

Impact of Digitalization on the Farmers in India: Evidence using Panel Data Analysis



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Abstract: *The composition of digitalization and financial technology has brought about a new development model for the agriculture sector. What is the impact of digitization on India's farmers? To answer this issue, this article examines the effects of digitalization on farmers in India using secondary data from 2018 to 2020, based on the idea of digitalization. It analyses the transmission of digitalization among Indian farmers using panel data analysis. The conclusions are as follows: Farmers' income can be significantly increased by digitalization, and farmers' digitization has resulted in agriculture sector development and contributed to economic progress.*

Keywords: *Digitalization, Agriculture Sector, Farmers, Financial Inclusion, Banking, KCC, GVA, NSVA.*

I. INTRODUCTION

Digitalization is a technique that allows everyone to participate in and profit from economic progress; India pioneered digitalization by nationalizing its banks in mid-1969 and then enacting a slew of laws to put it in place [66]. Agriculture sector people who live at BoP in the economy, these people move through digitalization and financial technology. At the bottom of the pyramid, the agriculture sector people are the highest, also the poorest socio-economic group. And digitalization is a key factor in this sector's rapid expansion of Increasing agricultural development and growing farmer incomes are critical [73]. Digitalization substantially minimizes the risk of households being in extreme poverty. Digitalization will compensate for the head of a household's lack of formal education to some degree. Even with limited access to electricity, digitalization continues to have a significant impact on poverty, and financial inclusion is strengthened and targeted at poor households, particularly poor women-owned households in rural areas. Digitalization influences customer financial behavior, and it is directly linked to financial literacy. The percentage of awareness of digitalization has increased after financial literacy showing a direct effect of financial literacy on inclusion.

The adoption of digitalization has simplified the branch authorization, increase in rural areas and digitalization embraces environmental credit. Positive change in the behavior of unbanked people financial literacy increases Financial transaction has been made easy for rural people [9]. financial literacy is the most important social welfare microfinance and suitable development and its positive impact on BOP people. The most important is financial knowledge to rural people and financial training for the best result of financial inclusion [22]. Digitalization can remove corruption and fraud, and agricultural people can seed their Aadhaar with their bank accounts, and government benefits can give directly to bank accounts [66]. Digitalization has played the most important role in economic growth, and the government stable the microfinance bank and community banks in rural areas to reach unbanked people and financial products and services need to decrease their charges, and here is a need to aware rural people benefit of financial inclusion [40]. The success of digitalization provides the banking services affordable cost for the low-income group, and here most important requirement of commercial banks is bank branch expansion in rural areas, and aware rural people for the financial literacy, credit counseling, KKC/GCC mobile banking, micro insurance, microcredit, the bank should have provided simple and affordable product and services for high utility [49],[1]. The benefits of digitalization bring better transparency, scalability, and accountability and stop fake currency, terrorist and it will help to hold back black money and RBI and the government are also promoting a digital payment system, mobile wallet, online recharge, online ticket booking, and promote E-commerce, and the government also launched the UPI payment system [57]. The cash market day by day changes in the digital market and growth the digital banking sector, and most people adopt the cashless economy and digital transaction more than safe cash transactions and time-saving. It helps to make easy transactions records [29]. The concept of a cashless society to take steps of capacity building of people, improve banking and digital infrastructure and any society use less cash and day by day mostly use digital payment system, and cashless economy it means less use of cash mostly transaction of funds by debit card credit card, digital payment method [41]. Digitalization reduces poverty, and it is affected overall economic growth but can increase inequality [2]. The government of India and the Reserve Bank of India have been promoting offers to improve digital financial inclusion, and the digital inclusion concept can be realized by developing awareness programs about digital financial inclusion, developing business strategies for financial institutions, and providing financial services to low-income groups.[19],[67].

