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FARMLAND USE EFFICIENCY AMONG MUKTAKAMAIYA HOUSEHOLDS IN GAURIGANGA MUNICIPALITY, KAILALI

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ABSTRACT

The Muktakamaiya, an indigenous Tharu group of former bonded workers liberated in 2000 A.D., were given only small landholdings (2-5 kattha) by the Nepalese government. However, household with similar landholdings have uneven income levels. Some households are able to secure livelihood from farm production, whereas some others are able to secure it. This study aimed to assess the farmland use efficiency of the Muktakamaiya households in Gauriganga Municipality, Kailali District. A total of 87 households were sampled through simple random sampling and analyzed using SPSS software. The result showed that only 57% of Muktakamaiya farmers were able to generate income from their agricultural land, with an average gross income of NRs. 1,625 per unit kattha land, ranging from NRs. 45 to 12,487. A binary logistic regression analysis suggested that agricultural-related training support and the number of modern technologies to their farm had significant impacts on farmland use efficiency. Especially, the farmers with agricultural training and technological support used their land three (3) and seven (7) times more efficiently than those without. The findings underscored the use of proper technologies and addressing challenges support enhancing agricultural productivity. Expanding access to agricultural training programs and subsidies for modern agricultural technologies is recommended to enhance farmland use efficiency and ensure sustainable livelihood for the Muktakamiya farmers.

Key words: *Agricultural land utilization, livelihood, marginalized community, muktakamaiya*

INTRODUCTION

Land is one of the most crucial resources of our planet, and all living organisms greatly rely on it to meet their fundamental needs. However, land resources are becoming increasingly scarce. In Nepal, the population growth rate stands at 0.92% (CBS, 2022). To ensure food security and promote sustainable land use for future generations, it is essential to comprehend farmland use efficiency (FLUE). This concept not only aids production but also contributes to food security, nutrition, and income (Pilvere et al., 2014). Agricultural land use efficiency is defined as the capability to achieve the highest economic return from a certain amount of land or to minimize land input while maintaining a specific level of economic output (Qiu et al., 2021).

Maximizing land use efficiency is vital to boost food security, lower production costs, increase profits, and promote sustainable use of limited land resources. This efficiency is crucial to fostering sustainable agricultural productivity (Kalisz et al., 2023). In its broad sense, FLUE as an economic category encompasses the relationship between land-use impact and the resources used to attain that impact by observing changes in both areas. An increase in the resulting output, surpassing the resources expended, improve efficiency (Auzins et al., 2013). Additionally, the notion of efficiency is contingent on assessments, linking the determination of a process' efficiency to the value of its outcomes and costs as viewed by the evaluator (Heyne et al., 2013).

The term "Muktakamaiya" refers to the indigenous people in Nepal's Terai region who were forced laborers of landlords until the year 2000 (Chaudhary, 2013). Many of them are uneducated, unskilled, earn low incomes, face health challenges, live in poverty, and have limited opportunities beyond agriculture (Chaudhary, 2006). Historically, they worked in the homes of landlords to repay debts and were often landless or owned no land for farming. Typically, Kamaiya would enter one-year contracts with landlords, only to fall deeper into debt to meet their family's basic needs, resulting in generations of bonded labor (Gahatraj, 2011). On July 17, 2000, following pressure from national and international groups, the government officially recognized them as freed bonded laborers, known as "Muktakamaiya" (Chaudhary, 2006). The Muktakamaiya community comprises 32,509 households, with the highest number in Bardiya district at 14,499, and the smallest in Dang at 1,426. In Kailali, there are 9,762 Muktakamaiya households, making it the second-largest population of this community in the country (Gahatraj, 2011).

Following their emancipation from bonded labor, the government allocated 2–5 kattha (0.067–0.68 ha) of land per family for housing and some agricultural practices (MoLCPA, 2022). Regrettably, much of the distributed land was often unproductive, infertile, or situated in remote locations with poor access to infrastructure and markets. Nevertheless, a portion of farmers within the freed bonded laborer community has been able to generate a decent income from their limited land; the land granted by the government has become vital for their livelihood, significantly improving their quality of life compared to before. Thus, there remains a strong connection between agricultural land and the freed bonded laborers, with both being integral to the agricultural sector (Pyakuryal et al., 2011). Therefore, it is significant to explore methods to improve land use efficiency among the Muktakamaiya to alleviate poverty and enhance household incomes (Timilsina et al., 2019).

