BSSS Journal of Management: Print ISSN (Print) – 0975-7236, E-ISSN – 2582-4643, Vol. XIV, Issue – I (2023), pp.165- 176, Ms.Aayushi Sharma, Dr.MahendraSinghai: Digitalization of agricultural sector- An assessment of its effect on farmers and Indian economy
https://doi.org/10.51767/jm1411

DIGITALIZATION OF AGRICULTURAL SECTOR- AN ASSESSMENT OF ITS EFFECT ON FARMERS AND INDIAN ECONOMY

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Abstract

With an increase in popularizationof internet of things and digitalization in every sector of economy, agricultural digitalization is attracting various stakeholders. Digitalization of agriculture or smart agriculture meansintegration of digital technology in farm production system which involvesuse of real time data capturing, robotics, weatheralert, big data and artificial intelligence, satellites etc. that gives farmer various opportunity to increase productivity by choosing better cropping patterns, agricultural marketing and finances, enhanced soil quality which will help Indian economy to meet up the goal of sustaining the growing population of India.It is much needful to take Indian agriculture to next level with modern food system of India and this can happen by making our farmers more aware about these technologies. Besides this the benefit of accessing digital platform for gaining opportunity and gain is unevenly distributed between farmers who have digital awareness and accessible and those who does not have any awareness regarding digitalization. To reduce this digital divide govt of India has launched many programmes to aware farmers about benefits ofdigitalization. This research paper we will highlight the benefit of digitalization of agriculture to farmers as well as to the economy of India and spread awareness among public about role and need of digitalization of agricultural sector.

Keywords: *Digitalization of agriculture, Indian economy, Awareness, Opportunities, Digital Technology*

Introduction

In today's world digitalization is present in every aspect of human life like in communication, banking, marketing, food supply chain which has made human life easier and more transparent. In Indiadigitalization was initiated by nationalizing the banks in 1969 and then slowly law was put in place to make India digitalized. This technique of digitalization help everyone in profit making from economic growth.And the combination of digitalization in agriculture sector is boom for an economy as well as for farmers. Almost 70% of India's population resides in rural area, more than 58% of population depends on primary source as their occupation. This sector contributes almost 18% in total GVA of the economy. According to Inc42, it is estimated that Indian agricultural sector will increase to US$ 24 billion by 2025. Increases in population and rise in the income level of rural and urban areas

are the reason which has contributed to an increase in demand of agricultural product in the nation.

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In line with this, it becomes importance to make our agriculture sector more productive, efficient and profitable of our farmers by adopting artificial intelligence (AI), blockchain, drone, geographic information system (GIS) and various e-farming application.

Digitalization of agriculture is in line with the government of Indians vision of doubling the farmers income. Government of India has implemented various plans and policies to make Indian agriculture digitalized for achieving high efficiency in production on sustainable development. Drone perform number of functions for improving agricultural operation, for this the GOI has prepared standard operating procedures (SoP) which is used for sprayingpesticides, insecticides and fertilizers by drone. India's national strategy on AI has signified the importance of implementation of AI in agricultural sector.

Smart farming or using digitalized technology in agriculture like geo- positing systems, unmanned aerial vehicles, automated system and internet of things are still an emerging concept in India but attention of Indian farmers towards digital farming is growing rapidly. Recently Huawei illustrated the potential of 5G, internet of things and drones on sustainable agriculture. Huawei demonstrated how technologies could help agriculture of South Africa to have sustainable future.

Objectives

1- To know benefits of Digitalization on the farmer
2- Awareness among farmers about Digitalization of agriculture
3- Impact of Digital farming on the economic growth of India
4- To know about various government plans and policies for promoting Digitalization of agricultural in India
5- To know barriers to digital agriculture.

Research Methodology

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This research study is descriptive in nature based on secondary data. The information is collected from various secondary sources including research paper, government websites, government publication and various recognized websites.

Analysis

a) To know benefits of Digitalization on the farmer

Digitalization of agricultural sector plays a very important role in improving the standard of living of farmers, providing employment opportunities and help farmers to reduce uncertainties that every farmer, specially whose are dependent on climatic conditions are facing presently.

Use of Big Data and Artificial Intelligence

Big data analytics solve certain problem with the help of predetermined algorithms. Now a days Artificial intelligence methods are used in agriculture for various applications. This techniquewith the help of machines enables decisions making without human intervention.

