



Impact of emerging digitalization an agricultural Productivity: With special reference to Eastern Uttar Pradesh

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Abstract

The Government of India is prioritizing the optimal use of advanced technologies to ensure uninterrupted food security and increase the agricultural productivity of farmers. This paper examines the impact of various emerging digital services used by the farming community on agricultural productivity and also studies the impact of digitalization in Indian agriculture. It highlights the applications of various digital technologies for increasing agricultural yield, improving farm level decision making. This is mainly an analytical and exploratory paper based on primary data which has been collected through structured schedules and questionnaires from some districts of eastern Uttar Pradesh. This paper has found that various digital services are being used very little by the farmers in the agricultural fields and there is also little awareness about various information. The paper suggests that policy makers should encourage and focus the use of various digital services in the agricultural sector to increase food productivity so that farming can become digitally oriented.

Keywords: agricultural productivity, digitalization, digital information, awareness, farmers

Introduction-

In recent years, technological advancements in India's agriculture sector have led to an unprecedented emphasis on the need for digitization in Indian agriculture, driven by the overarching goal of increasing productivity and ensuring sustainability in the face of emerging challenges. The infusion of digital technologies in agriculture, commonly referred to as digitization, has emerged as a transformative force that has the potential to significantly boost agricultural productivity. Digitalization of agriculture refers to the integration of cutting-edge technology into the agricultural production system, including artificial intelligence (AI), robotics, uncrewed aviation systems, sensor and communication networks, drone technology, and smart irrigation systems.

Niti Aayog has estimated “that AI in agriculture will be worth \$2.6 billion by 2025 and grow at a compound annual growth rate (CAGR) of 22.5 percent. Technology today helps farmers increase yields by helping them choose the best crops, hybrid seeds and resources, efficient agricultural techniques”.

“Digital agriculture is a powerful tool to accelerate agricultural and rural transformation. I have the potential to revolutionize agricultural practices, expand market access and overcome persistent challenges in the agriculture sector. We conceptualize and research the use of the latest digital technologies in smallholder agriculture”. (Anil Rai 2023)¹

The development of the agricultural sector has always played a key role in rural development. Therefore, it has been the focus of Indian policy makers. Agriculture, the main source of income in villages, contributed 20.2% to the gross value added in 2020-21. Digitalization in agriculture has brought great potential to bring significant innovation and transformation in India's agricultural sector. Adoption of digital technology can help India increase agricultural productivity, reduce waste of resources, increase agricultural exports, increase farmers' income and improve food and nutrition security. Apart from this, it can protect the environment and promote sustainable development in the overall agricultural sector. However, the increase in internet and mobile phone access in India has had a significant impact on various sectors including agriculture, education, healthcare and e-commerce. Thus, we can say that now Indian agriculture is ready to fully adopt digital transformation.

Review of Literature

Reviews of some of the literary works that have been carried out in this regard:

Balkrishna, Pathak & Arya - (2023)- A comparative analysis of key aspects of several portals and applications found that very few applications were unique, while most others replicated similar features. With greater affordability of digital technologies, aided by rising rural internet penetration and growing investor interest, India's agricultural landscape could become more resilient to climate change, while boosting food security and economic growth.

ROY & Saha (2022)- suggests that on a planet with limited resources and a changing climate, it is imperative to produce more food sustainably. Technological processing power and analytical advances offer this possibility. Digitalization of agriculture will certainly address these difficulties. New technologies, advanced sensor capabilities, increased data connectivity and computer-based artificial or augmented intelligence (AI) decision support and self-learning systems will play a key role in the transformation to digital agriculture.

Cheruku & Katekar (2021)- This paper explores the digitalization of Indian agriculture to create value for the farming community and enhance opportunities to double farmers' income. It highlights the applications of various digital technologies to increase agricultural yield, improve farm-level decision making, maximize resource use efficiency. It is an analytical paper based on a survey of literature and draws on secondary data. The researchers have adopted qualitative research methodology to conduct the study. The paper analyzes the scope of application of advanced digital technologies in agriculture and suggests principles for integrating

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digital technology into the agri-food system to maximize the impact of digitalization to increase farmers' income.

