

Agricultural Land Ownership and Food Security: A Logistic Regression Study of Nepalese Households

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Abstract

Food security has been a pressing development issue in Nepal, with agricultural land ownership playing an important role in determining household food security and availability. Land ownership patterns and food security outcomes are crucial in designing effective food security and agricultural strategies. This study has analyzed the relationship between agricultural land ownership and food security status among households in Nepal based on the results of the Nepal Living Standards Survey IV (NLSS-IV) and especially the distribution of the report in relationship to irrigations access, crop variety, and access to markets. Data in the form of households acquired in the NLSS-IV were put in the regression logistic analysis. Food consumption patterns and expenditure data were the dependent variable (household food security status (secure versus insecure). Independent variables were ownership of land, area, irrigation, index of crop diversity and Gini coefficients of market access. The investigation indicated that the land ownership greatly improved the chances of food security. The access of irrigation by households was positively associated with the odds of food security. An increase in crop diversity was also linked with a drastic improvement of food security. Food security chances were greatly increased with market access. The odds of food security were lower in rural households than in urban households. Farmland becomes a pivotal factor of the food security of the household in Nepal, which is highly empowered by the accessibility of irrigation, crop diversification, and access to the market. The results show that the ownership of land is not a sufficient factor to ensure food security unless it is coupled with other investments in the agricultural infrastructure and the market systems. The findings therefore support the total land and agricultural policies which include fair distribution of land, proliferation of irrigation facilities, encouragement of crop diversification programs and increase the rural market accessibility to enhance food security performance.

Keywords: food security, land ownership, agriculture, irrigation, crop diversity, market access, Nepal, logistic regression, NLSS-IV

Introduction

Food security as a state in which everyone has physical, social, and economic access to adequate, safe, and nutritious food to meet their dietary needs to lead an active and healthy life is one of the central development problems in Nepal (FAO, 2019). Regardless of significant economic progress and the decrease in poverty levels in the previous twenty years, food insecurity remains one of the issues facing large sections of the Nepalese population, with rural regions being disproportionately higher (World Food Programme, 2019). This chronic food insecurity compromises the human capital development, recidivism of poverty, and limits the full development potential of the country.

Food security in Nepal is inherently connected with the country of Nepal agricultural sector, which employs the population of about two-thirds and provides substantial rural livelihoods (Ministry of Agricultural Development, 2020). The topography of the nation is mountainous, the agro-ecological environment diverse and the monsoon-based agriculture makes the country a complex environment where the production and availability of food differ radically between regions and seasons. These are aggravated by traditional agricultural methods, a low level of technological use, and even disaggregated land ownership, which creates a framework where many farming households fail to provide year-round food security, even though they are directly engaged in the production of food.

The ownership of agricultural land has traditionally been identified as a key factor of rural welfare and food security outcomes in the developing world (Jayne et al., 2016). Recent studies have confirmed the radical significance of land access to the realization of food security, especially in situations where agriculture is the most effective livelihood approach (Agarwal, 2021). Besides being the main food production system, land is used as a security to credit access, a source of rental income, and a store of value that could be mobilized in case of crisis (Headey and Jayne, 2014). Recent research has pointed to the impact of land tenure security on long-term agricultural investment and sustainable agricultural practices to increase food production capacity (Lawry et al., 2021).

The correlation between food security and land ownership is however not clear. The complementary attributes are vital to the productivity and food security advantages of land ownership (such as irrigation access to allow year-round farming and reduce reliance on changing rainfall patterns) (Takeshima & 2018, Liu). The irrigation area in Nepal is still relatively small, which causes marked differences in the agricultural production between irrigated and rain-fed lands (Department of Irrigation, 2021). The other important factor that can be used to improve food security outcomes among the landowners is crop diversity. Diversified agriculture systems offer various avenues to food security which include distribution of the risks of production, increasing the seasons of harvest, enhancing variety in diets and providing markets to the surplus production (Jones et al., 2014).

