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Determinants of Farmers' Willingness to Grow Potato on a Commercial Scale in Rupandehi District, Nepal

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ABSTRACT

Despite being an important food and cash crop in Nepal, commercialization of potato is limited. This study was conducted to identify the determinants of farmers' willingness to grow potatoes on a commercial scale, as well as the encouraging and limiting factors, in Rupandehi district, Nepal. Employing a purposive random sampling, 120 farm households were selected from seven municipalities. Primary data were collected in 2025 through household surveys using a pretested semi-structured interview schedule, while Key Informant Interview (KII) and Focus Group Discussion (FGD) were conducted with selected participants. Descriptive statistics and a probit model were used for data analysis. The results revealed that farming experience, access to labor, landholding size and access to subsidy were key determinants that positively affected farmers' willingness to commercialize potato cultivation, while age had a negative effect. Farmers reported better market access, availability of improved seeds, higher selling prices and financial support as major motivating factors for commercialization. Similarly, farmers reported risks of crop failure, lack of capital, small landholdings and unstable prices as major barriers. Thus, the study highlights the need for targeted policy actions such as providing timely access to quality inputs, expanding financial support, stabilizing market prices and promoting collective approaches to address landholding issues to enhance farmers' involvement in commercial potato production.

Key words: Inputs, labor, landholding, market, subsidy

INTRODUCTION

The potato (*Solanum tuberosum* L.) is an important non-cereal crop, grown extensively in more than 125 countries and contributing to food security across

the globe (Bozan et al., 2023; Sahu et al., 2024). Cultivated through the terai to the high mountains in Nepal, in an area of 203,812 hectares, yielding a production of 3,487,816 metric tons and achieving a productivity of 17.11 metric tons per hectare, potato is a major food and cash crop contributing significantly to agricultural GDP, at 6.55% (MoALD, 2024).

Suitability of potato to different agro-ecological zones of Nepal has highlighted this crop for smallholder commercialization. This approach is promoted with the view to accelerate rural income growth, market participation, and structural transformation (Subedi et al., 2019; Timsina et al., 2019).

Agriculture Development Strategy of Nepal defines commercial cultivation as shift from subsistence farming towards market-oriented farming aimed at income generation. Commercialization is promoted because it helps farm household to increase farm income and improves food and nutrition security, with long term benefits of employment generation across the value chain and overall transformation of the agriculture sector into more competitive and sustainable one. The Agriculture Development Strategy highlights that to promote commercialization, enabling factors should be facilitated such as access to quality seeds, fertilizers, irrigation and mechanization, improved storage, transportation and market infrastructure. It also highlights strengthening value chains, encouraging contract farming and cooperatives, providing agricultural finance and insurance, and expanding training and extension services (MoAD, 2016).

However, commercial-scale production is limited as it is still dominated by subsistence production and integration into higher-value market channels is seen uneven across the country (Gairhe et al., 2017). Productivity has only marginally increased from 16.05 Mt/ha in 2018/19 to 17.11 Mt/ha in 2022/23 (MoALD, 2024), indicating unsatisfactory production levels (FAOSTAT, 2023). Nepal imported large quantity of potatoes to meet domestic demand for consumption and cultivation during the fiscal year 2079/80 (2022/23). Record indicates that 29,990 kg of seed potatoes, 306.6 million kg of whether fresh or chilled, and 4.4 million kg of frozen potatoes was imported (MoALD, 2024).

Despite the crop's importance and the focus on commercialization, there is limited studies that looks at both farmers' willingness to grow potatoes on a commercial scale and the various factors that encourage or hinder this across different farming environments. Addressing this gap is important for three main reasons. First, the Government of Nepal continues to prioritize vegetable value chains for growth and food security, with potatoes as a key crop. Second, fluctuations in input and

output markets increase the need for storage, market information, and risk-reduction services when making commercialization decisions. Third, new and renewed investments in improving seed systems and supporting farmer organizations need detailed, location-specific evidence to identify where the main constraints are and which strategies can most effectively increase commercial interest. In this context, the present study offers novel contributions by explicitly examining farmers' willingness to commercialize potato cultivation, rather than focusing solely on adoption or production outcomes, and by integrating econometric analysis with qualitative insights to generate comprehensive, policy-relevant evidence for promoting market-oriented growth in the potato subsector of Nepal. This includes seed system reforms, targeted extension, cooperative development, and investments in market and storage infrastructure.