Beriya Abhishek (2020) - Analyzed the challenges and possibilities of emerging digital agriculture in India. The main objective of this paper is to study how digital agriculture helps in increasing the income of farmers and to examine the challenges faced in digital agriculture. It mentions many applications and portals of digital agriculture. To understand the challenges associated with digital agriculture in India, comparison has been made with the average farms of America, Australia and Europe. We find that low cost of technology, easy to use portable hardware, per capita production, policy support and harnessing the power of farmer collectives are needed for the success of agriculture in India.

Dr. Zearamane (2018)- The study focuses on explaining the concept of digital technology and the growth of Indian agriculture. The paper also analyzes the approach adopted by such companies to check how the supply-chain demand will be met in the future. The research paper is based on secondary data and is descriptive and conceptual in nature. The conclusion is that the technology platform can bring the desired results in agriculture such as reduced costs, improved productivity and quality, better prices, reduced risk and ultimately a sustainable ecosystem.

Governments play a vital role in the access and use of new technologies and applications. Several digital based initiatives and programmes have been launched by governments/NGOs and other organizations to boost agricultural growth, productivity and farmers' income in India. Some of them are as follows:

Digital Agriculture Mission 2021, 2025 - This initiative has been launched by the government from the year 2021 to the year 2025 to promote projects based on new technologies like artificial intelligence, blockchain, remote sensing and GIS technology, use of drones and robots in the agriculture sector.

Agri stack - It is a collection of technologies and digital databases focused on farmers and the agriculture sector. Under this program, every farmer will have a unique digital identity containing personal details, information about the land they cultivate, as well as production and financial details.

(e- NAM)- An all-India electronic trading system that links the existing Agricultural Produce Market Committees (APMCs) Mandis to create a unified national market for agricultural commodities.

(NeGP-A)- This scheme aims to promote rapid development in India by using information and communication technology (ICT) to deliver timely agricultural information to farmers.

Kisan Loan Portal (KRP)- KRP aims to revolutionize access to credit services under Kisan Credit Card by providing a comprehensive view of farmer data, specifications of loan details, interest subsidy claims and progress to the Planning Commission.

KCC Abhiyan - This is to ensure that every farmer has access to credit facilities without any restrictions so that he can run his agricultural activities smoothly.

Integrated Farmer Portal - Through this portal, management, supervision and reporting will be easy in the implementation of schemes. The data available on this portal is also carried forward as per requirement.

Objective of study-

- 1- To study the impact of use of digital services in raising awareness in the agricultural sector.
- 2- To examine the impact of digitalization on an agricultural productivity in selected area.

Research Methodology-

This study is an exploratory survey which uses a systematic and organized method to meet the desired objectives. Primary and secondary data have been used in this paper. But it is mainly based on primary data. Data collection has been done through structured questionnaire in June 2022. Purposive random sampling method was used in data collection and sampling. The sample size of total farmer respondents is 150 which includes both male and female farmers. This study has taken 50-50 farmer respondents from three districts of eastern Uttar Pradesh, Deoria, Azamgarh and Jaunpur.