Statement of problems

The government provided land for Muktakamaiya ranged from 2-5 kattha and was mostly undulated, less fertile, and prone to flooding and drought, although its use varied across the households. Despite similar land holdings, differences in crop production and income generation were observed, leading to food insufficiency and poverty in some communities. Using land in an efficient way could have increased production and uplift the economic situation of people living in the study area (Childs, 2001).

The difference in return acquired by Households may be more with the Households with more knowledge, training opportunities, exposures, use of technologies and practices and years of experience. Knowing the determinants for increased land return from agricultural produce will be very useful for policy makers and implementers on improving livelihood options of these communities. Currently research on the impact of training and exposures is available, but its impact on land use efficiency is merely available. A study on Households land use efficiency to identify the key factors affecting the Land use efficiency will add value on current study diaspora. Therefore, identifying the challenges, socio-economic factors, and individual farmer's perceptions, and understanding how these directly affect the land use efficiency of the Muktakamaiya community was the main concern of this study.

Rationale of study

Having similar landholding and land stucture, the households have different abilities to benefit from the lands. A study on factors than can impact the production ability or farmland use efficiency among the households will an interest to design and implement programs on securing livelihoods of the smallholders farming communities like Muktakamaiya. Various aspects of agricultural land use efficiency and income dynamics were investigated among these communities. Experiences from other countries suggest that targeted interventions such as extension, credit, and transportation facilities substantially improved agricultural outcomes. In the Chittagong Hills of Bangladesh, with the help of improved extension, credit, and transportation facilities, the production and land degradation problems were drastically improved, and farmer's income levels increased by 20% compared to previous years (Rasul et al., 2004). Similarly, In China, by adopting soil management and agronomic practices disciplines and genetically improved crop varieties, they have been feeding 22% of the world population by cultivating 7% of the world's arable land (Fan et al., 2012).

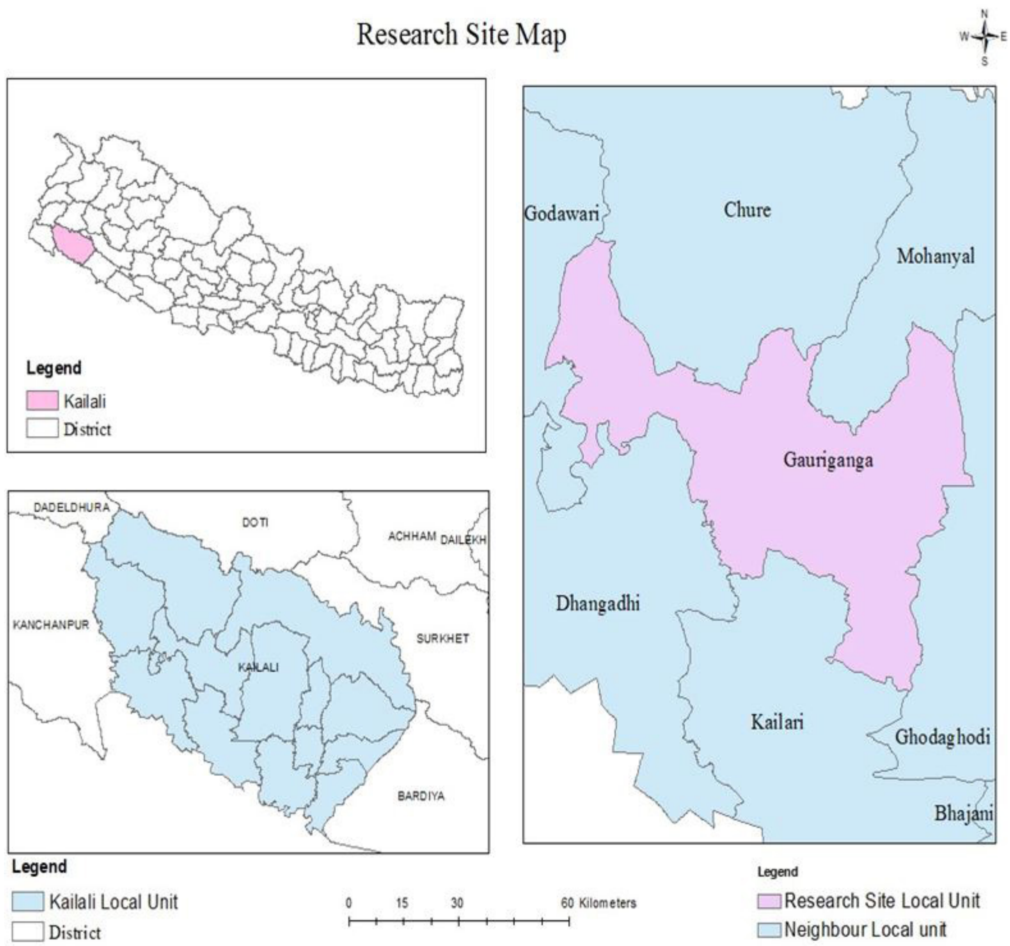
However, little is known about land use efficiency of the Muktakamaiya communities in Nepal, or about the socio-economic and institutional factors shaping their farming practices and income dynamics. This study therefore seeks to fill that gap by assessing agricultural land use efficiency, analyzing the relationships between landholdings size, cropping pattern, and income levels and identifying the role of training and modern technologies. The findings will provide insights for policymakers, researchers, planners, and development practitioners to design targeted interventions that enhance food security, income and livelihood of the Muktakamaiya.

