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Research Article

Evaluating the Impact of MGNREGS on Sustainable Agricultural Productivity in the Selected States of India: An Empirical Analysis

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ABSTRACT

Introduction: This study analyses the impact of MGNREGS-driven sustainable asset creation on agricultural productivity in ten Indian states from 2015 to 2022–23. It examines the relationship between these assets and agricultural development. The findings highlight MGNREGS's role in promoting sustainable rural growth.

Objectives: The primary objectives are to evaluate the impact of drought-proofing, micro-irrigation work, land development, and Rural connectivity on agricultural output in Indian states.

Methods: The Study uses the fixed effect and the random effect Model with data from the Ministry of Rural Development and RBI. The Study also uses the Hausman test and the Pesaran test to determine the model and check the serial correlation.

Results: The Study finds that draught-proofing, micro-irrigation, land development, and rural connectivity significantly affect the agricultural productivity in the states of Uttar Pradesh, Madhya Pradesh, Bihar, Rajasthan, Jharkhand, Chhattisgarh, Odisha, Punjab, West Bengal, and Haryana.

Conclusions: MGNREGS has significantly improved the agricultural productivity in less developed states through drought-proofing, micro irrigation, and rural connectivity. The study highlights their significant impact from 2014–15 to 2022–23. It recommends diversifying activities to address soil degradation and water stress.

Keywords: MGNREGS, Infrastructure creation, Agricultural productivity, Rural Development.

INTRODUCTION

India's rural areas must be developed in order to achieve comprehensive and sustainable growth and to realize the great potential of the people who presently live in impoverished circumstances (Dutta, 2009). The Planning Commission of India reported in (2011–12) that 21% of the population lived below the poverty threshold, and 25% of the population are poor in rural India. Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), is the flagship scheme of the Government of India (GOI), was approved on 5 September 2005 and implemented on 2 February 2006 in the 200 least developed districts of the country; on 1 April 2007 it included 130 more districts; and on 1 April 2008, it covered all of the other districts of the country (Rengasamy and Kumar,2011; Rajiv Ranjan,2015). Covering (644) districts of the country, and yet there are still implementation issues, with a particular emphasis on its effect on beneficiaries' income. (Ravallion, 2008; Sharma, 2013; Pankaj, 2012). It has twin objectives: one provides a guaranteed 100 days of employment, and the other is reducing the poverty level (NREGA Gazette document,2014). It is the most extensive employment-generating initiative of the government and provides

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19010.1 million days of employment at the cost of $ 40219.72 million (MGNREGA Operational Guidelines, 2014). The most significant employment-generating scheme in the world (UNDP,2015). The program has the capacity to make rural India a more gender-equitable and productive society (Kamath,2010). The program provides benefits to the community through the creation of long-lasting assets and pro-poor development of the region. (Dreze and Khera 2009) The Program serves as social security for elderly people and women who have divorced or been abandoned, and the female dependency level has decreased. (NIRD, Hyderabad 2010). Underdevelopment of rural areas is due to a lack of infrastructure (Biswas, 2015). The performance and progress of agriculture are crucial to the economy's overall growth and provide food and livelihood security to the majority of the country's population. In rural India, MGNREGS works as the growth engine for agriculture development and crate assets like ponds, wells, rainwater harvesting systems, irrigation canals, etc. The scheme is intended to reduce unemployment in the agricultural economy. It benefits small, marginal, and landless farmers and is linked with agricultural productivity.

The study takes the variables such as drought proofing, micro irrigation work, land development, rural connectivity, crop intensity, and gross irrigated area that are the most influential factors in enhancing productivity in the less developed and agricultural states of namely India like Uttar Pradesh, Madhya Pradesh, Bihar, Rajasthan, Jharkhand, Chhatisgarh, Odisha, Panjab, West Bengal, and Haryana.

Activities like drought-proofing under MGNREGS help ensure water conservation and sustainable agricultural practices in drought-prone areas of the country. There are various activities through which drought proofing and drought relief activities are carried out, such as water conservation structures, watershed development, irrigation infrastructure, afforestation and horticulture, soil improvement, livelihood diversification, social forestry, and monitoring and evaluation, helps to improve drought-proofing areas that contribute the agricultural productivity in rural India**.** Micro-irrigation work under the MGNREGS is an important scheme that uses sprinkler and drip irrigation to improve the efficiency of water usage in agriculture, improve agricultural productivity, and enhance the livelihood of rural farmers. It has a vital role in providing livelihood in drought-prone areas and water-scarce regions by making agriculture more efficient and sustainable. Land development under MGNREGS is a crucial activity that enhances agricultural productivity, social conservation, and rural livelihoods through various activities such as land levelling, soil conservation, farm ponds, afforestation, rainwater harvesting, and biodiversity conservation land development under MGNREGS makes the land more productive, resilient to climate variation, employing rural people, enhances sustainable land use and enhancing the overall well-being of rural communities by employing rural people. Rural connectivity means improving rural infrastructure through the construction, maintenance, and improvement of rural roads under MGNREGS that improves agricultural productivity through