Data Analysis & Findings-**Table:1**

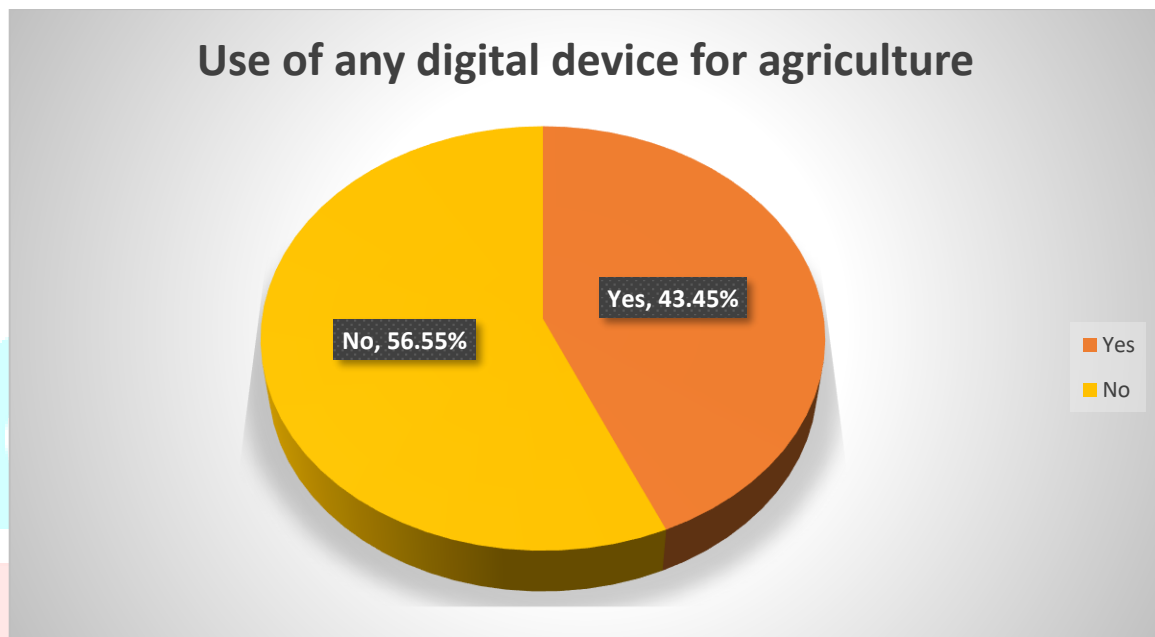
		Jaunpur	Azamgarh	Deoria	Total
Gender	Male	30	30	30	90
	Female	20	20	20	60
	Total	50	50	50	150
Age Group	21 to 40	20	20	20	60
	41 to 60	20	20	20	60
	61 to above	10	10	10	30
	Total	50	50	50	150
Category	General	18	15	16	49
	OBC	17	25	20	62
	SC	13	09	09	31
	ST	02	01	05	08
	Total	50	50	50	150
Ration card	APL (white card)	13	15	12	40
	BPL (Pink card)	18	18	16	52
	AAY (Red card)	09	08	11	28
	None	10	09	11	30
	Total	50	50	50	150
Use of digital devices	Yes	34	37	35	106
	No	16	13	15	44
	Total	50	50	50	150

Source: Field survey

In the demographic profile shown in the above table, 50-50 farmer respondents have been selected from 3 districts of eastern Uttar Pradesh. There are a total of 150 respondents, which include 90 male and 60 female farmer respondents. The age of the respondents has been divided into three groups. The first age group is from 21 to 40 years, the second age group is from 41 to 60 years and the third is the age group of farmers above 61