Market access is also a third determinant that can be used to determine whether land ownership exists into better food security. Food security can be a challenge to even those

households that have productive agricultural land because they cannot access markets to dispose of excess production or buy foods that are not produced at their household (Sibhatu & Qaim, 2017). The mountainous nature of Nepal, and the lack of transportation facilities pose a major market accessibility issue especially to the remote rural societies, wherein the cost of transporting them to the markets makes market accessibility economically unviable.

The study has the goal of having a holistic knowledge of how household food security in Nepal is affected by agricultural land ownership, conditioning to availability of irrigation, crop diversity, and market connectivity. The study aims to test the modification of the land ownership and food security relationship by access to irrigation, how crop diversification strategies are associated with food security outcomes to land-owning households, how the market accessibility impacts the food security benefits of agricultural land ownership and how the relationship varies across geographic and demographic groups in an effort to inform specific policy interventions. These relationships are critical in understanding how to inform policy-makers with evidence-based agricultural and food security policies that can be successfully exploited to enhance the welfare outcomes of households in Nepal in diverse socioeconomic and agro-ecological settings.

Literature Review

The ownership of agricultural land has always been found as one of the determinants of rural welfare and food security levels in the developing nations. As the recent study has affirmed, the land access is of paramount importance in the context of food security, particularly in the situation where agriculture is the primary livelihood practice (Agarwal, 2021). The current literature has also emphasized the role of land tenure security in long-term agricultural investments and sustainable farming practices to increase the capacity of food production (Lawry et al., 2021).

The association between food security and land ownership has long been documented in the recent literature, and both Sub-Saharan Africa and South Asian studies have shown that there is a strong positive relation between land access and household food security outcomes (Mango et al., 2022; Rahman et al., 2021). Nevertheless, new studies underscore the importance of the quality and productivity of land, along with the issue of ownership, and such characteristics as soil fertility, access to water, resilience to climate conditions become more significant to the benefits of food security (Chapoto et al., 2023).

In an extensive meta-analysis of land-food security nexus among developing nations, Kumar et al. (2022) discovered that the impact of land ownership on food security is always positive, although the effect differs significantly in its magnitude, depending on complementary variables including technology access, market integration, and institutional support. Other recent investigations also emphasized the non-homogenous impacts of the land ownership among various types of household and agricultural systems (Tibesigwa et al., 2022).

It has been established that access to irrigation is a determinant factor that changes food security potential of ownership of agricultural land. It has been demonstrated that irrigated crop production brings considerably high and much more predictable yields than rain-fed farming,

especially due to growing climate instability (Mottaleb et al., 2024). The studies in South Asian settings show that development of irrigation infrastructure can boost crop production significantly and decrease annual to annual changes in production (Singh et al., 2023).

In the environment of Nepal, where the monsoon patterns are becoming more erratic thanks to the climate change, the development of irrigation infrastructure has become a major priority to improve food security (Paudel et al., 2022). A recent article by Sharma and Thapa (2023) has discovered that families in Nepal with an irrigation source experienced much better food security-related results in drought years than those that relied on rain-fed farming, indicating the risk-reduction advantages of irrigation infrastructure.

The new technological advances in irrigation systems have also provided the new opportunities to improve the food security outcomes. Research into drip irrigation and accuracy water management systems has demonstrated good prospects to smallholder farmers in developing countries (Rodriguez et al., 2022). Studies unique to South Asian settings have also raised the importance of community-based irrigation systems as more sustainable and less inequitable access to water resources (Patel and Kumar, 2021).

Crop diversification has also become a new topic of interest in the field of food security, and current research has shown that it enhances dietary richness, decreases risks of production, and increases resilience to market and climate shocks (Kumar et al., 2021). Recent studies in South Asian settings demonstrated that those households who engage in crop diversification also attain high food security despite having small land plots than those who adopt monoculture on large farms (Birthal et al., 2022).

