of traditional and modern farming practice and techniques. However, since 2002 India has become the world's largest manufacturer of tractor and occupied world's largest tractor market, in some parts still using cattle to plough their arable land. Now there is need for work on cost-effective technologies with environmental protection and conservation. India is blessed with largest arable land with 15 agro-climatic zones having almost all types of weather conditions where almost all types of needful crops are cultivating. But less use of technology, mechanization, low access of credit, small land holding, lack of information, unorganized market nature makes Indian farming unproductive and loss-making sector. E-agriculture or Information and communication Technology (ICT) in agriculture creates an opportunity to make farming more profitable and it targets to make agriculture more vibrant. It is seen as a new model for agricultural development which is emerging at a faster step of both developing and developed countries. It has found as highly beneficial for the farmers including small and marginal categories. Government is providing different effective schemes to reach the benefits of ICT to the farmers. ICT initiatives in Indian agriculture act as a decision support system to get higher return.The main objective of ICT is to help farmers with the timely availability of information and practical solution of the agricultural problems so that farmers can adopt required effective practices and makes better strategy with useful inputs and finally get anticipated production and market price. But practical condition of poor, marginal and illiterate farmers do not get benefit of modern farming practices equally.Introduction of technology in farming made exposer to producers as well as consumers. Insufficient extension services and poor access to information widen the gap in the adoption of new technologies and can lead to lower long run-productivity (Miller, Saroja and Linder, 2013). No doubt, if it works properly both producer and consumer will get benefited.

Key words: E-agriculture, ICT Service, Agricultural Marketing, Farm Productivity

JEl Code: M31, Q13, Q16, Q18

Introduction

India is the world largest producer of milk, pulses and spices as well as largest area is occupied to produce wheat, rice and cotton. As per the record of 2018, more than 50 percent employment comes under farm sector and it contributes 17 to 18 percent total nations GDP. In spite of great importance of Indian farm sector still it suffers from lack cold storage, transport system, credit facility, marketing problems and many of others. Indian agriculture includes a mix of traditional and modern farming practice and techniques. However, since 2002 India has become the world's largest manufacturer of tractor and occupied world's largest tractor market, in some parts of the country still using cattle to plough their arable land.The main reason behind this traditional farming practice is land fragmentation. Marginal farmers having less than one hectare land holding can't use big and effective farm machineries extensively. As a result for plowing their land they have depends on bullock operated plough. On the other hand credit deficiency, proper marketing space for the crops, disguised unemployment and lack of required storing facilities makes agriculture less profitable occupation and due to that farmers and labourers are migrating from farm to non-farm sector. Another perceptible constraint of this sector is information gap regarding government schemes provided for poor farmers. Now there is need for work on cost-effective technologies with environmental protection and conservation. India is blessed with largest arable land with 15 agro-climatic zones having almost all types of weather conditions where almost all types of needful crops are cultivating. But less use of technology, mechanization, low access of credit, small land holding, lack of information, unorganized market nature makes Indian farming unproductive and loss-making sector.

ICT in agriculture or e-agriculture is an emerging field focusing on the enhancement of agriculture and rural development in India. E-agriculture or ICT in agriculture creates an opportunity to make farming more profitable and it targets to make agriculture more vibrant. Introduction of technology in farming made exposer to producers as well as consumers. Insufficient extension services and poor access to information widen the gap in the adoption of new technologies and can lead to lower long run-productivity (Miller, Saroja and Linder, 2013). No doubt, if it works properly both producer and consumer will get benefited. The tools of ICT for agriculture includes use of personal computer, mobile phones, and other communications devices for delivering agricultural extensions and brings new information services in rural areas. It involves the conceptualization, design, development, evaluation and application of innovative ideas to use information and communication techniques in the rural domain. The main objective of ICT is to help farmers with the timely availability of information and practical solution of the agricultural problems so that farmers can adopt required effective practices and makes better strategy with useful inputs and finally get anticipated production and market price. But practical condition of poor, marginal and illiterate farmers do not get benefit of modern farming practices equally. Poor infrastructure, insufficient information, lack of awareness driven the farmers from actual motive of e-agriculture.

Review of Literature

L. Pradhan and B.B Mahapatra (2015) showed in their study globalization has very adverse effect on Indian farmers as they have to complete with the farmers of developed countries. To cope with challenges of globalization in agriculture farmers will have produce quality product at minimum cost to sell in word market at reasonable price. Thus farmers need to be well informed and well trained in management of natural resources and production of agricultural commodities. E- Agriculture plays an important role to addressing the challenges and uplifting the livelihood of Indian farmers.

Barkha Gupta (2021) has cited that half of the Indian population resides in agriculture and doing agricultural practice with traditional equipment's. E-agriculture introduced new effective technique of farming with global competition witch make profitable Indian farmers. It is combination of traditional mechanism of farming with the role of information, technology and communication in agriculture which leads to smart farming.