Source- Analytics Vidhya

Now a days big data is being harnessed for agricultural sector in different part of the world. But still agricultural sector is on the bottom list which is using data analytics (Ryan and Acharya, 2017). However, with the passage of time and penetration of internet of things in GPS and sensor technologies, slowly big data is making its place in agriculture like GPS enabled sensors and technologies are resulting in crop , soil and weather data. The data obtained are transferred to centralized system in real time, this becomes the foundation of digital agricultural and big data in this sector. But this transformation of traditional

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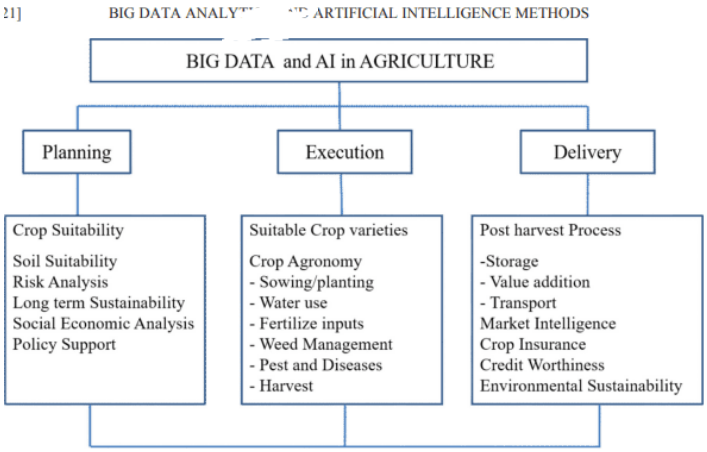
agricultural to digital agriculture requires the penetration of smart phones and digital literacy within Indian farmers.



Use of Big Data and Artificial Intelligence (AI)–based at various stages of agricultural management

GPS Tractor

Farmers can see exact location of their tractor. It is enabled with Automatic Area Management,now tractor can measure the farm land accurately on the basis of work done by tractor on the mobile app and farmers can trust the measurement without any doubt. This app also enables the user to keep track on fuel level and notifies when fuel is about to get over. Such technologies have made farmers work more convenient and trustable.

When we talk about Indian farmers, yes, it is too earlyfor Indian farmer. But this technological advancement is important for future of our wants of Indian farmers and agriculture. In upcoming years, it will be very useful.

Satellites

Satellite by GEOSYS's based on remote sensing, incorporate historical data with real time data and helps farmers to predict the problems even before it occurs. Which helps the farmers to protect crop before real symptoms occurs. Precision farming with the help of sensors, drone helps a lot the farmers by taking the real time pictures of crop and apply insecticides and pesticides according to the requirement.

Digital Marketing

Digital marketing also formsa significance part of digitalization of agriculture, special at the time of pandemic. Digital marketing is very helpful for farmers to reach their customers easily and sell agricultural product at higher price by reducing

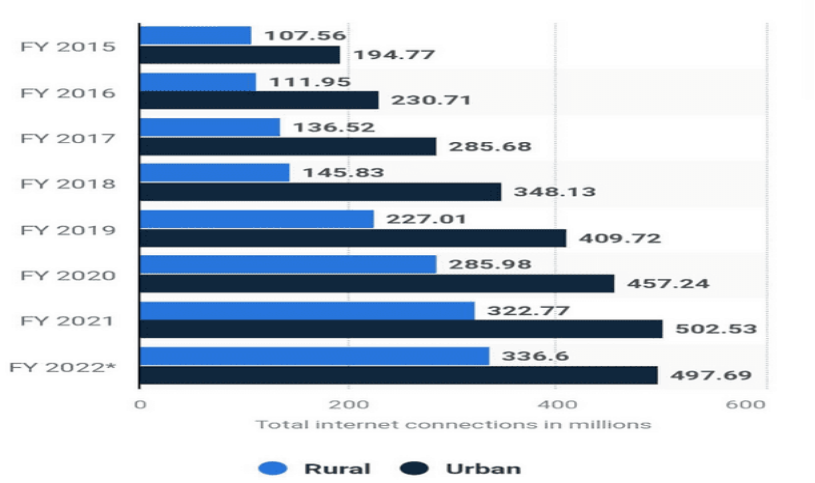
marketing cost of agricultural product. Now a days, young farmers are taking keen interest in adopting digital marketing. Awareness campaigns are conducted by state and central government to make farmers aware about benefits about digital marketing.