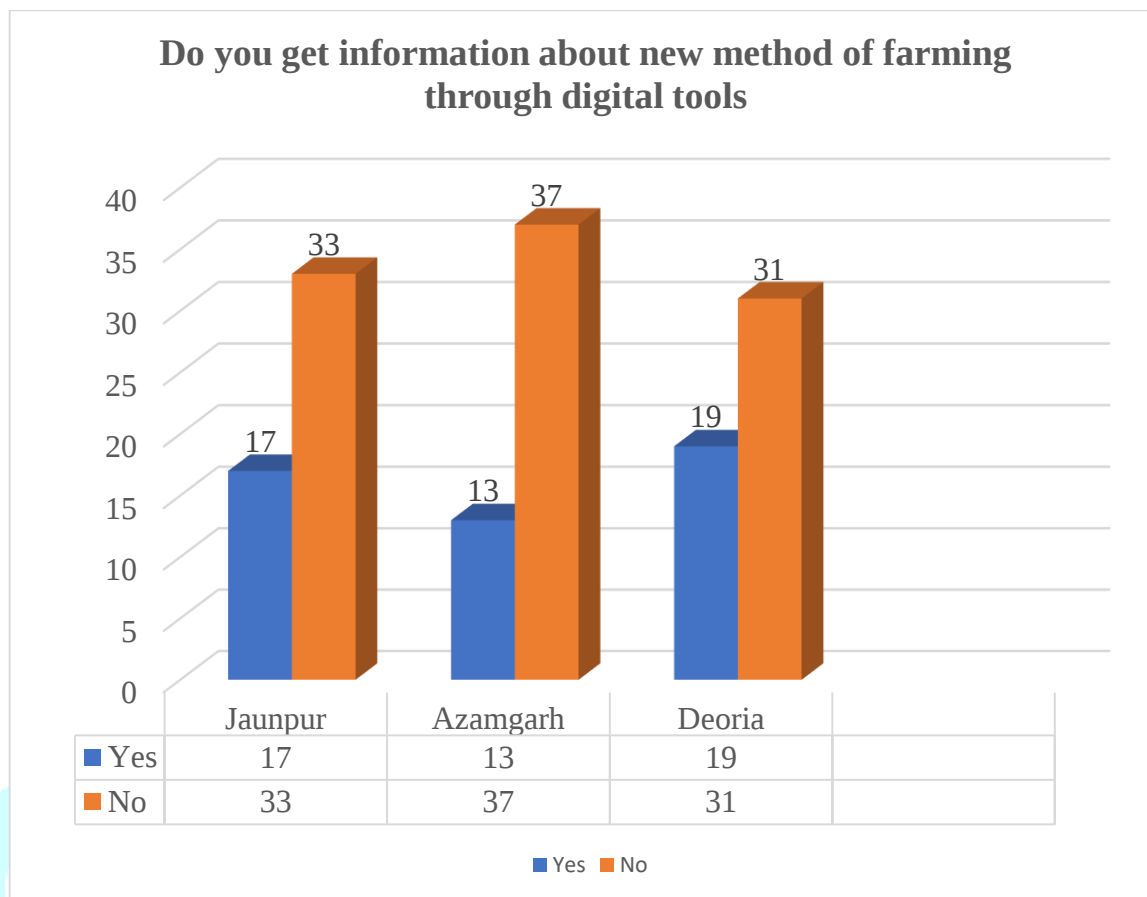
years. If seen category wise, the maximum number of respondents are from OBC category (62), 49 from general category, 31 from CSC category and 08 from ST category. If we talk about ration card of total selected respondents, then 52 respondents have BPL card i.e. (pink card), 40 respondents have APL card (white card) and 28 respondents have AAY (red card). Also, there are 30 such respondents who do not have any card. Now, if we talk about the use of internet based digital devices or smartphones, then out of total 150 respondents, 106 respondents have smartphones or other devices but 44 respondents do not have any such device in which internet can be used. Most of these are above 61 years of age and female respondents who have many reasons for lack of digital literacy, technical fear and hesitation, not having a smartphone.