Nidhi Thakur (2021) illustrated in her study in the era of climate change where farmers are facing extreme challenges of farming, E-agriculture provides service such as weather forecasting, disaster alerts which can help farmers to take precaution to get expected productivity and production. Agriculture is knowledge intensive technology and information technology provides required assistance to make farming more profitable. Government can supply rural communities with weather, market pricing, and insurance information that adds to their livelihoods with the current kids of ICT services.

Oladotun O. Okediran and Rafiu A. Ganiyu (2019) made one study in Nigeria and argued that over the years the benefits coming from adoption of information and communication technology in agriculture includes peoples knowledge's engaged in farming and practice the agricultural process properly which increase the agricultural productivity and creates linkage to remunerative markets and food security.

DhakneAniket, DespandeyMayur, PatharkerMayur and RathodAkash (2017) showed in their study that most of the farmers are unaware of new technologies and facing hard situation of farming due to climate changes which affect adversely their livelihood. After getting crops with these unavoidable challenges they are cheated by the market traders and commission agents. Information and Communication Technology can play an important role to increase income of farmers and economically standard of living.

M. Varun Kumar and PulidindiVenugopal (2016) in their study highlighted that rural development is the fundamental for the advancement of rural economy and finally Indian government introduced I.T in rural markets which developed the nature of rural markets and rural economy. In this regards Information and Communication Technology plays an important role to make framing more profitable and creates Indian farming eligible to compete with global markets.

Driouchi and Zouag (2010) told that ICT facilitated the farmer's real time access to crucial market and price in formation a crucial agricultural growth and development. The use of internet and website portals creates the Indian farmers informative and enabled them to trade on the line through their mobile phones applications or web platforms. They can now receive information instantly and on a regular basis unlike other traditional commutations methods.

Theoretical Framework of the Study

Lack of agricultural information is the serious problem of modern agricultural practice which attributed to the inability of small land holder to transition from subsistence to commercial agriculture. Recent efforts have been made to develop small landholder with the introduction of Information and Communication Technology (ICT) in agricultural sector. The application of ICT opened the scope of ICT based market information to reduce the transaction cost of small holders, commercialize the farming and improved household food security. The major ICT tools used in agriculture are different electronic devices which help them in profit-making cultivation. It reduced cost of cultivation in one side and also it makes faster ago-production half. Its benefit not only limited in large holding rather its impact spread out in rural remote areas. Government took initiatives to promote use of ICT with the introduction of National e-Governance Plan in Agriculture (NeGP-A), with various Touch Scren Kiosks, KrishiVigyanKendras, Kisan Cell Centres, Agri-Clinics, Common Service Centres, Kisan TV and with other various applicatins.

ICT tools can help in defending the challenges in agricultural development in the following ways:

- Agricultural information, awareness and education using by ICT
- Advance information about adverse whether condition, so that farmers can take precautionary measures.
- Information about near market and profit oriented price.
- Information dissemination about various government schemes.
- Information regarding agro-finance, agribusiness and agro-clinical.
- Regarding online farmers communities

Food and Agriculture Organization of the United Nations told that " the aim of ICT is to boost agriculture and rural development by improving access to valuable information that can help people whose livelihood depends on agriculture to make the best possible decisions and use resource available in the most productive and suitable manner." The application of information and communication Technology can play a very important role in Indian agriculture and in agro-marketing. Different forms of ICT can hit poor farmers positively in rural domain. The objective of this initiative is widening. It can deliver fast, reliable and accurate information for farm production and marketing facilities and also framed as user-friendly manner for practical utilization by the end user. But to get desired result from the use of ICT for dissemination of information farmers should have minimum knowledge on

recent technologies. But as we know the majority of the farmers are illiterate, have very low land holding and level of infrastructure is very poor, we can't expect anticipated result. With the introduction of this new strategy we should also assess the implementation methods to get healthy returns.