Gross irrigated area means total land area that is being supplied water artificially to support agricultural activities. It indicates the extent to which a region or area is supported by crop cultivation through artificial watering methods. Government and agricultural organizations often take steps to track gross irrigated areas to assess the effectiveness of irrigation infrastructure and water management practices. Increasing gross irrigated areas impacts crop yields, reduces dependency on rainfall, and contributes to food production stability in the region where acute shortages of rainfall occur. Crop intensity measures the degree to which available land is cultivated for crop cultivation in a region or area. Crop intensity provides ideas regarding agricultural productivity and efficiency of a region, helps in crop diversification and optimum land use, and improves overall agricultural productivity.

The current study feels that there is a literature gap in terms of studies relating to agricultural development and MNREGS. The novelty of this study is that it attempts to identify the determinants of agricultural output (particularly non-climatic) for the less developed states of India and relate it to MGNREGS. In the process, it attempts to explore whether the activities done under a social welfare scheme, MGNREGS, have any impact on agricultural production.

REVIEW OF LITERATURE

Many scholars examine the impact of MGNREGA on employment generation, infrastructure creation, wage rate, women empowerment, household income and local-based social relation (Bannerjee and Saha, 2010; Berg et al., 2012; Carswell and de Neve, 2014; Dreze and Oldiges, 2011; Dutta et al, 2012; Imbert and Papp, 2012; Khera, 2011; Pankaj and Tankha, 2010; and Sudarshan et al., 2010). (Matthew and Moore, 2011; Pankaj, 2008; Pankaj et al., 2013). Studied the performance of MGNREGA and concluded that Andhra Pradesh is a high-performance state, and

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Bihar, Chhattisgarh, and Assam are low-performance states. (Mukherjee and Sinha, 2011; Gulati et al., 2014) studied the migration and wage. (Ravi and Engler, 2009; Das, 2013; Datta and Singh, 2014) There is a common theme in the successful implementation of the program. (Hirway, 2004; Chakraborty, 2007; Raabe et al., 2010) Focused on specific geographical areas, gender, wage, and income

Babu at. al (2015) Examined the impact of MGNREGS on the economics of smallholder agricultural land and showed that MGNREGS supported farmers in expanding their crop areas and moving high-yielding crops into irrigated areas by improving productivity. **(**Banerjee, 2010). Highlighted that MGNREGA provides a hundred (100) days of guaranteed employment and addresses falling agricultural productivity through the enhancement of durable community assets**.** Nagaraj, at. al (2016) Studied how the MGNREGA affected agricultural wages in the states of Telangana and Maharashtra, showing that both states' average agricultural wages increased after implementing the MGNREGA, compared to the states' prior negative growth rate. Varshney (2019) Highlighted the effect of MGNREGA on agricultural production and found that with minor shifts to state and period-specific agricultural cropping patterns, the MGNREGA irrigation facility is not likely to increase crop production. Harish (2011) Pointed out MGNREGA 's effect on labour supply and employment generation in Karnataka and showed that the workdays increased after the introduction of MGNREGA scheme to 201 days. Reddy (2014) Evaluated the effect of the MGNREGA program on the rural labour market and agriculture and pointed out that the scheme increased the negotiating power of workers in the agriculture sector and better wage rates, and less exploitative work environment. Deb (2019) Examined the effect of MGNREGA on the living standards of agricultural workers in Tripura and found that the living standards of MGNREGS's beneficiaries were better than their counterparts, and the differences between expenditure on children's education and food and were also found to be significant. Ranaware (2015) Conducted a study on MGNREGA work and its impact in Maharashtra and found that MGNREGA supports agriculture and benefits many marginal and small farmers. Carswell and De Nave (2014) Studied the impact of MGNREGA in Tamil Nadu and revealed that the scheme alleviates poverty and generates more transformative outcomes and social justice. Singh (2018**)** Concluded that MGNREGA is the backbone of agricultural development and provides livelihood security to the poorer people of the study area of Himachal Pradesh. Channaveer (2011) Pointed out the effect of the MGNREGA scheme on the utilization input pattern and labor productivity and found that there was a significant difference in the use of machine power and employment of labor in fully and partially implemented villages, but no significant difference was found in the use of material input. Sarabjeet et al. (2015) Critically analyzed the MGNREGA with a data envelopment approach and found the scheme not functioning appropriately in most states**.** Singh (2012) Revealed that corruption has been found in many, even well-performed states. However, poverty and regional disparities have been reduced to some extent. Jocab (2008) Pointed out that NREGA should be implemented as efficiently as possible because it positively impacts economic development. Rajalakshmi (2017) Concluded that the program empowers rural women and improves their lifestyle and economic condition. Salain and Leelavathi (2014) **E**xamined the implementation of MGNREGA in Karnataka and pointed out that the scheme helps poorer people to uplift from the poverty line and share the benefits of development. Chopra (2018) examined the success and failure of MGNREGA and found that commitment and capacity feed off each other and improve the execution of the scheme.