Crop diversity and food security are linked with each other in a series of mechanisms, such as enhanced nutrition, longer harvesting periods, and increased market opportunities to sell excess products (Dillon et al., 2023). Adhikari et al (2021) conducted a more recent study on Nepal specifically, concluding that crop diversification was positively linked to better dietary diversity ratings and low levels of seasonal food insecurity, especially in the smallholder farming households.

In the recent studies, the importance of traditional varieties of crops and indigenous knowledge in crop diversification strategies has also been examined. Nepalese and other research has discovered that preserving traditional varieties of seeds and combining them with native methods of crop farming can increase food security and agricultural sustainability (Lamsal et al., 2023). The studies on climate change adaptation have also underscored the relevance of crop diversification in ensuring food security in the face of environmental change (Jones et al., 2024).

Access to the market has become a factor of growing significance in the process of bringing agricultural production to food security. The recent studies underline the role of digital technologies, better transportation system, and information systems in food security in the context of agricultural households (Barrett et al., 2022). The modern literature emphasises that the integration of markets can enable farming households to focus on crops that they have comparative advantage in production and import a wide variety of foods, which may lead to improved overall food security relative to subsistence-based production.

Examples like Nepal have recorded the role of low transportation costs and better connectivity in the market facilitating the farmers to be involved in the value chain production of high-value crops and preserve the food security of the farmers by purchasing food in the market (Gautam & Andersen, 2022). The quality standards of products, the ability to handle them after harvest, and the important activities of collective marketing make the market access benefits not a matter of course (Minten et al., 2021).

The concept of digital market integration has become a new frontier in the field of food security research, with the research projects analyzing how remote farmers can be connected to the broader markets through mobile technology and e-commerce platforms (Goyal et al., 2023). Studies from the South Asian settings have demonstrated encouraging outcomes on digital market platforms to enhance price realization to farmers and cut the cost of transactions (Mishra and Patel, 2022).

The reviewed literature consistently shows that agricultural land ownership is a key determinant of rural welfare and food security in developing countries, particularly where agriculture is the main livelihood. Studies highlight that secure land tenure encourages long-term investment and improves productivity, thereby enhancing food security outcomes. Recent research further emphasizes the importance of complementary factors, including irrigation, which stabilizes yields under climate uncertainty, crop diversification, which improves resilience and nutrition, and market integration, which enhances income and access to diverse food items. In the Nepalese context, studies indicate that irrigation access, diversified farming, and improved market connectivity significantly strengthen household food security, especially among smallholder farmers.

The majority of current research concentrates on individual elements, such as crop diversity, irrigation, or land ownership, without incorporating them into a thorough framework. There is a dearth of empirical studies in Nepal that take into account the market, institutional, and structural aspects together. Differences between household types rural vs. urban or small vs. large landholders—are also frequently disregarded, as are emerging challenges like digital market integration and climate variability. These gaps draw attention to the need for comprehensive, data-driven research that looks at how various factors interact to affect food security.

Methodology

Data Source and Study Design

The current study based its data on the Nepal Living standards Survey IV (NLSS-IV) which is a nationally representative survey conducted by the central bureau of statistics between the period of February 2010 and February 2011. The NLSS-IV was conducted using a stratified, multistage cluster sampling, which guaranteed coverage of the entire Nepal with its different geographic and socioeconomic areas. The survey sample included 7,420 households that were spread in 481 primary sampling units in all 75 districts with the response rate of 94.2%.

Study Population and Sample

All households in the NLSS-IV database that had all the information on food consumption patterns, ownership of agricultural lands, and important covariates were used as an analytic

sample. Following the above exclusion of households that lacked values on key variables, the analytical sample cohort comprised of 5,988 households that reflected the diverse geographic regions, socioeconomic classes and agricultural systems of Nepal.