MATERIALS AND METHODS

The study was conducted in Rupandehi district of Nepal, which represents the terai region. Rupandehi district is a major producer of potato, as it produces 35,945 metric tons of potatoes on 2385 hectares of land, with a productivity of 15.07 metric tons per hectare (MoALD, 2024). Rupandehi has a lot of potential for large-scale potato production because of its fertile, level ground and ideal agro-climatic conditions. To actively encourage commercial growing, the government has established a "potato zone" spanning seven municipalities in Rupandehi as part of the Prime Minister Agriculture Modernization Project (PMAMP). Within the district, the study was carried out in local bodies, namely Tilottama, Sainamaina, Shuddhodhan, Kanchan, Gaindahwa, Mayadevi, and Siyari, covering 19 wards in total which are the potato zones under PMAMP.A purposive random sampling technique was used to select 120 farmers from the PMAMP-potato zone command area. Primary data was collected using pretested semi-structured interview schedule with farm household head. Further, 5 Focus Group Discussion (FGD) were carried out with farmers in a group of 6-8 members and 10 Key Informant Interview (KII) with agriculture officer of PMAMP-PIU Rupandehi, local representatives, cooperatives and farmers group leaders, and progressive farmers. The secondary information was collected from various published sources like journal articles, and publications of the Food and Agriculture Organization (FAO), Ministry of Agriculture and Livestock Development (MoALD), Prime Minister Agriculture Modernization Project (PMAMP), National Potato Research Program (NPRP), Agriculture Knowledge Center (AKC) and other government offices. Purposive random sampling was used to focus on farmers within PMAMP-potato zone command area, which was

appropriate for capturing commercialization dynamics, this approach may limit the generalizability of the findings beyond similar contexts. Nevertheless, the method was suitable for generating in-depth, location-specific insights relevant for policy and program design.

A farmer who cultivates potatoes continuously on 0.5 ha (14.79 katha) or more, sells most of the harvest (>80%), and is linked/registered with market/processing channels or government program is termed as commercial in the study. Descriptive analysis and probit model were employed using Stata/BE 17.0 in order to determine the determinants of farmers willingness to grow potatoes on a commercial scale. The marginal effect on those variables was estimated in the probit model to assess the effect of each independent variable on the willingness.

Model specification:

$$Pr(Y = 1) = f(b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11})$$

Where,

$Pr(Y = 1)$ = Probability of willingness

X_1= Gender (dummy); X_2= Age (continuous); X_3= Education (continuous); X_4= Experience (continuous); X_5= Income (continuous); X_6= Contact (dummy); X_7= Membership (dummy); X_8= Credit (dummy); X_9= Labor (dummy); X_{10}= Land-holding (continuous); X_{11}=Subsidy (dummy)

b_0= Regression coefficient
$b_1, b_2 \ldots\ldots b_{11}$= Probit coefficient
The description of the variables used is presented in Table 1.

RESULTS AND DISCUSSION

Socio-economic and institutional characteristics of the respondents

The socio-economic and institutional characteristics of the respondents is presented in Table 1. As observed, 72.5% of respondent are willing to grow potato commercially and 73.3% of the households were headed by male. The average age of the household head was 53.10 years. On average, respondents have about 4.60 years of formal schooling. Respondents have a 29.87 years of farming

experience on average. On average, 4.32 members of family are involved in farming. Respondents on average had annual household income of NPR 203,916.70. On average, **85.8%** of the respondents have regular contact with extension workers and **87.5%** are members of farmer groups or cooperatives. Similarly, 98.3% of the respondents have access to credit and **81.6%** have access to labor. On average, respondents have 25.74 katha of total farm size, allocated for different commodities, within 3.74 katha under potato farming. On average, **76.6%** have access to subsidy.