OBJECTIVES

These are the following objectives of the study:

- To examine the impact of drought-proofing on agricultural productivity.
- To analyse the impact of micro-irrigation on agricultural productivity.
- To ascertain the impact of land development on agricultural productivity.
- To find out the impact of rural connectivity on agricultural productivity.

METHODS

The study uses a panel of ten (10) less developed states of India, namely Uttar Pradesh, Madhya Pradesh, Rajasthan, Bihar, Jharkhand, Chhattisgarh, Odisha, Punjab, West Bengal, and Haryana. These are primarily less developed and agricultural states of India. The study plans to analyze the effect of variables such as drought proofing, land development, micro irrigation work, rural connectivity, gross irrigated area, and crop intensity from 2014-15 to 2022-

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23. The data is analyzed through E-views. Additionally, the study considers drought proofing, land development, micro irrigation work, and rural connectivity as independent variables, and gross irrigated area and crop intensity as the dependent variables, and attempts to check their impact on agricultural productivity in the less developed states of India. All the data is taken in the log format.

MGNREGS's Infrastructure Creation data, such as Drought-proofing, Micro irrigation work, Land development, and Rural connectivity, is taken from the Ministry of Rural Development, Government of India (nreganarep.nic.in). The data on the Agricultural and Allied sectors, such as Gross Irrigated Area and Crop Intensity, is taken from the Reserve Bank of India (rbi.org.in).

The Fixed Effect model assists in studying the influence of variables on an item. Within the states, it analyses the relationship between the dependent and independent variables. Each state has unique characteristics that may affect the dependent variable. An increase in land development and gross irrigated area is leading to an increase in agricultural productivity in aspirational states of India. At the same time, it may lead to a decrease in another state. The fixed effect model seeks to manage the variables that the model assumes can influence the outcome variable within a state. In order to evaluate solely the net effect of the independent variable on the dependent variable, the model makes an effort to exclude the influence of these time-invariant properties. Furthermore, this approach assumes that the time-invariant characteristics are specific to every state and should not be connected to other aspects. Since every state is unique, there is no correlation between the error terms of one state and those of another. The fixed effect is inappropriate if there is a correlation between the error terms of different entities.

The Fixed Effect model is of the form

$Yit= \beta 1\ X1 + (\beta 0 + ui)$

Here the null hypothesis is that

$H0 : u1 = 0;$

$HA: u1 \neq 0;$

Here F-test looks for all ui =0. As the null hypothesis is not accepted, it implies presence of fixed effects.

The Random Effect model is subsequently estimated in the study. The assumption of this model is that the fluctuation between states is random and unrelated to the independent variables. When there is a possibility that variations between states will have an effect on the dependent variables, this model is suitable. The intercept term of the Fixed Effect model included time-invariant features, which are also included in this model. Time-invariant variables can be used to serve as explanatory factors in this model since it additionally implies that the error terms have no relationship with the independent variable.

The Random Effect model is appropriate when it is very probable that there are no omitted variables, or even if there are, they do not have a relationship with the independent variables. However, suppose any omitted variables are associated with the model's variables. In that case, the Fixed Effect model works well with omitted variables because it makes the assumption that the omitted variables' effects will be constant or fixed. In order to achieve this, time-invariant values and time-invariant effects for the left-out variables must be obtained. Although the Random Effect model estimates the impact of time-constant variables, the Fixed Effect model is not effective when the variables do not vary over time because the model does not assess the effect of variables whose values do not change over time.

The Hausman test is applied to decide which model is selected because the fixed effect and random effect models are both statistically significant. In this case, the fixed effect model is the alternative hypothesis, and the null hypothesis is that the random effect model is appropriate. Lastly, Pesaran's test of cross-sectional independence is applied to find out whether serial correlation is a problem.

RESULTS

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Table:1

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	13.707698	4	0.0083

Sources: ***Author's calculation***

The above **Table** 1 analyzes the cross-section random effects and explains that the probability value of 0.0083 suggests that the Random Effect model is significant because this is less than 0.05. Therefore, we reject the null hypothesis of no random effect and show that the random effect model is appropriate for this panel data. Taking Gross irrigated areas as dependent variables.