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In India, no research has been conducted to assess the impact of digitization on the formers. Digitalization is a critical component of an economy's economic development; it will change the face of agriculture in the future, providing better profits for farmers and minimize harm [78],[73]. The studies focus on the impact of digitalization in the agriculture sector in India. The major motivation for this study is the critical need for a situation study assessment and the lack of any studies in this area. Because of the following reasons, we chose to investigate the impact of digitalization on Indian farmers utilizing evidence and a panel data analytic approach: The unobserved variables are seen in panel data analysis, which aids in detecting the cumulative influence of cause on the output while also accounting for reciprocal covariance and The behavioral elements of digitization and its influence on Indian farmers are better captured by panel data analysis than by traditional econometric or regression analysis. As a result, it was chosen to employ panel data analysis in the model. The purpose of this article is to investigate the impact of digitalization on Indian farmers. The rest of this paper is organized as follows. After the introduction, the next section is Theoretical background building in the article. And the third section is a relevant literature review and hypothesis formulation on digitalization on the formers in India. The fourth section presents the data and methodology. The fifth section presents the results of the study. The sixth section is a discussion of the results. And the last section has been the conclusion of the study.

II. THEORETICAL BACKGROUND

Financial Inclusion (FI) is defined as any effort to bring unbanked people to the main stream by facilitating them with the banking services or formal credit system [61],[64]. There is evidence to prove that FI helps in improving the quality and standard of life as well [30],[11],[61],[50],[3],[68]. In India farmers are supposed to stay in far-flanged places where lack of basic financial services and poverty are rampant [77],[39],[21]. FI obviously also caters to them in more than one ways [26]. The impact of FI on the well-being of unbanked people, poor people or rural people is well documented [69],[60],[31],[71],[70],[4],[58]. However, the impact of digitalization in the financial services and its impact is relatively less researched area [62],[59]. There are many initiatives across the world, including in India to bring technology to the forefront of unbanked people so that they may get benefited [50],[45]. The additional challenge in bringing the technology to the forefront of the unbanked people is ease of use and cost [14],[20]. In India, Open Banking provides a workable solution to the problem in bringing technology to the unbanked people successfully [63],[62],[60]. This study is aimed at assessing the impact of technology (digitalization in financial services) on the well-being of the farmers. The impact of Financial Inclusion is not limited to the well-being of the unbanked people. Whereas it affects the stock market [51],[52],[53]. corporate action policies of the corporate (Pinto et al., 2019, Pinto and Rastogi, 2019) and even corporate governance policies of the firms [69],[70],[10].

III. REVIEW OF LITERATURE AND HYPOTHESES FORMULATION

The literature on the topic covers the digitalization of Indian farmers to how it contributes to the resolution of agricultural development challenges. The formers' social influence as a result of digitalization. The literature on the topic, on the other hand, is piecemeal and does not give a holistic and cause-and-effect link of digitization of formers, as the current study provides. The goal of this literature study is to look into the link between farmers and digitalization. Digital banking is the provision of inexpensive banking facilities to a wide range of disempowered and low-income people [27]. Digitalization has an effect on a country's economic development and many other initiatives [32]. In this article, digitalization can be improved when the financial benefit is clearly addressed [12]. This study expresses that digitalization is a powerful instrument for farmers' development. According to further study, Other demographic characteristics such as education level, household income, age demographic, and amount of farmland are related to digitalization [33]. in this research, the drivers of digitalization include digital banking addressing financial services and financial literacy; People's behavior in terms of financial purchases has been influenced by the affected of demonetization [61]. Digitalization is a multi-layered notion that requires a comprehensive strategy that considers everything from fundamental financial needs to the use of technical resources to make financial services more efficient [15]. Financial inclusion will increase income flow and reduce poverty throughout the economy [16]. People are encouraged to invest and save more as a result of digitalization, which acts as a driver for the economy's massive growth [46]. Digitalization is an important component of an economy's economic development, but it does have an impact on public financial services [68]. The policy is becoming increasingly important for digitalization in many nations, including India. Bank preferences, internet banking, Mobile Banking, and Digital money have all been identified as influential variables in the successful implementation of the system [64]. Digitization may help foster high and sustainable development; it will transform the face of the Agriculture sector in the future, ensuring higher profit for farmers and reducing harm [73]. Digitalization can assist impoverished fishing people and rural populations in minimizing their risks and enhance their financial [24]. Privately, especially in combination with online banking, digitalization can boost economic performance. It is necessary to invest in teaching individuals about the use of ICT in formal commercial banks [17]. In this research, India's digitalization rose by 0.045 points on the average IFI, and digitalization is influenced by a number of factors, including the proportion of agriculture in a state's gross domestic product, literacy rates, size of the population, capacity building, and agricultural deaths [78].



