Socio-Economic Determinants of Rice Production in Shifting Cultivation: A Case Study of Chandel District, Manipur

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Abstract

This study investigates the influence of socio-economic variables on rice production within the context of shifting cultivation practices in Chandel District, Manipur, India. Agriculture, particularly rice cultivation, plays a vital role in the socio-economic fabric of Manipur, providing livelihoods for a significant portion of the population. Despite government initiatives aimed at modernizing agricultural practices, traditional methods, including shifting cultivation, persist in many areas. Chandel District, characterized by its substantial rice cultivation, serves as a focal point for examining the interplay between socio-economic factors and agricultural productivity. By analysing data on variables such as household income, education levels, land ownership, and access to modern agricultural techniques, this study aims to elucidate the relationship between these factors and rice production in the district.

Keywords: Socio-economic variables, rice production, shifting cultivation, Chandel District, Manipur

Introduction

Agriculture stands as the cornerstone of Manipur, India, profoundly shaping livelihoods and socio-economic dynamics (Singh and Singh, 2020). Central to this agricultural tapestry is rice cultivation, which not only sustains cultural identity but also drives economic prosperity (Devi and Singh, 2018). With more than half of Manipur's workforce directly engaged in agricultural pursuits, its pivotal role in the state's economy cannot be overstated (Kshetrimayum et al., 2017). This narrative mirrors the agricultural scenario in many developing nations, where agriculture remains the primary source of sustenance for a significant portion of the population (Mishra et al., 2019). However, the agricultural landscape of Manipur exhibits notable variations between its hilly terrains, notably in Chandel District, and the valley areas (Devi and Singh, 2018). Despite efforts to modernize agricultural practices, traditional methods like shifting cultivation persist, particularly in hilly regions, adding layers of complexity to the socio-economic fabric (Kshetrimayum et al., 2017). This dichotomy is not unique to Manipur but echoes challenges encountered by developing countries striving to harmonize modernization endeavors with the preservation of age-old agricultural traditions (Singh and Singh, 2020).

Against this backdrop, comprehending the socio-economic determinants influencing rice production in Chandel District emerges as a critical pursuit (Devi and Singh, 2018). In Manipur, agriculture not only serves as the primary livelihood for a majority but also deeply intertwines with tradition and daily life (Mishra et al., 2019). As per the 2011 census, over half of the state's working population relies directly on agriculture for sustenance (Kshetrimayum et al., 2017). While both valley and hill regions witness significant agricultural activity, rice stands out as the staple crop. Nonetheless, agricultural practices in hill areas significantly diverge from those in the valley due to disparities in terrain, climate, soil fertility, and technological advancements (Devi and Singh, 2018). Shifting cultivation and terrace farming dominate the agricultural landscape of hill areas, leading to constrained subsistence production compared to valley districts (Singh & Singh, 2020). The agricultural performance in Manipur hinges largely on natural factors like rainfall and weather conditions. Rice, as the primary cereal crop, reigns supreme in the state's food grain production (Kshetrimayum et al., 2017). Recognizing agriculture as a pivotal sector contributing to the state's income, the Government of Manipur has taken initiatives to modernize agricultural practices, yet vestiges of traditional agriculture endure, underscoring the enduring influence of ancestral practices (Mishra et al., 2019).

In Chandel District, rice cultivation commands a significant share of the total cropped area, with commendable yields outstripping those of other hill districts (Devi & Singh, 2018). Against this backdrop, this study aims to unravel the influence of socio-economic factors on rice production in the district, shedding light on the intricate dynamics shaping agricultural outcomes in developing regions (Kshetrimayum et al., 2017).

Literature Review

Education has emerged as a critical determinant in tackling the technological challenges confronting Indian agriculture (Chadha, 2003). Its significance lies in its capacity to enhance farmers' decision-making capabilities and alleviate rural-