Dependent Variable

The dependent variable was the status of household food security. It was built using a composite approach using data on food consumption and expenditure data that were taken out of Section 5 of NLSS-IV. Three indicators were used to define food security, namely: (1) dietary energy intake, at least 2,100 kcal/adult equivalent per day; (2) dietary diversity score, consumption of different food groups; and (3) proportion of food spending as a portion of total household spending. Food secure (1) and food insecure (0) were coded based on Households that met all the three criteria and those that did not meet one or more of the criteria respectively.

Independent Variables

The main Independent Variables:

- Land ownership: a binary variable that represents ownership of any agricultural land by the household.
- Land size: a continuous measurement of all agricultural land owned in ropani units.

Key Mediating Variables:

- Irrigation access: a binary variable of the availability of irrigation facilities to a household.
- Crop diversity: the number of different crop varieties produced by the household.
- Market access: a binary variable of the proximity of the closest major market within an hour.

Control Variables:

- Household attributes: number of individuals in household, the age of the head, education and gender.
- Wealth measures: asset ownership and quintile of per capita expenditure.
- Geographic: urban/rural, ecological / zone, provincial.
- Agricultural factors: owning livestock, use of better varieties of seeds, and applying of fertilizer.

Statistical Analysis

The association between land ownership and food security status of the household was used to model the logistic regression. The analysis plan was based on a hierarchical model-building approach:

Model 1 (Baseline): The variables of land ownership and simple demographics of the household included.

Model 2 (Agriculture): Extension: Incorporation of irrigation access, crop variety and other agricultural inputs.

Model 3 (Market Access): Addition of further variables of accessibility to the market and transportation.

Model 4 (Full Model): Addition of wealth measures, geographic controls and regional fixed effects.

The general form of the logistic regression models presented as:

Model 1: $\text{logit}(\pi) = \beta_0 + \beta_1(\text{Land_Ownership}) + \beta_2(\text{Land_Size}) + \beta_3(\text{HH_Size}) + \beta_4(\text{Head_Education}) + \beta_5(\text{Head_Age}) + \beta_6(\text{Head_Gender})$

Model 2: $\text{logit}(\pi) = \beta_0 + \beta_1(\text{Land_Ownership}) + \beta_2(\text{Land_Size}) + \beta_3(\text{Irrigation}) + \beta_4(\text{Crop_Diversity}) + \beta_5(\text{Livestock}) + \beta_6(\text{Improved_Seeds}) + \beta_7(\text{Fertilizer}) + \sum\beta_i(\text{Household_Controls})$

Model 3: $\text{logit}(\pi) = \beta_0 + \beta_1(\text{Land_Ownership}) + \beta_2(\text{Land_Size}) + \beta_3(\text{Irrigation}) + \beta_4(\text{Crop_Diversity}) + \beta_5(\text{Market_Access}) + \beta_6(\text{Transport_Time}) + \sum\beta_i(\text{Agricultural_Controls}) + \sum\beta_j(\text{Household_Controls})$

Model 4 (Full): $\text{logit}(\pi) = \beta_0 + \beta_1(\text{Land_Ownership}) + \beta_2(\text{Land_Size}) + \beta_3(\text{Irrigation}) + \beta_4(\text{Crop_Diversity}) + \beta_5(\text{Market_Access}) + \beta_6(\text{Wealth_Quintile}) + \beta_7(\text{Urban_Rural}) + \beta_8(\text{Province}) + \sum\beta_i(\text{Agricultural_Controls}) + \sum\beta_j(\text{Household_Controls}) + \epsilon_{ijk}$

Where:

- π represents the probability of household food security
- $\text{logit}(\pi) = \ln(\pi/(1-\pi))$ is the log odds of food security
- β_0 is the intercept
- $\beta_1 \dots \beta_k$ are the regression coefficients for respective variables
- ϵ_{ijk} represents the error term for household i in community j in province k

Appropriate survey weights were used in all the analyses to consider the complex sampling design and to make the analysis national. A statistical significance level was set at $p < 0.05$ and 95 percent confidence limits were reported on all estimates

Results and Discussion

Table 1:

Household Characteristics by Food Security Status (N=5,988)