When these technologies are implemented in agricultural sector it enables better management of resources and keep track on farm. With this farmer can analysis farm in real and short time and can help to work efficiently andeffectively. This fusion of digitalization and agriculture will provide help for resolving farmers growth and development. This also help farmers to increase socio- economic status and thus playa significant role in poverty reduction.

b) Awareness among farmers about Digitalization of agriculture

To make any sector digitalized there are some basic conditions which needs to be fulfilled and therefore its must for farmers to transform traditional agricultural to digitalized agriculture. These factors include: literacy and ICT education, connectivity: internet access, mobile subscription, networking, electricity, proper infrastructure and most important institutional support. Digital technology access to small farmers can provide direct linkage to suppliers and consumers, can gather information about various scheme, training programs and financial and legal supports.

Number of internet connections in rural and urban areas of India from financial year 2015 to 2022



Source:Statista

From fig3. We can interpret that internet penetration is increasing year after year in India, which is a good sign for digitalization in India.

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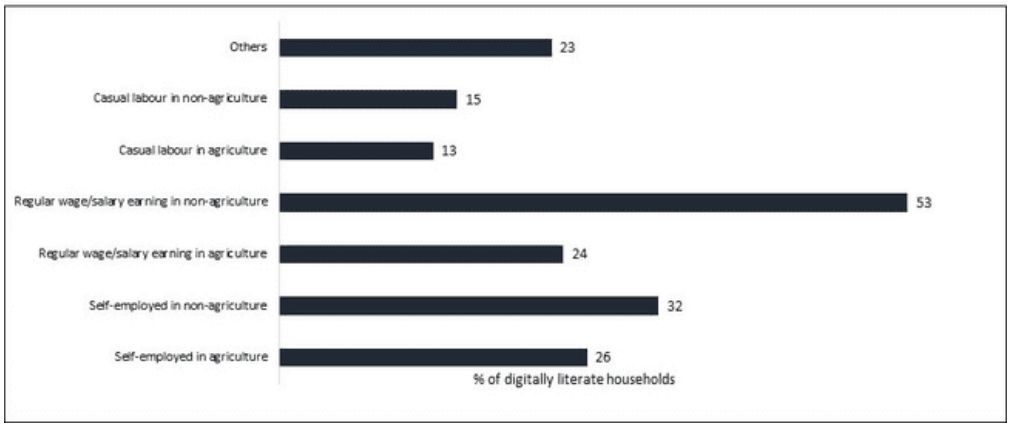
Only internet penetration is not enough for increasing awareness among the farmers of India , digital infrastructure is much needed facility. As far as urban areas are concerned digital infrastructure are well developed but rural areas lack in this factor, which results in digital divide between urban and rural areas. Due attention should be given to enhance digital literacy, although penetration of mobile phone and internet has increased , but an study under IFFCO – Airtel Kisan Card initiative found very low usage of mobile phones by farmers for accessing agricultural information.

Digital literacy levels in rural India, by occupation



Source:The digital dream: Upskilling India for the future

From above fig we can observe that digital illiteracy among casual labour is least and not very much prominent among people engaged in agricultural. Digital literacy is primary condition to make digitalization more prominent tool among farmers. And for this government of India has taken various steps to education our farmers one of them is Krishi-VigyanKendras (KVKs) which is not successful to make famers aware about digitalization. Not only this after COVID19 transaction through UPI has also increased and awareness about UPI transaction is increasing among farmers also but at slow pace. Digitalization not only includes use of drones, high tech innovation technology in agriculture, but it also includes marketing or selling agricultural goods online through digital platforms. And in today's era Indian farmers has started using social media platforms to sell agricultural product.

Awareness among farmers about digitalization is spreading but at slow pace, thus this needs support of Indian government and private players so that awareness can be spread among farmers' special small scale.

c) Steps taken by government for promoting digital agriculture

Government act as an important stakeholder in development and adoption of digital technology among farmers. Which is important catalyser which form planning, policies and infrastructure. Following are the initiatives taken by government for promoting digital agriculture.

Earlier, government has taken some initiatives under e-governance, which was NICNET in 1987 (the national satellite- based computer network), under this land records was computerised ensuring that land owner could get computerised copy of landholding, land under tenancy, updated RORs on demand (records of rights). Project GyandootandLokvanliin in UP, FRIENDS in Kerala, e-Mitra in Rajasthan, Khajane in Karnataka etc are example of e-governance.