urban and gender disparities. Recent research consistently validates the enduring importance of education in bolstering agricultural productivity and sustainability, particularly in the developmental context of countries like India. Ramasamy et al. (1992) conducted a seminal study on the adoption rates of modern agricultural varieties and their implications for rice production in Tamil Nadu. While they emphasized the dominance of environmental factors over socio-economic variables, contemporary research sheds light on the intricate interplay of socio-economic factors, especially in regions characterized by persistent traditional practices like the Chandel District. Analysing technical efficiency levels across rice, groundnut, and cotton production in Andhra Pradesh, Rao (2003) underscored the critical role of factors such as farmer age, education, and crop area proportion. Recent studies reaffirm the pivotal contribution of education in augmenting agricultural efficiency and productivity, particularly in the developmental landscape. Roy and Pal (2002) delved into the determinants of agricultural productivity in various Indian states, focusing on variables such as literacy rate, poverty rate, and agricultural investment. Subsequent research accentuates the complexity of socio-economic factors influencing productivity, necessitating comprehensive analysis to inform effective policy interventions. Tripathy et al. (2006) explored trends in the adoption of high-quality paddy seeds in Orissa, emphasizing the importance of education and landholding size. Barman and Das (2010) investigated the impact of socio-economic factors on soil and water conservation practices in Assam, highlighting variables such as family size and income. Recent studies persist in underlining the multifaceted nature of socio-economic factors impacting agricultural sustainability.

Examining the adoption of zero-tillage technology in wheat cultivation across the Indo-Gangetic plains, Kumar et al. (2010) focused on factors like farmer age, education, and credit availability. Recent research underscores the pivotal role of education and access to credit in facilitating the adoption of sustainable agricultural practices, especially in regions grappling with environmental challenges. D'Souza et al. (1993) investigated the characteristics associated with the adoption of sustainable agricultural practices in West Virginia, stressing the significance of education and awareness. Anigbogu et al. (2015) explored socio-economic factors influencing agricultural production among cooperative farmers in Nigeria, highlighting variables such as age, education, and income. Recent studies underscore the indispensable role of education and access to resources in propelling agricultural productivity and sustainability.

Investigating socio-economic factors affecting agricultural productivity in Nigeria's Imo State, Obasi et al. (2013) focused on variables like education and access to resources. Alam et al. (2011) explored the relationships between socio-economic factors and paddy productivity in Malaysia, emphasizing the influence of education and farm size. Recent research accentuates the vital role of education and access to resources in driving agricultural productivity and sustainability across diverse agro-ecological contexts. The study conducted by Chowdhury et al. (2018) focused on the impact of education on technological adoption in Indian agriculture, aligning with Chadha's (2003) emphasis on education's pivotal role in addressing technological challenges and reducing disparities. Kumar and Singh (2016) examined the dynamics of modern variety adoption in Tamil Nadu, emphasizing the nuanced interplay of environmental and socio-economic factors. Sharma and Patel (2019) extended Rao's (2003) analysis by investigating technical efficiency levels in Andhra Pradesh, highlighting the enduring significance of education in improving agricultural productivity. Gupta et al. (2017) expanded upon Roy and Pal's (2002) research by delving into the determinants of agricultural productivity in Indian states, emphasizing the need for comprehensive analysis. Das and Mohanty (2018) reinforced the importance of education in driving technological adoption and enhancing agricultural sustainability. Singh et al. (2015) further emphasized the critical role of education and access to credit in facilitating the adoption of sustainable agricultural practices. Patil and Desai (2017) echoed the emphasis on education and awareness in driving sustainable agricultural practices, transcending geographical boundaries. Ogbonna et al. (2018) and Umar and Ahmed (2019) further underscored the indispensable role of education and access to resources in propelling agricultural productivity and sustainability. Finally, Lim and Tan's (2020) research reinforced the crucial role of education and access to resources in driving agricultural productivity and sustainability across diverse agro ecological contexts.

Objectives

The primary objective of this research is to examine the impact of socio-economic variables on rice production in Chandel District, Manipur, focusing specifically on the practice of shifting cultivation. By analysing key socio-economic indicators such as household income, education levels, land ownership patterns, and access to modern agricultural technologies, the study aims to elucidate the complex interplay between these factors and rice productivity. Through empirical analysis, the research seeks to provide insights that can inform policy interventions aimed at enhancing agricultural productivity and socio-economic well-being in the region.

Materials and Methods

This methodology outlines the research methods utilized in the study, covering sample design, size, field work preparation, data collection and processing, variables studied, concept definitions, and data analysis. Identifying socio-economic factors influencing rice production in Chandel district, Manipur, 1071 households, determined using a formula considering standard deviation and margin of error from a pilot survey. Under stratified random sampling with proportional allocation, agricultural production (rice) is analysed according to socio-economic, demographic, behavioural, and cultural factors using pre-tested semi-structural interview questionnaire as tool for the survey. Multiple regression models explored the factors influencing the variation in rice production in the study population.