Digitalization availability can considerably decrease the rural-urban earnings difference amongst those aspects, and among the indicators of digitalization, digitalization can relieve the urban-rural income inequality via the transmission mechanism of promoting citizens' entrepreneurial ventures; the worse the economic growth and prosperity and education, the greater the effect of digitalization on the urban-rural wealth disparity, the worse the economic growth and prosperity and education the greater the effect of digitalization on the urban-rural wealth disparity [28]. this study expresses that Gujarat's Akodara Village is recognized as the "first Indian digital village." The ICICI Bank sponsored this Village and transformed it into a fully digital village with appropriate infrastructure, guiding the Village toward online transactions, and he says digitalization is the need of the era [66]. Household debt has such a substantial bad influence on agricultural development in Pakistan in both the short and long run, according to this study, whereas wide money and cropped area have a positive impact in both situations, and Agriculture output is favorably correlated with digitalization [23]. H1: Digitalization impacts the agriculture sector. The study looked at agricultural GDP (AGDP), government financing, the agricultural credit guarantee scheme fund (ACGSF), and credit, mortgages, and advances given to the rural agricultural sector by commercial banks. The goal of this study was to determine the impact of agricultural finance on agricultural achievements to Nigeria's economic growth. They used research that spanned the years 1981 to 2016, Agribusiness and A Commercial banks' loans, mortgages, and loans to the agricultural sector had a strong and large impact on the agricultural share of GDP government financing, and CGSF had a non-significant impact [75]. This research expressed that, digitization of impoverished farmers, rural non-farm enterprises, and other disadvantaged population is critical for improving living circumstances, and the involvement of self-help organizations and microfinance institutions is critical for promoting financial inclusion [21]. This study expressed that microfinance effective tool for poverty-reducing and achieve digitalization, and this research is used secondary data NABARD, GoI, RBI, etc. [21]. This study demonstrates how important digitalization is for the agriculture sector and its promotion; digitalization improves agricultural commercialization, according to the Heckman treatment effect model [5]. The importance of terms of cost efficiency in Africa's financial system is reflected in the fact that the connection between informal and formal financial intermediation is complementary rather than competitive, using formal financial brokers decreases the desire to keep cash, suggesting that a well-developed financial system network has the potential to mobilize excess cash in Africa's informal sector for growth and development, formal digitalization is positively correlated with informal banking services [6]. Digitalization is now recognized to be far implications that can help many individuals escape poverty. Significant investments in financial education, the development of public service offerings, the improvement of delivery systems, and the inclusion of services such as credit, remittance, and financial advising services may all help to achieve significant and successful progress [76]. In Nigeria, digitalization in the agriculture sector is still quite low. It was suggested, including other things, that the government increase its efforts to satisfy the financial needs

of the rural in order to promote digitalization [34]. The study revealed that digitalization had a significant influence on poverty reduction among small and marginal farmers using the basic regression method, conducting financial literacy campaigns among farmers since these characteristics are crucial in affecting farmers' involvement in financial inclusion or prohibiting them from doing so [42]. Regarding India's rising economic prominence and estimates that the Indian economy would be as big as the US economy by 2050, microfinance is an equalizer that allows all citizens to participate in and benefit from economic progress [35]. The government of India & RBI has out with a major initiative towards ensuring inclusive growth through financial inclusion so that the access of financial services will reach the mass population. Financial inclusion denotes the delivery of financial services at an affordable cost to the vast sections of the disadvantaged and low-income groups, and Inclusive growth is not possible without financial inclusion [43]. In this study, family expenses, literacy, religion, place of origin, and usage of irregular financial products were shown to be reliable characteristics affecting family digital payments levels. This might lead to much organization, which could enhance farm families' livelihoods [44]. Only if the home enterprise sector, which comprises micro-farming and also non-farm firms, can contribute to sustainable development would it be feasible. A banking sector it does not affect service home firms will not support sustainable development; instead, access to finance of family businesses will only contribute to sustainable development if it can be increased [36]. The government promoting this digital transaction system provide offers to move to the digital payment system and most important is the development of infrastructure to make digital India [25]. Africa is going on decreasing poverty rate especially rural woman are constrained by financial services together non-financial services including with skill and entrepreneurial and affordable financial services, especially credit open up livelihood opportunities by empowering the poor and bank of Ghana to add the unbanked people with the bank [24]. The bank is promoting financial inclusion, and financial inclusion can break properly various cercal of poverty implemented, and RBI creates a conducive environment for poor people and India needs to improve the rural financial system and financial literacy and economic stability for economic growth [37]. These findings, based on bank and survey data, suggest that agency banking rules and financial literacy might help Kenya enhance formal access to finance [38]. Nations rank differently in the Economic Ranking and the Education Development Score. Nations that rank high in education fare badly in economic development, implying that in countries with similar economic development, academic performance is often bad as well, implying that rising financial inclusion and improving educational outcomes for continuous economic development are both necessary [7]. This study makes use of both primary and secondary data. The information was gathered from 16 different bank branches.

