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Sustainable Groundnut Cultivation: A Comparative Study of Resource Use Efficiency in Tribal and Non-tribal Farming Communities in Jashpur, Chhattisgarh

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ABSTRACT

Groundnut holds immense significance for India's economy and nutrition, particularly for tribal communities. However, lower groundnut productivity in tribal areas compared to non-tribal regions is attributed to resource constraints, inadequate agricultural techniques, and limited technical knowledge. This study investigates resource utilization efficiency in groundnut cultivation within tribal and non-tribal households in Chhattisgarh's Jashpur district. The goal is to compare the effectiveness of land, labour, capital, and input utilization between these two groups. Data from 257 farm households, comprising 146 tribal and 111 non-tribal farms, were collected through surveys. The study analyzed input quantities, output, and costs associated with groundnut cultivation, utilizing production function and marginal value product (MVP) analyses. Results reveal significant disparities in resource efficiency between tribal and non-tribal farming households. Non-tribal areas exhibit more efficient use of all inputs except human labour, along with higher MVPs for these inputs. Production function analysis indicates positive relationships between seed, machine use, and plant protection with the outcome variable in both tribal and non-tribal areas. However, the significance of these relationships varies. The study's models explain a moderate to high proportion of outcome variable variance, with R-squared values of 0.72 for tribal and 0.79 for non-tribal areas. MVP and marginal fixed cost (MFC) comparisons for seed, machine use, and plant protection across tribal and non-tribal settings reveal overutilization of these resources, with the former exhibiting higher values. However, human labour and fertilizer data remain inconclusive due to low usage or data limitations. Findings underscore the need to enhance resource efficiency in both contexts, suggesting optimal allocation to bolster agricultural returns. The study's implications for policy and practice are significant. Access to resources such as land, credit, and inputs must be improved for tribal farmers, accompanied by enhanced agricultural techniques and technical know-how. Recommendations include promoting improved seed varieties, integrated pest management, machinery usage training, and the formation of farmer groups for knowledge dissemination and agricultural best practices adoption. In conclusion, bridging resource use efficiency gaps could enhance groundnut cultivation sustainability among tribal and non-tribal communities in the region.

Keywords: Groundnut cultivation, resource use efficiency, production function analysis, marginal value product, agricultural sustainability, rural development.

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Groundnut is an important crop in India, both for its economic and nutritional value. It is a major source of livelihood for many farmers, especially in tribal areas. However, the productivity of groundnut cultivation in tribal areas is often lower than in non-tribal areas. This is due to a number of factors, including limited access to resources, poor agricultural practices, and lack of technical knowledge.

The present study examines the resource use efficiency of groundnut cultivation in both tribal and non-tribal farm households in Jashpur district of Chhattisgarh. The study aims to assess and compare the efficiency of resource utilization, including land, labour, capital, and inputs, in groundnut cultivation among tribal and non-tribal farm households.

METHODS

Data was collected through a survey of 257 farm households, 146 farms from tribal and 111 farms from non-tribal areas. The survey collected information on the quantity of inputs used, the output produced, and the costs incurred in groundnut cultivation. The data was analyzed using production function analysis and marginal value product analysis to assess the resource use efficiency of groundnut cultivation.

RESULTS

The results of the study show that there is a significant difference in the resource use efficiency of groundnut cultivation between tribal and non-tribal farm households. In non-tribal areas, the use of all inputs, except human labour, is more efficient than in tribal areas. The marginal value product of all inputs is also higher in non-tribal areas than in tribal areas.

The results of the marginal value product analysis show that the seed, machine, and plant protection inputs are overutilized in both tribal and non-tribal areas. The human labour and fertilizer inputs are underutilized in both areas.

1. Production Function Analysis for Estimation of Resource Use Efficiency for Groundnut with disparity between tribal and nontribal farm households

This table 1 and 2 presents the results of a multiple regression analysis that examines the impact of different factors on an unknown outcome variable in both tribal and non-tribal areas. The table includes six variables, namely the logarithm of seed used (X1), human labour (X2), machine use (X3), fertilizers (X4), and plant protection (X5). For each variable, the table shows the regression coefficient, standard error, and p-value for both tribal and non-tribal areas. Additionally, the intercept (A) is included for each group.

The results suggest that in non-tribal areas, the logarithm of seed used (X1), machine use (X3), and plant protection (X5) have a positive impact on the outcome variable, whereas the intercept has a negative impact. In tribal areas, only machine use (X3) and plant protection (X5) have a positive impact on the outcome variable. However, the impact of all variables is not statistically significant except for seed (X1) machine use (X3) and plant protection (X5) in both tribal and non-tribal areas.

The R-squared value of the model is 0.72 for tribal areas and 0.79 for non-tribal areas, indicating that the model explains a moderate to high proportion of the variance in the outcome variable.

2. Resource Use Efficiency for Groundnut

The table 3 and 4 shows the marginal value product (MVP) and marginal fixed cost (MFC) of five inputs: seed, human labour, machine, fertilizers, and plant protection. The data is split into two groups: tribal and non-tribal. The table shows the MVP, MFC, and MVP/MFC ratio (r) for different variables in both tribal and non-tribal areas. The D value is also provided to indicate the level of efficiency of the resources.

For the seed variable, the MVP is higher than MFC, indicating overutilization of this resource in both tribal and non-tribal areas. The MVP/MFC ratio is 0.000594 for tribal and 0.000454 for non-tribal areas, suggesting that the resource is highly over utilised in tribal areas compared to non-tribal areas. The D value for the seed variable is negative in both areas, indicating inefficiency in the use of this resource.