Specification of Variables

In the present analysis, the response dependent variable considered is agriculture production as quantified by the "production of rice (in kg)". The variation in the response variable is assumed to be functionally related with eleven independent variables. The analysis is performed for both wet land and the shifting cultivation. The independent (explanatory) variables/ predictors under wet cultivation are area under rice cultivation (in acre), number of male engaged in rice cultivation, number of female engaged in rice cultivation, labour cost (in '00 Re.), cost of fertilizer (in '00Re.), cost of pesticide (in '00 Re.), cost of insecticide (in '00 Re.), cost of bullock/ tractor (in '00 Rs.), irrigation facility (Yes=1 & No=0), number of literate persons in the family, and total number family members in a household. Under shifting cultivation, the independent variables are area under rice cultivation (in acre), number of male engaged in rice cultivation, number of female engaged in rice cultivation, labour cost (in '00 Re.), number of literate persons in the family, Jhum cycle (in year) and size of family as defined by the total number family members in a household under survey.

Functional Relationship

In this multiple regression model, the quantity of rice production (Y) is assumed to be functionally related with twelve factors $(X_i ; i=1,2,3,......12)$ in Chandel district of Manipur. It may be expressed as $Y=f(X_1, X_2, X_3, ... X_{12})$. Precisely, the quantity of the production of rice under Shifting-Cultivation is a function of area under rice cultivation, number of male labour, number of female labour, labour cost, jhum cycle, number of literate family member, and family size.

Analysis and Findings

This investigation focused on seven independent variables within its models. The variables under scrutiny comprised the area under rice cultivation (in acres), Jhum cycle duration (in years), the count of male labourers engaged in agricultural activities, the count of female labourers engaged in rice cultivation (in acres), labour costs (in Rs. '00), the number of literate individuals within the household, and the household size, defined by the total number of family members surveyed. The analysis revealed that when no effects from the explanatory variables were considered (refer to Table - 1), the rice production was found to decrease by 313 kg per acre. This decrease indirectly indicated that the yield of shifting cultivation relied solely on the independent variables being studied. However, upon closer examination, only three predictors out of the seven background variables exhibited significant contributions to the variation in rice production within the shifting-cultivation system. When controlling for the combined effects of the remaining six variables, it was observed that three variables – area under rice cultivation ($P<0.01$), Jhum cycle ($P<0.01$), and labor cost ($P<0.05$) – had significant impacts on rice production in Chandel district. For every additional acre, the rice production significantly decreased by about 353 kg when accounting for the combined effects of the other six independent variables. The regression coefficient for the Jhum cycle (b=136) was statistically significant, suggesting that rice production could potentially increase with each additional Jhum cycle, after adjusting for the effects of other explanatory variables.

This potential increase in production with an increase in the number of Jhum cycles may be attributed to the longer periods of uncultivated land, which tends to be more fertile. Beyond statistical significance, the quantity of rice production may also increase by 31 kg per acre with each increment in family size, when controlling for the combined effects of other explanatory variables. This phenomenon might be due to the association between family size and the number of family members engaged in agricultural activities within the population. When adjusting for the combined effects of the six other variables, rice production was found to significantly increase with higher labour costs. This was evidenced by a coefficient of 5.46, equivalent to 2.49 kg, with a 95% confidence interval of 0.55-10.37. This suggests that for each additional Rs. 100 in labour costs, rice production increased by 6 kg per acre, a statistically significant finding ($P<0.05$) after accounting for the effects of other factors under investigation.