To help farmers community, government has rolled out several other recent initiatives

1. Union Minister of Agriculture and Farmer Welfare, Mr. NarendraTomar, in September 2021 announced to launch Digital Agriculture Mission 2021-2025, signing five MOUs with Ninjacart, CISCO, Jio Platform Limited, NCDEX e- Market Limited(NeML) and ITC to run pilot project for advancement of agriculture. This mission aims to motivate and inspire projects which are based on digital technologies such as remote sensing, artificial technologies, blockchain, use of drones and robotics in agriculture

2. National Agriculture Market (e-NAM):it is pan-India electronic portal with was launched on 14th April 2016. This portal create a central online platform which unify all the national agricultural market for discovering price of agricultural commodity by creating a network between APMC, private market, market yards and unregulated market. It aims to promote effective performance of the market by streamlining market and transactions and make one uniform market for all. It helps farmers to sell agricultural product without interference of middle man and brokers.

3. The government launched Meghdoot mobile application which provide weather forecasting relating to humidity, rainfall, temperature, speed and direction of wind, ways to take care of livestock and crop.

4. mkisan- As internet penetration is low in rural area, text messaging in native language of farmer can reduce the barriers of digital divide. mkisanis a SMS portal which enable government to provide information, advice and services to farmers by SMS in their language, according to agricultural practice and location. With the help of this portal large number of farmers and every farm household can be covered in rural area, and bringing small and marginal farmers in level playing field.

5. With the help of The World Economic Forum's Artificial Intelligence for Agricultural Innovation (AI4AI) , Government of Telangana launched *SaaguBaagu*,making Telangana first state to implement a structure for intensify technologies which can improve the productivity, sustainability and efficiency in agricultural sector. As on January 2023, around more than 7000 farmers have enrolled with this pilot project, farmers are getting support in form of AI technologies, which includes monitoring crop health, testing of soil, testing of sowing quality, predictions and estimations and finding new customers and suppliers in different geographical area.

6. In order to provide farmers with information of climate change, the Telangana government and UNDP (United Nations Development Programme) currently introduced data in climate resilient agricultural(DiCRA) which differentiate between land which are extremely vulnerable to climate change and those that are climate resistant through remote sensing and algorithms.

7. Soil Health Card portal- Web portal and smartphone based application which is developed and designed by MeitY(Ministry of Information and Technology) and NIC, provides information about application and dosage of fertilizer and pesticides and information on nutrient status of various types of soil.

8. Realizing importance of technology in agricultural sector, government launched " Kisan Suvidha" app which has almost 100 million users registered and taking advantage. This app provide weather information of current day as well as of next five days, suppliers, ways to protect plants, market selling price and agro- advisories.

d) Barriers to Digital agriculture

Besides having potential and multiple advantages to farmers from digitalization of agriculture, there are some barriers which needs to be addressed:

1. Small scale farmers might not have the resources needed for getting digital technology, nor they have resources to learn about this technology, might be left behind. This results in slow rate of adoption of digital technology by small scale farmers
2. To employ digital technology on farm land it requires continues and reliable electricity supply. Power connection is most important source for digital connectivity. But continuous power supply in rural arears is still dreams for many
3. Use of remote sensing and artificial intelligence based smart technology in agriculture had made the data of farmers more vulnerable for cyber acts. Leakage of such

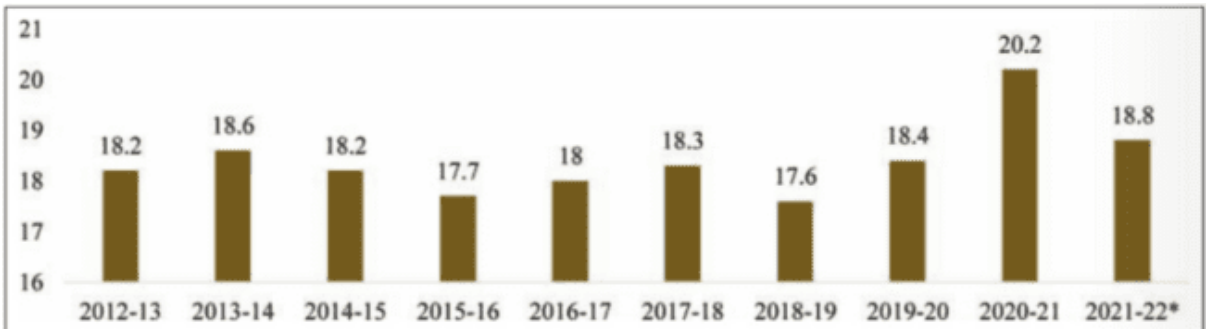
information can through an unauthorized access can become a major challenge and threat for farmers