Chart:1



Source: Field survey

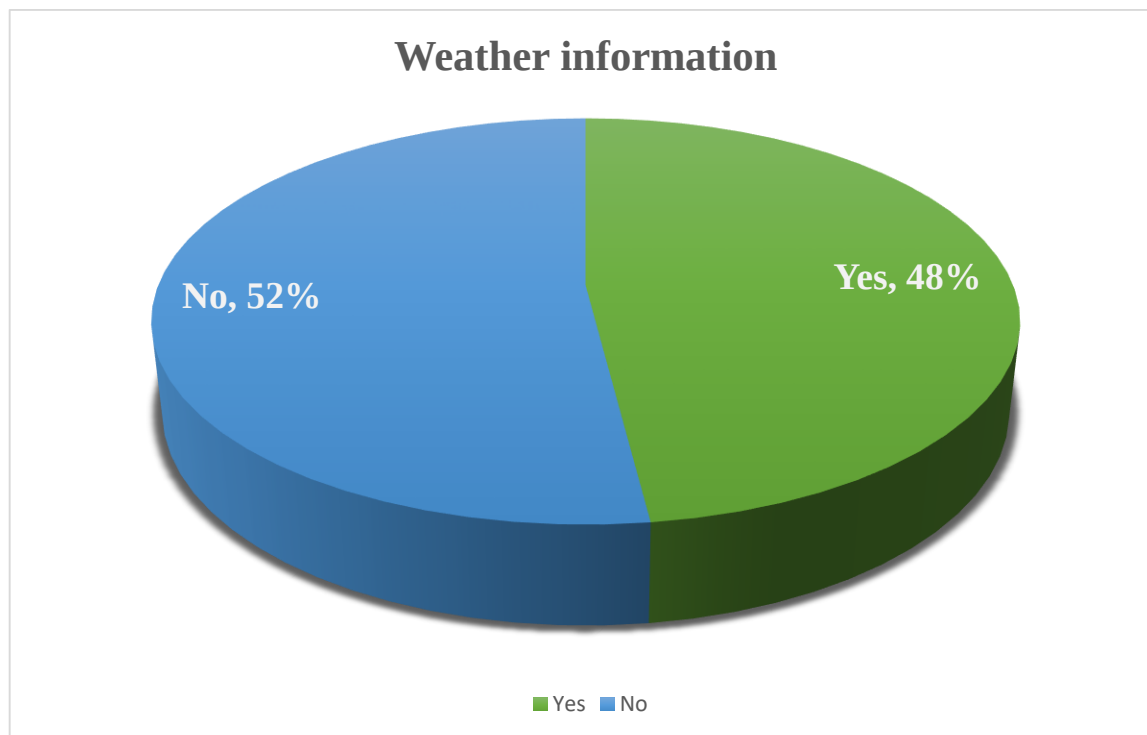
This chart shows the use of any digital devices to obtain information related to agriculture. 70.66% of the selected respondents have internet-based smartphones and Adar devices but only 43.45% of the respondents use those devices in the field of agriculture. 56.55% of the respondents do not use any such online service to obtain information in the field of agriculture. Thus, we can say that the effect of emerging digitization is gradually being seen in the field of agriculture but still at a very slow pace.

Chart:2

Source: Field survey

The above bar chart shows the district-wise learning of new methods of farming through the use of smartphone internet devices in eastern Uttar Pradesh. Out of a total of 150 respondents, 49 farmers use digital services to learn new methods of farming. The highest number of 19 farmer respondents from Deoria district, 17 from Jaunpur district and 13 respondents from Azamgarh use digital devices to learn new methods of farming. Farmers are trying to take advantage of online facilities for diversification in agriculture.

Chart:3



Source: Field survey

In the above pie, 48% of respondents search the internet for weather broadcasting information, while 52% of respondents do not use smartphones for weather information and neither do they have any knowledge about this subject. With the information of weather broadcasting, farmers can secure their fields and barns.

Table: 2**Use of digital services for various information related to agriculture**

Use any digital services to know various information		Jaunpur	Azamgarh	Deoria	Total
To check soil quality & seeds quality	Yes	05	09	07	21
	No	45	41	43	129
	Total	50	50	50	150
Agricultural loans	Yes	11	08	06	25
	No	39	42	44	125
	Total	50	50	50	150
Information related to pesticides & chemical fertilizers	Yes	06	07	04	17
	No	44	43	46	133
	Total	50	50	50	150