Objectives

The study aimed to assess the farmland, use efficiency of the Muktakamaiya community of Gauriganga Municipality and identifying the key factors which support smallholder households to use the land more efficiently.

MATERIALS AND METHODS

This study was carried out in Gauriganga municipality of Kailali district, which is located in Far Western Province. It is situated in the western part of the country and includes diverse cultures and ethnicities. This municipality is located between 28.7670° N latitude and 80.7547° E longitude, at an altitude of 109 m from the mean sea level, having a tropical climate. Gauriganga Municipality is divided into 11 wards. It is geographically plain and occupies a total area of 244.4 sq km.



Study area map (Created by ArcGis Map 10.4)
Figure 1: Locational map showing the research sites in Gauriganga, Kailali

Population, sampling frame, sample size, and sampling technique

The study population was the most underprivileged Muktakamaiya households of Gauriganga Municipality of Kailali district, 87 households sample were selected with simple random sampling among the Muktakamaiya communities from 11 wards of Gauriganga Municipality. The community has similar landholdings, geographic area and cultural aspects. Thus, the samples were selected through simple random sampling with 95% confidence level and 10% margin of error. Raosoft sample size calculator (Raosoft, 2004) was used for sample size calculation.

Methods of data collection

Primary data were collected by conducting Household survey by using semi-structured questionnaire in order to acquire more field data. Secondary data were collected through the relevant literature from different sources such as PMAMP, NARC, MOALD, LIBIRD, CBS and NPC. The data taken was found to be 75% reliable through the SPSS reliability analysis command, where the scale value of Cronbach's alpha was 0.75. This means that the information provided by farmers is 75% reliable. Similarly, verbal informed consent was obtained from all respondents before conducting interviews, as the study involved no sensitive personal information. Respondents were informed about the objectives of the research, and participation was entirely voluntary.

Tools of data analysis

Data were collected through the KOBO toolbox, an online data collection tool. The collected data were furthered processed through excel and analyses through the IBM SPSS (Statistical Package for Social Sciences, version 27.0) software. Central measures such as mean, standard deviation, range along with frequency and proportion of the data were observed for descriptive measures. Further dummy variables were created and tested to understand the impacts. Means were tested with T-test. Further, binary logistic regression used for odd of the factors impacting land use efficiency.

Binary logistic regression model

Farmers were asked to evaluate their land use efficiency using a self-assigned score ranging from 1 to 10, reflecting their satisfaction with their land utilization. The self-evaluation of the farmland efficient by farmers was used as proxy indicator assuming farmers who is efficiently using land and taking optimum benefit will score high and who is not able to use land efficiently will score low. These scores were then categorized into two groups: "non-efficient" for scores between 1–5, and "efficient" for scores between 6–10. Similar approach has outlined by Auzins et al. (2013) in his study. A binary logistic model was used for the analysis of farmers' perception on farmland efficiency as 0 for non-efficiently used and 1 as efficient of Muktakamiaya. Seven different factors hypothesized to assess the farmland use efficiency of MKH were taken as independent variables taking farmers perception on farmland use efficiency use as dependent variable. Table 1 represents the description of variables used in the binary logistic regression model.