4. Delay in updating and developing agricultural content timely which hamper digital transformation of agricultural.
5. Other challenges of Indian digitalization include ownership issues between government data generated and private data generation, inadequacy in public private partnership, lack of awareness and training among farmers regarding digital technologies.
6. Credit access challenge- Most of the farmers don't have formal credit history therefore it become difficult for them to access any form of formal financial access beyond KCC, therefore digitalization finds it difficult to penetrate in rural areas
7. Landholding among Indian farmers is much lesser than from other foreign countries farmers. If we want digitalization in agriculture to be scalable to majority of farmers, then it has to be customized according to Indian farmers.

e) Impact of digitalization on Indian economy

In India almost 70% of population lives in rural area, and about more than 58% of Indian population relies on primary source for their occupation. The share of agriculture and its allied industries in total GVA is around 18%. This has although improved to 20.2 % in year 2020-21 and 18.8 % in 2021-22.

Percentage Share of GVA of Agriculture and Allied Sector to Total GVA



Source: economic survey 2021-22
*As per 1st advance estimates of national income

- Total agricultural export recorded during 2021-22, USD 49.6 billion with an 20% increase from USD 41.3% in 2020-21.

- With an increase in technological intervention in agriculture sector, organic sector has seen an unusual growth of CAGR 10% in year 2016 to 2021 and will reach 75,000 cr by 2025 from 2,700 in 2015
- According to research by NITI Ayog on artificial intelligence in agriculture, the report says that agriculture will increase at rate of 4% or higher and will maintain an annual growth rate of 8%- 10%. NITI Ayog also predicted that artificial intelligence in agriculture would be worth USD 2.6 billion by 2025 and will rise at pace of 22.5 % CAGR.
- Digitalization has also helped in growth of Agrifood startups, the investment has gone up from USD 1.66 billion from 2013-17 to USD 4.6 billion in the year ending 31st March 2022 and overtook China and become Asia- Pacific's biggest funded agrifood ecosystem.

Suggestions

Digitalization of agriculture in India face many challenges, but one of the main challenges is segregation of land which complicate data collection gathering. Holder of small farm land hesitates in using these technologies because of cost inefficiency. Thus, digitalization should be customised in application to small farmers in India, and later can be scaled up and made available to all farmers. When we talk in Indian context financial estimate about cost of digitalized technologies per unit land , per individual and return of investment and saving from these technologies are not available yet, which make it difficult to evaluate from economic aspects point of view. So, first government to India should try to gather financial estimates to make digital policies for farmers more beneficial.

Thus to make digitalization successful in India one must focus on – lowering the cost of technology, according to Dalwai committee report an average Indian farmers earns ₹ 77976 per annum this figure itself tell about financial circumstance among Indian farmers. Thus, technologies should be affordable, that will be appealing to farmers. To make digital technologies available to all farmers, government should focus on direct income support to farmers. These schemes require large digital database of farmers so that scheme could be implemented in short period of time.Further, private sector can also play a key role in facilitating e commerce and other platform to modify food supply chain of farmers. Long term investments are required from both public and private sector to boost up digital connection in rural India. Additionally, research work related to digital agriculture should be scaled up by promoting agriculture academic institutes, FPOs, NGOs, Agri-startups and agriprenuers.

Conclusion

Hence,we can say that, introduction of digital technology in agriculture will bring desired result in this sector which includes increase in production and lower cost of production, elevate socio economic status of farmers, lesser chemical application, improve price and ultimately promote sustainable development of ecosystem. Digitalization has great potential to resolve the problems of farmers as well as help Indian economy to sustain growing population. Now only this a major change in agricultural sector will take up sustainable food system which will help in meeting up UN Sustainable Development Goals. Its success required better implementation of policies by government along with significant public private partnership. Finally, digital infrastructure like internet connectivity, mobile phone and adoption and continuous use of digital technology by farmer etc. plays an significance role in digitalization of agriculture. Specially people living in rural areas still do not have access to basic facilities. This can result in delay in digitalization of this sector. Policy maker must look after rapid creation of digital infrastructure in rural area and development of AgriTechstartups which will help in rapid development of technologies for farmers in India.

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