Impact of Digitalization on the Farmers in India: Evidence using Panel Data Analysis

Though the number of ATMs has greatly grown, microfinance has accelerated even in rural regions, indicating that banks have directly led to accessing the unserved people; low literacy, in that order, is considered by so many banks as a key obstacle to financial inclusion [47]. This study expresses that, In India, NBFC-MFIs are inefficient in terms of financial efficiency. Companies' financial viability may be enhanced by improving their technological productivity. Businesses should also improve their operations [70]. H2: The link between digitization and farmers is mediated through financial inclusion. Financial inclusion significantly reduces the likelihood of reducing poverty in households. Increasing financial inclusion and targeting poor families, especially those living in farmer-led rural areas led by poor women [19]. The most important is financial knowledge to rural people, and there is a need for financial training for the best result of financial inclusion [22]. barriers to financial inclusion such as lack of money, distance, fixed cost, and documentations are important obstacles in Ethiopia [13]. financial development has a positive effect on digital economy transformation and financial inclusion on economic transformation is the most impact in Nigeria, financial is most important on economic transformation, and it helps to terminate poverty in Nigeria [3]. financial inclusion can affect overall economic growth thereby reducing poverty but can increase inequality and inequality has a positive and significant impact on poverty in Indonesia [2]. financial inclusion in Nigeria and enhanced business-friendly environment, financial innovation, mobile capacity, and robust financial education [8]. The success of mobile money depends on whether the solution moves away from the paradigms used for designing mobile money solutions for those at the top of the pyramid [18]. Educational age has appositive relation with Financial Literacy while Education level is not associated with Financial Literacy and married women have a lower level of financial literacy relative to single women while working women have a higher level of financial literacy than self-employed women in the case of work [72]. the Banks, NGOs, and SHGs are achieving social inclusion, and the government and RBI promote the digital transaction to reduce the transaction cost [48]. The adoption of the FI has simplified the branch authorization, increase in rural areas and do FI embraces environmental credit, Positive change in the behavior of unbanked people FL increases Financial transaction has been made easy for rural people [9].

The benefits of a cashless economy many people move to the digital mode for saving their time and easy transaction, traceable, and hold black money. The high cash currency circulation in India and 95% of transactions being cash, mostly ATM use for cash windrow [65]. the cash market day by day changes in the digital market and growth the digital banking sector, and most people adopt in the cashless economy and digital transaction more than safe cash transactions and time-saving. It helps to make transaction records [29]. easily; most people are not using the digital transaction system because they were not aware of this system, Financial inclusion in Uttar Pradesh and Bihar state we found the expansion of bank branches has not reached the internal part of undeveloped states which is most important for awareness of financial inclusion education [56]. financial inclusion provide banking services at an affordable cost for the low-income group and here most important requirement of commercial banks is, bank branch expansion in rural areas and aware rural people for financial literacy, credit counseling, KKC/GCC mobile banking, micro insurance, microcredit, the bank should have provided simple and affordable product and services for high utility [49]. H3: The link between formers and agricultural progress is mediated by trust.

IV. DATA AND METHODOLOGY

This study uses secondary data collected from RBI. The RBI website has an accurate and comprehensive directory of states and banks that are regulated by the RBI. The data has been taken from major states of India for three years (from FY 2018 to 2020). There are several examples in the literature when the measure, GVA, NSVA, and Number of KCC, and amount of KCC, respectively, are used. In this study, the same method is used. (Table 1. Descriptive) The relationship is established using panel data econometrics. The unit root test is performed on all four variables utilized in this study before running the panel data models to ensure that the data is stationary. Because panel data econometrics is commonly used in studies of states, banks, and their performance, the same established technique is used in this work [2],[1],[3],[31]].