The different ICT initiatives for agriculture and allied sectors are-

- AGWATER- A program developed for irrigation scheduling and utilization.
- CROPWAT-A program developed by FAO to calculate evapo-transpiration, crop water requirement, irrigation requirements.
- CROPLOT- It is a decision aid to plan the production of field crops such as cotton, corn and cereals.
- CUPTEY- It is an expert system for cucumber crop production.
- CITEY -It is an expert system for orange crop production.
- VEGES- It is an expert system for vegetable crop production.
- SOYEY- It is expert system for soybean oil extraction.
- AGRISNET- an ICT infrastructure network system existing at block level facilitating agriculture offices, agricultural extension services and agri-business activities to enhance rural development.
- IKSL-It delivers relevant information to farmers on mobile phones through voice messages in local language.
- IKisan- It provides one-step solution for farmers in providing information on crops, crop management practices /techniques, fertilizers, pesticides and other related information like market updates and weather forecast.
- Earik- It provides single window expert solution on production, plant protection and marketing of the products.
- Aqua- It is a multilingual online problem-solving system facilitates farmers for getting their queries answered by our experts.
- KCC-The Kisan Call Centre utilizes telecom infrastructure to provide solutions of farmers problem on various aspects of agriculture in local language using toll free number 1800- 180-1551.
- Agmarknet- It provides information on market prices, arrivals and other related aspects like grades, standards, packing etc and disseminated by networking measure to agriculture produce market operation in the country.
- e-choupal- It provides alternative marketing channels, information on weather, agricultural practices, input sales etc. It is a kiosk located in a village and equipped with computer with Internet access managed by a trained sanchalak.

Objectives and Methodology

Agriculture sector is plagued with various problems in India. Illiteracy and capital deficiency is one of the most vital difficulties of this sector. Similarly land fragmentation and small land holding is another problem that acts as a barrier to implement modern technique of farming. Through these unavoidable and unexpected obstacles agriculture sector may get success by implementing ICT properly. It not only linked the farm sector globally but also it gives systematic cultivation technique. Use of different modern devices in farm sector farmers makes farming as successful occupation.The objective of this paper is to review the extent of ICT in agricultural and different hindrances which prevent the success of ICT project in agriculture and agricultural marketing. This study is completely based on secondary source of data collected from different journals, articles, and from government records. Simple statistical calculation say percentage, frequency etc. has been used in this study and tried to illustrate the accurate picture of ICT implementation in agriculture sector.

Results and Discussion

One study made by Mittal et al in 2010 in different places to know the sources of information by which Indian farmers can avail their required information. This study provide us effective role of ICT used in farm sector. As we know ICT stands for information and communication technology it brought revolution in agriculture sector by innovating different devices to pass information across the nation. It helps in farm productivity as well as helps in marketing system through the information channel among producers, sellers and consumers. In the given table we can see different devices such as mobile phone, television, Kiosk, newspaper and many other devices helps to circulate information's among the farmers, consumers and sellers. Since mobile is quite common and available device used by the persons attached with farming sector information are circuiting widely through this device. Similarly, television, newspaper etc. also laying important role to convey the messages in farm sector by which , farmers, sellers and consumers get benefited properly.

Table 1: Sources of Information for Indian Farmers

Sl. No	Source of Information	Frequency (total N-183)	Percentage
1	Mobile phone	183	100
2	Mobile- Phone enabled service	138	75.4
3	Television	118	64.5
4	Newspaper	98	53.6
5	Kiosk	51	27.9
6	Other farmers	43	23.5
7	Radio	37	20.2
8	Input Dealers	42	23.0
9	Extension workers	121	66.1

Source: Calculated from Mittal et al, 2010

In this above information we can see that different devices are using in farm sector among which mobile phones are using extensively in the surveyed area of the study made by Mittal et al in 2010 over 183 households. The locations covered are Allahabad, Agra, Mathura, Alwar, Dausa, Bhilwara, Baran, Jaipur, Satara and Puducherry. The role of other devices also very significant to enhancement the productivity of farm sector.

However introduction of ICT in agriculture plays a pivotal role but its benefit did not enjoy equally. Still its concept is not clear to all farmers as mostly they are illiterate and poor farmers. Indian farming is dominated by marginal land holding nature and they are not properly aware about the scheme. Uneducated or less educated farmers or producers do not have clear idea about agro-finance, e- marketing system and about government provided information centers. They are dependent on local fertilizers shop for seed, fertilizers, pesticides etc. and purchasing these ingredients at higher price. As majority of farmers are cultivating their land with self-experience manner and purchasing manures and others ingredients from the as due basis, the sold out their crops in nearby markets say HAT and due to lack of information sometimes they face distress sale. As a result ICT does not implement properly in agricultural sector. One study is made in Lucnow district of Uttar Pradesh over 120 household to get idea over utilization of effective ICT service in India. It raised several questions to know limitation of e-farming in Indian context. This study found that lack of education is one of the important constraints to get awareness about modern farming and it has found that ICT sources are not eco-friendly and sometimes farmers are not receiving right and appropriate information for implementation of ICT devices.There are other limitation observed in this study such as poor conditions of ICT equipment's, lack of knowledge about online communication services, lack of sufficient government awareness programs, ICT helplines centers are far from villages etc.