For the Machine variable, the MVP is higher than MFC in both tribal and non-tribal areas, indicating overutilization. The MVP/MFC ratio is 0.003809 for tribal and 0.002024 for non-tribal areas, suggesting that the resource is highly over utilised in tribal areas

Table 1: Production Function Analysis for Resource Use Efficiency of groundnut for tribal household

Sl. No.	Particulars	Parameters	Tribal		
			Regression Coefficient	Standard Error	P-Value
1	Intercept	A	-10.78***	3.92	0.006
2	LOG (Seed)	X1	0.42**	0.22	0.051
3	LOG (Human Labour)	X2	0.27	0.29	0.370
4	LOG (Machine)	X3	0.61***	0.13	4.86E-06
5	LOG (Fertilizers)	X4	-0.0005	0.22	0.998
6	LOG (Plant Protection)	X5	0.32*	0.18	0.072
7	R square	$_R2$	0.72		

Note: *** significant at 1% level of probability; ** significant at 5% level of probability; (R^2 = Coefficient of multiple determinations).

Table 2: Production Function Analysis for Resource Use Efficiency of groundnut for Non-tribal household

Sl. No.	Particulars	Parameters	Non-Tribal		
			Regression Coefficient	Standard Error	P-Value
1	Intercept	A	-4.01***	0.56	1.48E-10
2	LOG (Seed)	X1	0.31**	0.15	0.042
3	LOG (Human Labour)	X2	0.04	0.05	0.40
4	LOG (Machine)	X3	0.29**	0.14	0.03
5	LOG (Fertilizers)	X4	0.03	0.04	0.52
6	LOG(Plant Protection)	X5	0.12***	0.04	0.009
7	R square	R^2	0.79		

Note: *** significant at 1% level of probability; ** significant at 5% level of probability; (R^2 = Coefficient of multiple determinations).

Table 3: Resource Use Efficiency of groundnut for tribal household

Sl. No.	Variables	Tribal				
		Marginal Value Product (MVP)	Marginal Fixed Cost (MFC)	MVP/MFC Ratio (r)	Remark	D Value
1	Seed	0.0006	1	0.0006	Overutilised	-168294
2	Machine	0.004	1	0.004	Overutilised	-26156.8
3	Plant Protection	0.001	1	0.001	Overutilised	-69767

Table 4: Resource Use Efficiency of groundnut for non-tribal household

Sl. No.	Variables	Non-tribal				
		Marginal Value Product (MVP)	Marginal Fixed Cost (MFC)	MVP/MFC Ratio (r)	Remark	D Value
1	Seed	0.0005	1	0.0005	Overutilised	-220217
2	Machine	0.0020	1	0.0020	Overutilised	-49314.1
3	Plant Protection	0.0008	1	0.0008	Overutilised	-113973

compared to non-tribal areas. The D value for the machine variable is negative in both areas, indicating inefficiency in the use of this resource.

For the Plant Protection variable, the MVP is higher than MFC in both tribal and non-tribal areas, indicating overutilization. The MVP/MFC ratio is 0.001431 for tribal and 0.000877 for non-tribal areas, suggesting that the resource is highly over utilised in tribal areas compared to non-tribal areas. The D value for the plant protection variable is negative in both areas, indicating inefficiency in the use of this resource.

Human labour, and fertilizers, variables have NS (Not Specified) for the MVP, MFC, and MVP/MFC ratio values in both areas. This could be due to the low usage of these resources in both areas or lack of data

Overall, the analysis suggests that there is a need to improve the resource use efficiency in both tribal and non-tribal areas. The overutilization of some resources and underutilization of others indicate the need for optimal allocation of resources to improve the economic returns from agriculture. The D values suggest that there is potential for improvement in the use of resources, which could be achieved through better technical knowledge and training of farmers and appropriate policies and interventions. The findings of this study suggest that inputs are important for increasing crop yield. The results also suggest that both tribal and non-tribal farmers can benefit from increasing the use of these inputs. Future research should be conducted to further investigate the relationship between crop yield and these factors.

DISCUSSION

The results of the study suggest that there is a need to improve the resource use efficiency in groundnut cultivation in both tribal and non-tribal areas. The overutilization of some resources and underutilization of others indicate the need for optimal allocation of resources to improve the economic returns from agriculture.

The study also suggests that there are a number of factors that contribute to the difference in resource use efficiency between tribal and non-tribal farm households. These factors include limited access to resources, poor agricultural practices, and lack of technical knowledge.

CONCLUSION

The findings of this study have important implications for policymakers and practitioners working to improve the productivity of groundnut cultivation in tribal areas. The study suggests that there is a need to provide tribal farmers with better access to resources, such as land, credit, and inputs. The study also suggests that there is a need to improve the agricultural practices of tribal farmers and to provide them with better technical knowledge.

Recommendations

The following recommendations are made based on the findings of the study:

1. **Resource Empowerment**: Empower tribal farmers with enhanced access to resources like land, credit, and inputs for sustainable agriculture.
2. **Smart Farming**: Elevate agricultural techniques among tribal farmers for increased yields and resource efficiency.
3. **Technical Proficiency**: Provide tailored technical education to boost tribal farmers' capabilities.
4. **Seed Advancement**: Advocate for superior groundnut seed varieties.
5. **Eco-Friendly Pest Control**: Promote eco-conscious integrated pest management.
6. **Machinery Mastery**: Offer machinery training for enhanced productivity.
7. **Community Synergy**: Encourage farmer groups and cooperatives for collective progress in adopting modern practices.

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