Determinants of farmers' willingness to commercialize potato production

Determinants of farmers' willingness to commercialize potato production is presented in Table 2. Results showed that age, farming experience, access to labor, land holding and subsidy were statistically significant in the willingness to commercialize potato production. Keeping other variables constant, the probability of willingness decreases by 2.38% with increase in age by one unit, suggesting that older farmers are less likely to adopt commercial farming practices, possibly due to risks or reduced physical involvement. Result is in line with previous studies (Mdoda et al., 2023; Wakaba et al., 2022).

Table 1. Socio-economic and institutional characteristics of the respondents

Variables	Description	Mean	Standard Deviation
Dependent variable			
Willingness	=1 if the respondent report willingness, 0 otherwise	0.725	0.448
Independent variables			
Gender	Gender of the respondents (1-male, 0-female)	0.733	0.444
Age	Age of the respondent (year)	53.108	12.136
Education	Formal schooling of the respondent (year)	4.60	4.278
Involvement	Family member involved in farming (number)	4.325	3.004
Experience	Farming experience of the respondent (year)	29.875	11.413
Income	Annual income of the household (NPR)	203916.70	231540.50
Contact	=1 if regular contact with extension workers, 0 otherwise	0.858	0.350
Membership	= 1 if member in farmer's groups or agricultural cooperatives, 0 otherwise.	0.875	0.332
Credit	=1 if access to credit, 0 Otherwise	0.983	0.128
Labor	=1 if access to labor, 0 otherwise	0.816	0.388
Land-holding	Total land holding (katha)	25.741	16.918
Farm size	Area under potato farming (katha)	3.741	3.990
Subsidy	=1 if access to subsidy,0 otherwise	0.766	0.424

Similarly, probability of willingness increases by 1.92% with increase in farming experience by one unit, implying that experienced farmers are more confident and informed about commercial opportunities. Result is in line with Wubet et al. (2022).

Probability of willingness increases by 47.41% with access to labor, reflecting the critical role labor availability plays in managing commercial farming. Result is in line with previous studies (Amrullah et al., 2024; Mdoda et al., 2023; Wakaba et al., 2022). Similarly, access to subsidy increase the probability of willingness by 41.73%, highlighting that financial support significantly encourage commercialization. Result is in line with previous studies (Chauhan et al., 2022; Kalwar et al., 2024). Probability of willingness increase by 0.68% with increase in land- holding by one unit, suggesting that land size enables better scale and resource utilization. Result is in line with previous studies (Mdoda et al., 2023; Wakaba et al., 2022). Other variables such as gender, education, income, extension contact, membership and access to credit were not significant, including their limited or indirect influence in this context.

Table 2. Probit model estimation and marginal effect for determinants of willingness to commercialize potato production

Variables	Coef.	Std. Err.	p-value	dy/dx	Std. Err. (dy/dx)
Gender	0.1367	0.3833	0.721	0.0385	0.1103
Age	-0.0870**	0.0375	0.021	-0.0238	0.0098
Education	-0.0306	0.0462	0.507	-0.0084	0.0126
Experience	0.0703*	0.0379	0.064	0.0192	0.0101
Log(income)	0.0683	0.4807	0.887	0.0187	0.1319
Contact	0.9399	0.7253	0.195	0.3176	0.2733
Membership	-0.6866	0.7635	0.369	-0.1465	0.1221
Credit	-0.7850	0.9074	0.387	-0.1462	0.1012
Labor	1.3876***	0.4246	0.001	0.4741	0.1484
Land-holding	0.0250*	0.0134	0.063	0.0068	0.0035
Subsidy	1.2612***	0.4359	0.004	0.4173	0.1537
_cons	0.8977	2.5247	0.722		

Summary statistics: Number of observations=120; LR chi2 (11) =55.20; Prob >chi2 =0.0000; Pseudo R2 = 0.3911; Log likelihood = -42.9792
Note: *, **, *** indicate significant at 10%,5%,1% level of significance, respectively.