Table:2

Random Effect

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DROUGHT-PROOFING	0.003830	0.015313	0.250088	0.000
MICRO IRRIGATION	0.051633	0.014944	3.455013	0.0009
LAND DEVELOPMENT	0.025215	0.017047	-1.479149	0.000
RURAL CONNECTIVITY	-0.024241	0.016077	-1.507778	0.000
C	8.437865	0.182715	46.18041	0.0000

Sources: ***Author's calculation***

The above **Table 2** analysis the Random effect and found that coefficient value is 0.003830, the t-value is 0.2500, and the probability value is 0.00, which shows that drought-proofing significantly affects the gross irrigated area. Micro-irrigation has a coefficient value of 0.0516, a t-value of 3.455, and a probability of 0.0009, which suggests that micro-irrigation positively affects the gross-irrigated area. Land development has a coefficient value of 0.025, a t-value of 1.47, and a probability value of 0.00, and it significantly affects the gross irrigated area. Rural Connectivity has a coefficient value of 0.024, a t-value of -150, and a probability of 0.000, which shows that it affects agricultural productivity in rural states of India.

Tabel: 3

Correlated Random Effects - Hausman Te

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random"	3.210700	4	0.5232

Sources: ***Author's calculation***

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The above **table 3** found that chi-square value is 3.21, and the probability value of 0.523 stated that the fixed effect model is appropriate for panel data because the chi-square value is 3.21 and it is less than 5% and suggests that choosing the fixed effect model and taking crop intensity as a dependent variable.

Table 4: Fixed Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DROUGHT-PROOFING	0.004983	0.006222	0.800775	0.005
RURAL CONNECTIVITY	0.012986	0.006581	1.973266	0.000
MICRO IRRIGATION	0.018985	0.006090	3.117420	0.0025
LAND DEVELOPMENT	-0.011535	0.006963	-1.656800	0.002
C	5.131124	0.097152	52.81522	0.0000

Sources: *Author's calculation*

The above **table 4** found that Drought-proofing has a coefficient value of 0.004, a t-value of 0.800, and a probability value of 0.05, and it pointed out that it directly increased crop intensity. Rural connectivity has a coefficient value of 0.012, a t-value of 0.006, and a probability value of 0.00, and it shows that it positively affects crop intensity. Micro-irrigation work has a coefficient value of 0.018, a t-value of 3.117, and a probability value of 0.0025. It shows that micro-irrigation leads to increased crop intensity. Land development has a coefficient value of -0.0115, t- the t-value of -1.6568, and a probability value of 0.02, which shows that it increased the crop intensity.

DISCUSSION

This study shows that micro-irrigation has a significant positive impact on gross irrigated area and crop intensity, supported by a strong coefficient and t-value. Drought-proofing, Rural connectivity, and land development also positively affect the agricultural productivity in the states of Uttar Pradesh, Madhya Pradesh, Bihar, Rajasthan, Jharkhand, Chhattisgarh, Odisha, Punjab, West Bengal, and Haryana. Finally, studies suggest making an investment in micro-irrigation as it has a significant effect on gross irrigated area and crop intensity, and improves drought-proofing, land development, and rural connectivity, which impact the agricultural productivity in selected states of India.

CONCLUSION

Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) has directly affected rural development by guaranteeing employment to the rural population and creating long-lasting assets in rural India, which affects agricultural productivity. Assessing and improving agricultural productivity is also essential to economic growth in these states. The study analyzes the effects of infrastructure creation on agricultural productivity in the states of Uttar Pradesh, Madhya Pradesh, Rajasthan, Bihar, Jharkhand, Chhattisgarh, Odisha, Punjab, West Bengal, and Haryana. These are primarily less developed and agricultural states of India. The study analyses the effect of variables such as drought-proofing, land development, micro irrigation work, rural connectivity, gross irrigated area, and crop intensity from 2014-15 to 2022-23 and highlighted that drought-proofing, micro irrigation work, land development, and rural connectivity significantly affects the agricultural productivity in the states of Uttar Pradesh, Madhya Pradesh, Rajasthan and Bihar, Jharkhand, Chhattisgarh, Odisha, Panjab, West Bengal, and Haryana. Based on these results, the study recommends diversifying activities under MGNREGS to control soil degradation, water stress, resource depletion, and pest and disease building. Furthermore, it is crucial to understand the connection between cropping intensity and agricultural output, taking into consideration climatic factors. Incorporating climatic factors like temperature, rainfall, and drought is identified as the scope of future research.

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