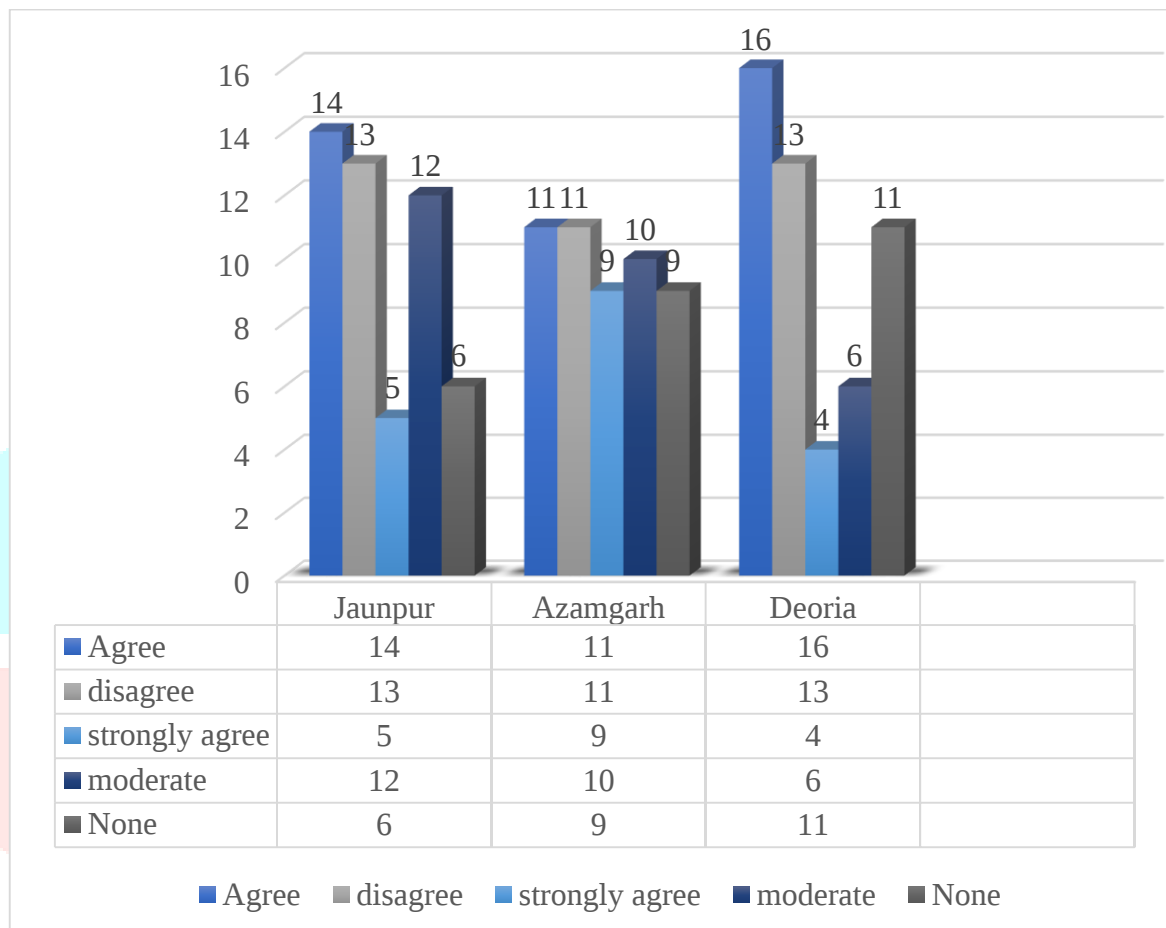
Source: Field survey

Many initiatives have been taken by the government and non-government organizations to promote digitalization in agriculture. Internet-based smartphones and services are used to obtain various types of information related to agriculture. If we look at the selected districts of eastern Uttar Pradesh in this study, the government has taken the initiative of organizing camps and digital portals and apps at various places to check the quality of soil and seeds. But out of a total of 150 respondents, only 21 respondents use various digital online services to check the quality of soil and seeds. Online based services are used by farmers to get

information about loans and to prepare data of loan providers. 25 farmer respondents also apply for loans through information about online loans and bank apps. Out of a total of 150 respondents, only 17 respondents use digital services for information related to pesticides and chemical fertilizers. At present, the use of various online based services for this type of information is nominal. At present, there is a need to make farmers aware and encourage them for digitalization in the agriculture sector.

Chart:4

Impact of the use of digital service on the increase in awareness of the agriculture sector



Source: Field survey

In the above chart-4, the impact of awareness of use of various digital services in the agriculture sector of eastern Uttar Pradesh is shown district-wise. Out of a total of 150 respondents, 41 respondents agreed that awareness in the use of digital services in the agriculture sector has increased, 37 respondents disagreed, 18 respondents strongly agreed and 28 moderated and 26 respondents did not give any answer. Thus, it can be said that the use of digital services in the agriculture sector is increasing, and its impact on awareness in the agriculture sector is also increasing.