$Y = \beta 0 + \beta 1 X 1 + \beta 2 X 2 + \ldots\ldots\ldots + \beta 11 X 11$(Ezra et al., 2017)

Where, Y is a dependent binary variable & $\beta 0$ = constant term

Table 1: Description of variables used in Binary logistic model

Variables	Types	Description	Value
Dependent Variable Y			
Farmers perception on farmland use efficiency	Dichotomous dummy	Farmers perception on farmland use efficiency	If 0 non efficient land use, 1 if efficient land use
Independent variables			
Age	Continuous	Age of household head	Years
Gender	Dichotomous dummy	Gender of household head	0 if male, 1 if female
Education level	Dummy	Education of household head	0 if Illiterate, 1 if primary, 2 if secondary above
Family size	Continuous	Family size of respondent	
Family member engaged in agriculture	Continuous	Family member engaged in agriculture	
Training received	Dichotomous dummy	Technical support provider organization	1 if Yes, 0 if No
Technology adoption	Dichotomous dummy	Technology adoption of respondent	1 if Yes, 0 if No

RESULTS AND DISCUSSION

Demographic characteristics of respondents' household

This chapter explains the socio-economic and demographic analysis of MKC households.

The various demographic characteristics of respondents were taken in table 2 and described it. The male respondents of study area were found to be 9.2%, while the female respondents were 90.8%. The age groups of the population were divided into three portions. The age group from 20-40, 41-60 and 60 above, where age group of 20-40 were highest percentage of involvement consisting of 51.7% while age group of 60 above had the least involvement only 8%. The religion of respondents was found to be 84% Hinduism and 16% Christianity. The education level of respondents had been categorized into the three categories illiterate, primary, and secondary above; 51.7% respondents were found to be illiterate, 21.8% respondents had a primary level of education, and 26.4% respondents had a secondary level education.

Table 2: Respondent characteristics

Respondent Characteristics	Frequency (n=87)
Sex	
Male	8(9.2)
Female	79(90.8)
Age	
20-40	45(51.7)
41-60	35(40.2)
61-70	7(8)
Religion	
Hindu	73(84)
Christian	14(16)
Education level	
Illiterate	45(51.7)
Primary	19(21.8)
Secondary and above	23(26.4)

Note: parenthetical numbers represent percentage (Source: Field Survey, 2024)

Household head characteristics

In study area, 87.4% of households were headed by males, whereas only 12.6% were headed by females. The education level of household heads has been categorized into the three categories illiterate, primary, and secondary above based on their responses, where 54% household heads were found to be illiterate, which was the highest number of respondents involved in the survey, 32.2% household heads had a primary level of education, and only 13.8% household heads had a secondary level of education.

Table 3: Household head characteristics

Household head Characteristics	Frequency (n=87)
Gender	
Male	76(87.4)
Female	11(12.6)
Education level	
Illiterate	47(54)
Primary	28(32.2)
Secondary Above	12(13.8)

Note: Figure in parentheses represent percentage (Source: Field Survey, 2024)

Land ownership status

The size of cultivated land among MKH varied significantly, with an average 10.4 kattha with a standard deviation of 9.85 kattha. Among the 87 respondents, 60 households had access to irrigated land, while 27 relied solely on non-irrigated land. The mean area of irrigated land per household was 2.93 kattha (±1.17), whereas non-irrigated land averaged 2.89 kattha (±1.08). Additionally, households engaged in sharecropping cultivated a larger area on average, with 15.34 kattha of land and a standard deviation of 8.18 kattha.

Table 4: Variables related to landownership status

Variables related to agriculture	Frequency (N)	Mean	Standard deviation
Total cultivated Land	87	10.45	9.85
Irrigated own land	60	2.93	1.17
Irrigated rented land	44	15.34	8.18
Non irrigated own	27	2.89	1.08
Non irrigated rented Land	1	4.00	-

(Source: Field Survey, 2024)

Major problem faced by the farmers of study area

Problem ranking was done among the respondents on the basis of a scale of 1-5. The result shows that most challenges they are facing was lack of irrigation and wild animal attack, followed by lack of fencing facility and disease pest problem in farming operation and also lack of adoption of technological knowledge this study is supported by (Rai et al., 2019) who obtained similar problem in vegetables farming in inside Kathmandu valley.