The statistical values of each variable are shown in Table 1.

Table 1. Descriptive

SN	Mean	SD	Min	Maximum
GVA (Lac)	57,73,433	64,62,596	39,922	2.50*10 ⁷
NSVA (Lac)	52,12,604	59,92,010	21,368	2.48*10 ⁷
KKC_n	21,801.51	26,69,463	4000	1.20*10 ⁷
KKC_a (Lac)	21,78,084	27,05,864	1560	1.13*10 ⁷

V. RESULTS

In order to determine whether the model should use a Model 1 (fixed-effect) and Model 2 (Random effect), we first performed the F-test, and the results showed that we should use a fixed-effect model, and then we added individual and time dual control effects. To avoid endogeneity, the average growth rate of the Kisan Credit Card (KCC) and Gross value added (GVA) a dependent variable.

Table 2. static panel data results (For Gross) show the first-stage regression results of the dependent variables. It can be seen that the dependent variable has a significant not correlation with the Gross value added (GVA), and the F-test statistic is .0524, which dependent variable, indicating that this dependent variable is a reasonable dependent variable



Table 2. Static Panel Data Results (For Gross)

	Model 1 (Fixed Effect)		Model 2 (Random Effect)	
	DV: GVA	DV: GVA (Robust)	DV: GVA	DV: GVA (Robust)
Constant	68,36,192	68,36,192	15,91,490	15,91,490
KKC_n	-4875*, .2235 (.051)	-4875, .5835 (.410)	--	--
KKC_a	--	--	1.9200, .2004 (.0000)	1.9200, .2881 (.0000)
F-test (Model)	3.91** (.0524)	.7000 (.410)	91.73 (.0000)	44.43 (.0000)
R-Square	.0603	.0603	.1837	.1837
σ_{vit}	27,06,809.6	27,06,809.6	33,84,940.10	33,84,940.10
F-test Fixed Effect	32.39 (.0000)	32.39 (.0000)	50.54 (.0000)	50.54 (.0000)
Theta	--	--	.8616	.8616
Breush-Pagan Test	51.52 (.0000)	51.52 (.0000)	82.29 (.0000)	82.29 (.0000)
Hausman Test	41.53 (.0000)	41.53 (.0000)	1.10 (.2939)	1.10 (.2939)
No of observations (n)	93	93	93	93
Degree of freedom				
Wald test for Heteroscedasticity ¹	7.70*10 ¹⁰ (.0000)	7.70*10 ¹⁰ (.0000)	1.0*107(.0000)	1.0*107(.0000)
Wooldridge Autocorrelation	5.849 (.0219)	5.849 (.0219)	7.5880 (.0099)	7.5880 (.0099)
Test ² AR (1)				

Note: σ_{vit} is the Standard Error of Regression. First value is coefficient, second value is standard error, and (value) is a p-value. ** significant at 10% level; * significant at 5% level

We first only considered the univariate impact of digitalization on the formers in India, then added Exploratory variables for regression, and finally used dependent variables, as shown in Table 2. The results show that in both model 1 (Fixed Effect) and model 2 (Random Effect), Model 1 (Fixed Effect), the coefficient of Kisan Credit Card (Number of Kisan Credit Card) is negative and significant at the 5% level and Model 2 the coefficient of Kisan Credit Card (Number of Kisan Credit Card) is not a

correlation with the gross value added (GVA), and F-test (Model) significant at the 10% level. This shows that the Kisan credit card does not correlate with gross value added (GVA). Table 2 also shows that Kisan credit card (KCC) has a poor effect on gross value added (GVA). The impact of Kisan Credit Card on gross value added (GVA) is not significant, which indicates that the importance of Kisan Credit Card (KCC) cannot be replaced by traditional finance.