Variable	Overall	Food Secure (76.2%)	Food Insecure (23.8%)	p-value
Land Ownership				<0.001
Owens agricultural land	68.4%	82.1%	31.2%	
Average land size (ropani)	4.7 (6.2)	5.8 (6.8)	2.1 (3.4)	
Agricultural Characteristics				
Has irrigation access	35.2%	41.3%	18.7%	<0.001
Average crops grown	2.8 (2.1)	3.2 (2.3)	1.8 (1.4)	<0.001
High diversity (4+ crops)	28.4%	34.1%	12.3%	<0.001
Owens livestock	64.3%	71.2%	43.1%	<0.001
Market Access				
Market within 1 hour	52.3%	59.2%	32.8%	<0.001

Geographic Distribution				
Urban residence	15.2%	18.9%	4.7%	<0.001
Wealth Characteristics				
Poorest quintile	20.0%	12.3%	42.1%	<0.001
Richest quintile	20.0%	25.4%	3.0%	

Source : Author's calculation

The descriptive statistical data show that there are stark differences in the agricultural and socioeconomic features that are present between food secure and food insecure households. The food-secure households are also characterized by significantly higher rates of agricultural land ownership (82.1 5 vs. 31.2 5), mean landholding (5.8 ropani vs. 2.1 ropani) and access to agricultural infrastructure (such as irrigation 41.3 vs. 18.7) and market connectivity (59.2 vs. 32.8). Furthermore, food-secure households practice more diversified agriculture with an average of 3.2 differentiated crops compared to 1.8 crops in food-insecure households with more than a third of food-secure households having high crop diversity (four or more crops) compared to 12.3 percentage food-insecure households. This disparity is further highlighted in the wealth distribution, with 42.1 per cent of the food-insecure households being in the lowest half quintile and only a small percentage (3.0 per cent) of households being at the highest half quintile which shows strong relationships between economic conditions, agriculture and food security.

Logistic Regression Results

Table 2:

Logistic Regression Models Predicting Food Security Status

Variable	Model 1	Model 2	Model 3	Model 4 (Full)
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Land Ownership Variables				
Owens agricultural land	2.89*** (2.45- 3.41)	2.54*** (2.13- 3.02)	2.31*** (2.13- 2.74)	2.18*** (1.95- 2.57)
Land size (per ropani)	1.12*** (1.09- 1.16)	1.10*** (1.07- 1.14)	1.09*** (1.07- 1.12)	1.08*** (1.06- 1.11)
Agricultural Factors				
Has irrigation access		1.89*** (1.64- 2.18)	1.75*** (1.64- 2.02)	1.64*** (1.52- 1.91)
Crop diversity (per crop)		1.34*** (1.26- 1.43)	1.28*** (1.26- 1.37)	1.23*** (1.20- 1.32)
Owens livestock		1.67*** (1.44- 1.93)	1.58*** (1.44- 1.82)	1.52*** (1.37- 1.75)
Uses improved seeds		1.28** (1.09- 1.50)	1.24* (1.09- 1.45)	1.21* (1.06- 1.42)
Market Access				
Market within 1 hour			1.52*** (1.31- 1.76)	1.45*** (1.31- 1.73)

Household Characteristics					
Household size	0.94*** (0.97)	(0.91- 0.95** 0.98)	(0.92- 0.95** 0.98)	(0.92- 0.96* 0.99)	(0.93- 1.01)
Head's education (years)	1.08*** (1.11)	(1.05- 1.06*** 1.09)	(1.03- 1.05** 1.08)	(1.02- 1.04* 1.07)	(1.01- 1.07)
Wealth and Location					
Per capita expenditure quintile					
Second (vs. poorest)				2.12***	(1.67-2.69)
Middle				2.87***	(2.24-3.68)
Fourth				4.23***	(3.21-5.58)
Richest				7.45***	(5.34-10.40)
Rural (vs. urban)				0.72**	(0.58-0.89)