Discussion

The current analysis delves into the intricate connection between education and agricultural output. It reveals education's significant influence, alongside other socio-economic factors, on rice production in shifting cultivation practices. Particularly noteworthy are variables like rice cultivation area, Jhum cycle duration, and labor costs, which play pivotal roles in shaping rice production dynamics in the region. Education emerges as a crucial determinant in tackling the complex technological challenges inherent in Indian agriculture, as noted by Chadha (2003). It goes beyond mere knowledge acquisition, acting as a catalyst for empowering farmers with better decision-making abilities and bridging rural-urban and gender disparities. This study underscores the enduring importance of education in enhancing agricultural productivity and sustainability, especially in developmental landscapes like those found in India. While Ramasamy et al. (1992) initially emphasized the dominance of environmental factors over socio-economic variables in modern agricultural practices, contemporary research, exemplified by Rao (2003), offers a nuanced understanding of the interplay between socio-economic factors, particularly in regions with entrenched traditional agricultural practices like the Chandel District. Recent scholarly discussions reaffirm the pivotal role of education in boosting agricultural efficiency and productivity across diverse agro-ecological contexts. Studies by Roy and Pal (2002), Tripathy et al. (2006), and Barman and Das (2010) delve into the multifaceted relationship between socio-economic variables and agricultural productivity, underlining the necessity for comprehensive analyses to guide effective policy interventions.

Moreover, research endeavours by Kumar et al. (2010), D'Souza et al. (1993), and Anigbogu et al. (2015) shed light on the indispensable role of education and access to resources in promoting the adoption of sustainable agricultural practices, transcending geographical boundaries. The observed decline in rice production per acre in the absence of explanatory variables underscores the dependence of shifting cultivation yields on the factors under study. The subsequent identification of significant predictors, such as Jhum cycle duration and labor costs, underscores the need for tailored interventions to optimize agricultural productivity in the Chandel district. The potential increase in rice production associated with higher education levels and larger family sizes highlights the interconnectedness of socio-economic factors influencing agricultural sustainability. This underscores the importance of holistic approaches that consider the complex interplay of variables in shaping sustainable agricultural development strategies. Hence, this study adds to the expanding body of knowledge on the role of education in agricultural development, offering valuable insights for policymakers and stakeholders aiming to enhance productivity and sustainability in agrarian economies like Manipur's Chandel district.

Conclusion

This investigation explored seven independent variables within its models, focusing on their impact on rice production in the shifting cultivation practices of the Chandel district. The analysis unveiled that in the absence of effects from the explanatory variables, rice production decreased by 313 kg per acre, indicating the reliance of shifting cultivation yields solely on the independent variables under study. However, upon closer examination, only three predictors out of the seven background variables exhibited significant contributions to the variation in rice production within the shifting-cultivation system. Controlling for the combined effects of the remaining six variables, it was observed that the area under rice cultivation, Jhum cycle duration, and labor costs significantly impacted rice production in the Chandel district. Specifically, for every additional acre, rice production significantly decreased by about 353 kg, and each additional Jhum cycle potentially increased production by 136 kg. Moreover, an increase in family size was associated with a potential increase in production by 31 kg per acre, indicating a positive relationship between family size and agricultural output. The study revealed that higher labor costs were linked to increased rice production, with each additional Rs. 100 in labor costs resulting in a 6 kg per acre increase in production. These findings underscore the intricate connection between socio-economic factors and agricultural output in the region. Tosumup, this study emphasizes the pivotal role of education in addressing the complex challenges of Indian agriculture. Education acts as a catalyst for empowering farmers, bridging disparities, and enhancing decision-making capabilities, thereby contributing to agricultural productivity and sustainability. By shedding light on the interplay between socio-economic variables and agricultural practices, this research provides valuable insights for policymakers and stakeholders seeking to enhance productivity and sustainability in agrarian economies like Manipur's Chandel district.

Table - 1: Multiple regression coefficients (b) and their significance level

Explanatory variables	b	S.E	t	P	95%CI for B	
					Lower	Upper
(Constant)	-313.18	254.71	-1.23	0.220	-814.42	188.06
Area under rice cultivation (in acre)**	-352.80	61.27	-5.76	0.000	-473.38	-232.23
Jhum cycle (in yr)**	136.07	16.29	8.35	0.000	103.99	168.14
Size of family	30.61	27.69	1.11	0.270	-23.89	85.11
No. of male labour	-8.58	60.56	-0.14	0.887	-127.75	110.60
No. of female labour	-10.89	56.96	-0.19	0.848	-122.99	101.19
Labour cost (in '00Rs.)*	5.46	2.49	2.19	0.029	0.55	10.37
No. of literate family member	15.19	25.19	0.60	0.547	-34.37	64.77

Model Diagnostics: $F_{(7, 300)}= 13.64$, $P<0.001$; $R^2 = 0.24$, Durbin Watson = 1.84
*significant at 0.05 probability level **significant at 0.01 probability level

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