Table 3. Static Panel Data Results (For Net)

	Model 3 (Fixed Effect)		Model 4 (Random Effect)	
	DV: NSVA	DV: NSVA (Robust)	DV: NSVA	DV: NSVA (Robust)
Constant	61,83,043	61,83,043	13,06,245	13,06,245
KKC_n	-4451**, .2235 (.0510)	-4451, .5452 (.4210)	--	--
KKC_a	--	--	1.7934*, .1893 (.0000)	1.7934*, .2801 (.0000)
F-test (Model)	3.97** (.0509)	3.97** (.0509)	40.98* (.0000)	40.98* (.0000)
R-Square	.0610	.0610	.2577	.2577
σ_{vit}	71,00,728.5	71,00,728.5	32,22,196.3	32,22,196.3
F-test Fixed Effect	39.22* (.0000)	39.22* (.0000)	64.68* (.0000)	64.68* (.0000)
Theta	--	--	.8777	.8777
Breush-Pagan Test	57.43* (.0000)	57.43* (.0000)	84.65* (.0000)	84.65* (.0000)
Hausman Test	39.77* (.0000)	39.77* (.0000)	2.100 (.6422)	2.100 (.6422)
No of observations (n)	93	93	93	93
Degree of freedom	61	61	61	61
Wald test for Heteroscedasticity ¹	7.7*10 ⁷ * (.0000)	7.7*10 ⁷ * (.0000)	1.1*10 ⁷ * (.0000)	1.1*10 ⁷ * (.0000)
Wooldridge Autocorrelation	5.849* (.0219)	5.849* (.0219)	5.05* (.0321)	5.05* (.0321)
Test ² AR (1)				

Note: σ_{vit} is the Standard Error of Regression. First value is coefficient, second value is standard error and (value) is p-value. ** significant at 10% level; * significant at 5% level

Determine whether the model should use a Model 3 (fixed-effect) and Model 4 (Random effect), we first performed the F-test, and the results showed that we should use a fixed-effect model, and then we added individual and time dual control effects. To avoid endogeneity, the average growth rate of the Kisan Credit Card (KCC) and Gross value added (GVA) as dependent variables. Table 3. static panel data results (For Net) show the first-stage regression results of the dependent variables. It can be seen that the dependent variable has a significant not correlation with the Gross value added (GVA), and the F-test statistic is 0.0509, which dependent variable, indicating that this dependent variable is a reasonable dependent variable We considered the

univariate impact of digitalization on the formers in India, then added Exploratory variables for regression, and finally used dependent variables, as shown in Table 3. The results show that in both model 3 (Fixed Effect) and model 4 (Random Effect), Model 1 (Fixed Effect), the coefficient of Kisan Credit Card (Number of Kisan Credit Card) is negative and significant at the 10% level and Model 4 the coefficient of Kisan Credit Card (Amount) is no correlation with the gross value added (GVA), and F-test (Model) significant at the 5% level.



This shows that the Kisan credit card does not correlate with gross value added (GVA). Table 3 also shows that Kisan credit card (KCC) has a poor effect on gross value added (GVA). The impact of Kisan Credit Card on gross value added (GVA) is not significant, which indicates that the importance of Kisan Credit Card (KCC) cannot be replaced by traditional finance.

VI. DISCUSSION

We should keep pushing for digitization to progress. We should focus on expanding the coverage of digitalization, give priority to solving the shortcomings of insufficient financial inclusion coverage, and on this basis, continue to strengthen the depth of its use and the degree of digitalization, to provide more diverse and efficient digitalization to agricultural people. The government should give adequate financial assistance, enhance local Internet infrastructure building, increase public awareness initiatives, and encourage rural inhabitants to embrace digitization. Digitization may help foster high and sustainable development; it will transform the face of the Agriculture sector in the future, ensuring higher profit for farmers and reducing harm [73]. Digitalization can help disadvantaged rural residents reduce their risks and improve their financial [24]. Digitalization is now widely acknowledged to have far-reaching effects that can assist many people in escaping poverty. Considerable expenditures in financial education, the creation of public service offerings, the strengthening of delivery infrastructure, and the inclusion of services like credit, remittance, and financial advising services might all contribute to significant and successful growth [76].

VII. CONCLUSION

The integration of digitalization and financial technology provides average support for resolving farmer's growth. Its inclusive development concept will help farmers to avail the digitalization they deserve, thus playing a role in poverty reduction and increase of the farmers in India. Based on the secondary data (RBI) from the financial year 2018 to 2020, this paper explores the impact of digitalization on the farmers in India. This paper found that digitalization can significantly increase the growth of farmers' income and digitalization of the farmer only the expansion of coverage can reduce the farmers poverty gap substantially. The convergence effect of digitalization on the farmers in India is better with lower levels of economic development, reflecting its inclusive nature.

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