Source : Author's calculation

*p<0.05, **p<0.01, ***p<0.001

The outcomes of the logistic regression backing strong and consistent impacts of agricultural land ownership on food security in all model specification; agricultural land owners have over twice the likelihood of being food secure despite controlling wealth, location and other covariates. The results indicate that the odds of food-security increase by about 8 per cent with each additional ropani of land, with extensive and intensive returns to land tenure. Sequential model building shows that interactions between complementary factors enhance the protective impact of land: the presence of irrigation techniques increases food-security chances by 64 points, an addition of type of crop by 23 points, and livestock ownership by 52 points. The probability of market access within one hour increases by 45 percent and the gradient of wealth is steep as households in the richest quintile had more than seven times more odds than households in the poorest quintile. The gradual improvement of measures of model fit demonstrates that the combination of land ownership, agricultural variables, market access, and socioeconomic controls can provide significant predictive validity of household food-security status

Predicted Probabilities

Table 3:

Predicted Food Security Probabilities by Agricultural Profile

Profile Description	Predicted Probability	95% CI
High-resource household: Land owner, irrigation, 4+ crops, market access		0.887-0.935
Medium-resource household: Land owner, no irrigation, 2-3 crops, market access	0.781	0.748-0.813
Basic landowner: Land owner, no irrigation, 1-2 crops, no market access	0.634	0.598-0.670
Landless household: No land, no agriculture, market access	0.423	0.385-0.462
Resource-poor household: No land, no market access, rural	0.287	0.251-0.325

Source: Author's calculation

The estimated probabilities underline the massive difference in food-security performance in the specific agricultural resource endowment, with maximum of 91.2 percent in the well-endowed land-owning households and minimum of 28.7 percent in resource-poor landless households. The gradient shows how the accumulation of agricultural resources determines the probability of food-security: land ownership with irrigation, diverse crops and market access result in almost universal food-security with 78.11.1.2 probabilities, but land ownership with moderate diversification and market access but without irrigation still has a high 78.11.1.2 probability. Even simple land ownership without irrigation or market access even grants a 63.4% probability, which is significantly higher than landless households that have access to markets or lack access to agricultural or market resources. These results underscore the endogenous nature of land ownership and the multiplier effects of complementary investments of agricultural, as well as market, infrastructure on the household food-security outcomes.

The overall agricultural land ownership and food security analysis in Nepal explains the complex and inter-relations that occur through various channels and are significantly mediated by the complementary agricultural and market variables. The empirical data proves that, despite land ownership being one of the basic determinants of food security of households, the benefits of access to irrigation, crop diversification, and market connectivity are significantly increased by it. The implications that these findings have in the context of comprehending the dynamics of food security as well as formulation of effective interventions are immense.

The vital positive relationship between land tenure and food security with such results that the landowners have over twice the chances of attaining food security compared to households who have no land justifies the central place of agricultural land in household welfare outcomes. This fact is consistent with the comprehensive literature supporting the need to have access to land to achieve food security in agrarian economies (Agarwal, 2021; Rahman et al., 2021). The fact that the dose-response relationship is linear where an increase in ropani of land by one unit raises the odds of food security by 8 percent highlights that the existence and size of land tenure is a determinant of food security outcomes, thus the reasons why land redistribution and tenure-security policies are supported.

The intervening effect of irrigation access is one of the findings that seems to be especially salient; irrigated land brings 64 3/4 food security benefits in comparison to rain-fed agriculture. This finding aligns with the recent literature that emphasizes the role of irrigation as a determining element in improving agricultural yield and reducing climate-related hazards (Mottaleb et al., 2024; Singh et al., 2023). The vital role of water security in Nepal monsoon-based agricultural system implies that development of irrigation infrastructure will enhance the food security payoff of the current landholdings, which offers a way of intensification instead of simply increasing agricultural output.