Table 5: Major problems face by the farmers

Major problems faced by farmers	Index value	Total rank
Irrigation	0.74	I
Wild animal attack	0.57	II
Inadequate Fencing facility	0.56	III
Disease Pest infestation	0.52	IV
Inadequate of technological knowledge	0.45	V

(Source: Field Survey, 2024)

Farmers perception on FLUE with different independent variables

Farmers were asked to evaluate their land use efficiency using a self-assigned score ranging from 1 to 10, reflecting their satisfaction with their land utilization. These scores were then categorized into two groups: “non-efficient” for scores between 1–5, and “efficient” for scores between 6–10. Similarly, same approach has outlined by Auzins *et al.* (2013).79% among 42 farmers who rated their land as efficient were earning from the land upto NPR 12,488 per kattha land, however among 45 who rated non-efficient, only 53% reported of earning up to NPR 2,950/katha land. To analyze the relationship between perceived land use efficiency and various factors, an independent two-sample t-test was conducted. Among 87 respondents, 45 farmers who rated their land as non-efficient had average food sufficiency of 5.77±3.14 months. In contrast, the 42 farmers who considered their land use efficient reported a significantly higher average food sufficiency of 7.85±2.89 months (P-Value=0.02).

The average age of respondents in the non-efficient group was 46.8 years, while those in the efficient category had a slightly higher average age of 47.17 years. This suggests a trend where increasing age may enhance land use efficiency, which aligns with findings by Rai *et al.* (2019), who noted that greater farming experience with age can improve productivity.

Technology adoption was another key differentiator. Farmers in non-efficient groups reported an average use of 1.36 technologies, whereas the efficient group had a higher average of 2.50, indicating a strong positive association between technology use and land efficiency. This observation is also supported by Ahmed *et al*. (2013), who emphasized the role of technology in improving farm income. Lastly, food sufficiency months were positively correlated with land efficiency perception. Households in the efficient category reported an average of 7.84 months of food sufficiency, whereas those in the non-efficient group averaged 5.7 months. This further supports the idea that better land use practices contribute to enhanced household food security.

Table 6: Farmers perceptions on FLUE with different independent variables

Parameters	Farmer’s efficiency perception	N	Mean	Std. Deviation	Std. Error Mean	Sig.
Total Cultivated land category	Efficient	45	1.40	0.75	0.112	.80
	Non Efficient	42	1.69	0.71	0.110	
Age of HH	Efficient	45	46.8	12.48	1.86	0.93
	Non Efficient	42	47.17	9.6	1.48	
Technology adoption	Efficient	45	1.36	0.712	0.106	**.000*** **
	Non Efficient	42	2.50	1.194	0.184	
Food sufficiency month	Efficient	45	5.76	3.13	3.13	0.002**
	Non Efficient	42	7.84	2.98	2.98	