Table 3: Constraints faced by farmers for utilizing ICT services (N-120)

Sl.No	Constraints	Frequency	Percentage
1	Sometime right and appropriate information not received	61	50.83
2	ICT sources not user-friendly	57	47.50
3	Lack of education resulting in a lack of awareness	56	46.67
4	Poor condition of equipment's	54	45.00
5	Lack of knowledge about online communication services and helpline number	51	42.50
6	Total information about ICT sources not provided by the officers	50	41.67
7	Information not received in time	49	40.84
8	Lack of knowledge of information communication technology sources	47	39.17
9	Too much distance from village	46	38.34
10	Lack of belief in government programs	45	37.50

Source: Information calculated from AbhisekMisraet. al, 2020

The surveyed peoples also provided few suggestions for effective utilization of ICT services. In the table-2 given below shows that 52.50 percent people told that education status of farmers should be improved to get proper awareness and proper utilization ICT devices. Similarly 50 percent people suggested that e-farming process should provide proper and appropriate information's. They also told every farmer should be trained for making ICT tools user-friendly and also told all information should be reached in time.

Table 2: Suggestions for effective utilization of ICT service (N-120)

Sl. No	Strategies	Frequency	Percentage
1	Education status of farmers should be improved	63	52.50
2	Always right and appropriate information should be provided	60	50.00
3	Helpline numbers should be made available to each and every farmer	58	48.34
4	Equipment should be maintained properly	55	45.84
5	Every farmer should be trained for making ICT tools user-friendly	54	45.00
6	Information about ICT sources should be provided by officers	53	44.17
7	Information centers should be in the village	46	38.34
8	Government programs should be highly advertised	45	37.50
9	Knowledge about ICT sources should be provided through campaigns and training information should receive in time	43	35.83
10	Information should receive in time	42	35.00

Source: Information calculated from AbhisekMisraet. al, 2020

Conclusion and Policy Implications

E-agriculture or ICT in agriculture targets to make agriculture more vibrant. Introduction of technology in farming made exposer to producers as well as consumers. No doubt, if it works properly both producer and consumer will get benefited. However the initiatives of this modern farming is not new thought but results did not reach equally and effectively across the nation for the reason of (i) insufficient government support (ii) domination of small and marginal farming nature (iii) lack awareness (iv) lack of credit facility (v) illiteracy of farmers etc. To make profit oriented farming and to prevent migration from farm sector E-Agriculture very important steps for the present farming scenario. India where more than 50 percent peoples are dependent on farm sector and agriculture dominated by marginal and small farmer to boost the production, productivity and marketing there is alternative of E-agriculture.

Government support is needed to fulfill the target of e-agriculture especially in developing countries like India. However approximately 45 percent of ICT project is of the hold world have been implemented in India and also maximum number of information kiosks has been employed in rural India (Manzar- 2004). Nevertheless it was found that majority of ICT projects in agriculture were put into action in socio-economics developed state of South

and North India (Paul et al., 2004). In India where 82 percent farmers are small and marginal and having very less education and awareness, government should provide special attention to extend the benefits of e-farming. Here 51 percent lands are rainfed and majority of farmers depends of unorganized credit sources. However there is lot of scope to enlarge the marketing access through e-farming by using different devices but still large part of farmers depends on nearby market known as "Hut" to sale their crops where price totally decided by demand and supply nature.

Poor farmers always face loss in this modern farming world. If they got whether friendly season in their cropping period they produced unexpected quality production but the problem is supply will increase and farmers face distress sale. On the other hand, if crops are damaged by natural calamities they don't get any crop insurance as they don't have knowledge on it. Systematic farming and organized farming may get full benefit of e-agriculture but for marginal farming nature government support is essential constraint to enjoy benefits of e-farming. Following steps are needed for ICT implementation in agriculture:

1. Policy work needs to take less time
2. E- Agaric strategy is needed as quickly as possible
3. More government awareness and leadership is needed
4. Small awareness camp at remote areas required routine basis
5. ICT infrastructure is one of the essential requirement
6. Government regulated finance should be available with minimum condition
7. Especial attention should provide on marketing infrastructure to mitigate price difference
8. User friendly machineries should be reached to poor farmers at subsidies rate.
9. All necessary ICT devices should be available to small and marginal farmers.
10. Regular monitoring is to be needed.

Limitation and future scope of research

Every study has some limitations and this work also not free from confines. The issue of digitization in agriculture is inevitable in contemporary farming but lack of awareness and poor condition farmer is major constraint of this farming practice. However this modern farming practice is necessary and profitable, it is not significantly implemented over the nation. Similarly, there is not sufficient number of empirical study made which will support the future research work on this issue. The significant limitation which has been noticed that there is huge gap between available scope of ICT implementation facilities and actual rate of implementation. Since ICT in agriculture is now modern and vibrant issue it's have much scope to picture out the study of inter-state comparison. It is also quite substantial to make study on feasibility of benefits got farmers after implementation of ICT where a major portion of farmers are unskilled, illiterate and unaware.

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