Chart:5

Source: Field survey

After the advent of information technology, its use in agriculture sector started increasing gradually, but after the advent of Digital India program, it started being encouraged by the government and its use in agriculture sector also started increasing. Earlier there was one-way flow of information due to information technology, but now information is also being exchanged by farmers, that is, information is flowing from both ways. 28 percent of farmer respondents ask or find out information directly through online mediums like through calling and messaging. 72% farmer respondents do not receive any kind of information directly.

Table:3

District	Impact of the use of digital service on the increase in agricultural productivity					Total
	Agree	Disagree	Strongly agree	moderate	None	
Jaunpur	12	16	5	4	13	50
Azamgarh	9	14	3	7	17	50
Deoria	11	19	2	4	14	50
Total	32	49	10	15	44	150

Source: Field survey

This chart shows district wise impact of use of digital services on increase of agricultural productivity. Out of total 150 respondents, 32 farmers agree that use of digital services is increasing agricultural productivity and 49 respondents disagree, 10 strongly agree, 15 moderate and 44 farmer respondents did not answer. Highest number of 12 respondents agree and 16 disagree from Jaunpur district. 9 respondents from Azamgarh agree and 14 disagree with increase in agricultural productivity due to use of digital services. In this way we can say

that due to emerging digitalization, productivity and awareness is increasing in agricultural sector but it is still having very little impact.

Table:4
Chi-Square Tests

	Value	Fdf	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.986 ^a	3	.263
Likelihood Ratio	4.049	3	.256
Linear-by-Linear Association	.708	1	.400
N of Valid Cases	150		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.25.

In the above table, the researcher has tested the effect of the use of smartphones or other internet devices in the agricultural sector and its impact on agricultural productivity. On testing, it was found that the Pearson chi square (P value) asymptotic significance is 0.263 which is much higher than the generally accepted significance value of 0.05, hence the null hypothesis is being accepted and the alternate hypothesis is being rejected. Hence, it is concluded that there is no significant relationship between the use of internet-based smartphones or other devices in the agricultural sector and its impact on agricultural productivity.

- Among the selected respondents, the number of male farmers is much higher than the female farmer respondents. Female farmers do not use smartphones for various information in the agricultural sector nor do they know anything about it. Mostly male farmers use digital services in the agricultural sector.
- In this study, the most frequent use of information technology in the agriculture sector is by farmer respondents in the age group of 21 to 40. As the age group of respondents increased, the use of digital technology gradually decreased. This could be due to many reasons such as lack of digital literacy, inaccessibility to resources, fear of technology, lack of literacy and others.
- 70.66 percent of the respondents have access to internet-based smartphone or other device but they do not know how to use it properly i.e. there is lack of awareness and training. There is no information about various online apps, portals, schemes and how to use them.
- The reason for low agricultural productivity in eastern Uttar Pradesh is the crop pattern which is still cultivated in the traditional way in which mainly paddy or wheat is cultivated.
- Earlier, farmers could get information through traditional information technology such as radio, news, paper, magazine and TV, but they could not share their farming related problems or ask questions. However, now with the help of digitalization, farmers can solve their farming related problems anytime, anywhere. Now the flow of information has become two ways.

Conclusion-

The Government of India has encouraged digitalization in agriculture through its policies and schemes. However, India is lagging far behind in adopting digital technology at the agricultural level. Most of the initiatives are limited to governance objectives and providing information to farmers. However, any government-led initiative will be successful only when there is maximum participation of rural people and

farmers. To develop innovation in the agricultural sector, accurate and updated data on weather conditions, soil quality and type, market, crop variety, crop yield is required. There is a need to create a reliable and centralized digital data repository which will help in reducing both time and cost. To increase the productivity of the agricultural sector, policy makers should promote the creation of digital infrastructure in rural areas, bring the benefits of new technologies to farmers and develop Agri tech startups in every Gram Panchayat to increase agricultural productivity.

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