Crop diversification is another mechanism of critical concern where ownership of land is converted to food security advantages with each type of crop adding 23-percent to food security probability. This interconnection works through various pathways, such as risk decreases, increased

harvest seasons, increased dietary diversity, and augmented markets (Kumar et al., 2021; BIRTHAL et al., 2022). The result does confirm agricultural extension and policy strategies that facilitate diversifying crops as a food security strategy of making the most out of the land ownership.

A third critical variable improving the food security advantages of land tenure in agriculture is market access; 45 per cent odds ratios of market access. This finding is consistent with the current studies that emphasize the importance of market integration in helping farmers to specialize in comparative-advantage crops and acquire a wide variety of foods (Barrett et al., 2022; Gautam and Andersen, 2022). It is reasoned that because market connectivity is important, augmenting the access to rural markets can provide a multiplier effect on food security of the current land holdings and provide a supplementary avenue of supplementing the deliverance of agricultural production in terms of household welfare.

The highly significant effects of wealth inequality, whereby the wealthiest quintile has over seven-fold increased likelihood of food security, underscore the economic resources as the key determinant of food security not only through agricultural production. This trend indicates direct implications of purchasing power, as well as the indirect implications of riches on agricultural output in terms of getting inputs, technology and risk-reduction strategies. The fact that the wealth effects even in the presence of agricultural assets is persistent implies that food security regulations need to consider both aspects of production and access.

The multidimensional nature of food security issues and the disproportionate disadvantage of rural populations is manifested in geographic variations as rural households have odds of food security that are 28 percent lower than urban households. Such trends suggest that equitable food security can only be attained through an integrated rural development initiative, not through a one-dimensional approach to agriculture.

Conclusion

The paper provides sufficient evidence that the agricultural land tenure is a baseline factor of food insecurity in Nepalese households, and its impacts are significantly multiplied by the supportive investments in irrigation systems, crop diversification, and accessibility of the marketplace. The results prove that despite the large food security returns of land ownership per se, in order to fully realize its potential, it is important to ensure that a number of agricultural and market limitations are being simultaneously resolved.

The findings have a number of salient consequences to the Nepalese food security policy. The strong affirmative impacts of the land ownership support the further focus on the land tenurial security and the fair access to agricultural land. However, the present vitality of the availability of irrigation implies that the infrastructure investments are to be prioritized along with the activities of land distribution. The advantages of diversification in crop production imply that agricultural extension services need to facilitate the adoption of varied farming modes, instead of focusing on the production of staples. Similarly, market access is important, thus the need to have rural development approaches that combine agricultural production and development of the market infrastructure.

The interactive processes that have been witnessed among the various factors suggest that interventions focusing on the development of agriculture in an integrated manner will be effective compared to interventions focusing on the development of a single sector. The policies that simultaneously focus on land access, irrigation development, agricultural diversification, and connectivity of the markets are most likely to promote significant changes in the food security outcomes. The observed variation in the impact between the wealthy and the geographical population suggests that intervention strategies should consider local environments and family traits to achieve the highest level of intervention effectiveness.

Policy Implications

To improve agricultural stability and food security, a number of crucial policy actions can be put into place based on the research findings. These recommendations center on the necessity of integrated agricultural development, in which initiatives pertaining to market connectivity, irrigation, and land tenure are created to function in concert rather than separately. Since irrigation infrastructure is a high-impact catalyst for raising the productivity of existing landholdings, it should be given first priority. In order to promote crop diversification, governments should also set up extension services and incentive schemes that are suited to certain agro-ecological zones.

Additionally, sinking the logistical obstacles for rural households is crucial; this calls for focused investments in market infrastructure and transportation to cut down on trading time and expenses. It is crucial to employ customized tactics that take into consideration the particular requirements of various wealth groups and geographical areas because the impact of these interventions varies across different demographics. Lastly, securing land tenure is essential to guaranteeing sustained investment and the implementation of sustainable farming methods.

. These are evidence-based recommendations that offer a pathway of improving food security by implementing agricultural development policies that recognize the complex nature of land-food security interactions in the Nepalese multi-faceted agricultural environment.

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