****,**,* indicates that Significant at 1%, 5%, 10% level of significance (Source, Field survey, 2024)*

Technology practiced

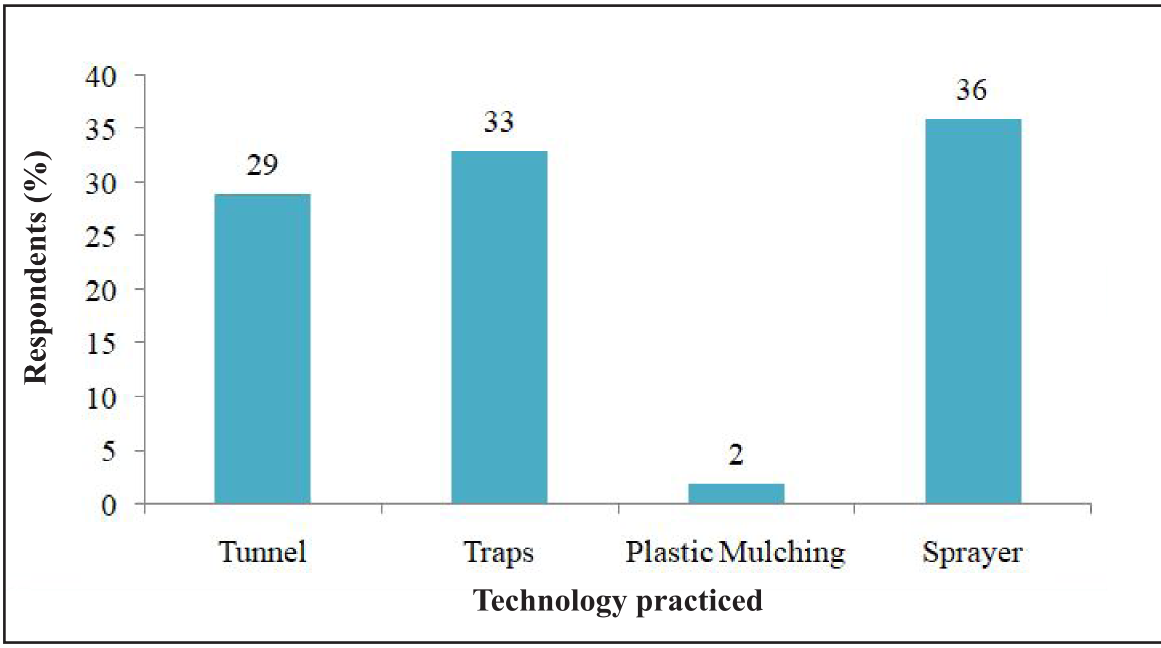


Figure 2: Technology practiced in the respondent farms

A significant portion of 36% households had adopted Sprayer technology. The adoption of Traps was slightly lower than Sprayers. The Tunnel technology had been adopted by around 29% of households. The adoption of Plastic Mulching was notably low, with less than 2% of households using this technology (Figure 2).

Key determinants of farmer's perceptions on land use efficiency of their land

The farmer's self-scoring of their farmland to the land use efficiently (1-10 scores) was grouped as binary variable as efficiently used for farmers scoring from 6 to 10 and non-efficient used for farmers scoring 1 to 5. The binary self-evaluation of farmers is regressed with gender, education and age of household head, family size, family members engaged in agriculture, training received, technology adoption. Among them, household receiving agricultural training and adopting more number of technologies were significantly evaluated themselves as more efficiently using their farmland. The binary logistic regression results (Table 7) show the households receiving training is 3.643 times likely to self-evaluate as efficient then not receiver. Thus, training receive has a strong positive impact on farmers' perceptions of efficient use of land. This is supported by Abdul-Rahaman *et al*. (2021) who disclose that farmers with extension exposure has better land use efficiency.

Moreover, the household adopting one more technology has 7.308 times more chance of stating efficiently using land compared to those who do not adopt technology, similar results were obtained by Ahmed *et al.* (2013). The gender, education and age of the household head, family size and number of family member involved in farming were not significantly, impacting the evaluation on efficiency made by the household, which contradicts with findings from (Ahmed et al., 2013; Asadullah and Rahman 2009).

Table 7: Key determinants on farmer's perceptions on land use efficiency of their land

Determinants (Farmers perception on ALUE)	Coefficient	S.E.	P value	Exponential(B)
Gender of Household Head (HHH)(Men)	-0.717	0.75	0.340	0.488
Education status of HHH (Illiterate)			0.730	
Education status of HHH (Primary)	0.746	1.78	0.676	2.108
Education status of HHH (Secondary)	-0.331	0.60	0.586	0.718
Age of HHH	0.001	0.02	0.972	1.001
Family size	-0.089	0.16	0.596	0.915
Number of family members engaged in agriculture	0.085	0.20	0.679	1.088
Training received	1.293	0.525	0.014	3.643
Technology adoption	1.989	0.717	0.006	7.308
Constant	-1.681	1.714	0.327	0.186
Log Likelihood	89.04[a]			
Nagelkarke R square	.40			

CONCLUSION

Using farmers' self-evaluation on his/her satisfaction on using land and receiving optimum benefit. The study showed that household accessing agricultural training and technology adoption opportunities are believing to be using land more efficiently, with more confident and satisfied. Also, women headed household is assuming to be using farmland more efficiently. This suggest that for enhancing land use efficiency of Muktakamaiya farmers, they must have access of agricultural trainings and knowledge of technology adoption. This study highlights the use of proper technologies and addressing challenges that support better crop production and productivity.

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