Encouraging factors for commercial expansion (among those willing)

The Table 3 shows that better market access is the most significant factor encouraging farmers to grow potatoes commercially, followed by improved seeds and inputs, and higher selling prices. These findings suggest that farmers are encouraged by consistent markets, quality inputs, and better income prospects. Availability of loans, subsidies and training on modern techniques also play important roles by reducing financial risk and improving skills. Although fewer respondents cited cooperative or contract farming, such institutional support still contributes to commercialization. This result is similar to previous studies (Chauhan et al., 2022; Gairhe et al., 2017; Kharel, 2022), which reported that the factors affecting commercialization includes access to quality seed, training and extension, market access and information, irrigation, storage and post-harvest infrastructure, financial services, and membership in farmers organization.

Reasons for not expanding potato farming

Among those unwilling, reasons for not expanding into commercial scale is presented in Table 4. The results revealed that the main obstacles to commercial potato farming are **the** risk of crop failure and lack of capital, suggesting that uncertainty and financial limitations are key concerns for farmers. Land shortage also limits expansion, particularly among smallholders. Additionally, unstable market prices **and** lack of technical knowledge further discourage commercialization.

Table 3. Encouraging factors for commercial expansion (among those willing)

Factors	Frequency (n=87)
Better market access	45
Improved seed and inputs	38
Higher selling price	36
Credit	32
Subsidies	32
Training on modern farming techniques	28
Cooperative/contract farming opportunities	19

Note: Multiple responses were allowed, so the sum of frequencies exceeds the number of respondents.

This finding is further supported by FGD, where a farmer (female, 40 years) stated, *"We know how to grow potatoes, but we don't always know the right fertilizer doses or pest management techniques."* This result is similar to previous

studies who reported major obstacles include a lack of quality seeds, delays in fertilizer supply, labor shortages, and poor market access (Subedi et al., 2019). Additionally, the absence of good post-harvest technologies, inadequate storage facilities, reliance on local collectors to set prices, and a lack of knowledge in pest management make production and marketing even more challenging (Chauhan et al., 2022).

Table 4. Reasons for not expanding potato farming (among those unwilling)

Reasons	Frequency (n=33)
Risk of crop failure	23
Lack of capital	22
Land shortage	17
Unstable market price	10
Lack of technical knowledge	6

Note: Multiple responses were allowed, so the sum of frequencies exceeds the number of respondents.

Desired support for commercial farming

Table 5 presents the desired support stated by farmers for commercial farming. Results revealed that the availability of quality inputs and institutional support such as subsidies, credit and training are desired support the farmers are expecting to grow potato commercially. This finding is similar to the previous studies (Chauhan et al., 2022; Kharel, 2022).

Table 5. Desired support for commercial farming

Type of support	Frequency
Quality/disease-free/graded seed	31
Subsidies (in general, lease-in lands, on seeds, fertilizer, irrigation)	30
Credit at low interest	30
Training	18
Fertilizer availability	12
Irrigation facilities	9
Storage support	7
Better market access	6

Note: Multiple responses were allowed, so the sum of frequencies exceeds the number of respondents.

This finding is also consistent with qualitative evidence from FGD, where a farmer (male, 45 years) stated, "Every year we face delays in getting good seed, and sometimes we are forced to plant whatever is available. If high-quality seed were supplied on time, our production would improve a lot." Similarly, KII with a local cooperative chairperson noted, "Farmers are willing to expand, but the high cost of seed and machinery discourages them. Subsidies would reduce their risk and encourage commercial farming." Similarly, a farmer (male, 50 years) during FGD stated, "Even if we grow more potatoes, where will we store them? Without storage, we are forced to sell at low prices." Similarly, KII with an agricultural officer stated, "Delay in fertilizer distribution creates a big gap between potential and actual yields." Similarly, a farmer (male, 55 years) during FGD stated, "We can grow more, but without water at the right time, it is difficult. And even if we grow, the traders decide the price, not us." Overall, both FGD and KII underscore that improving input delivery systems, strengthening subsidy and credit mechanisms, and investing in irrigation, storage, and market governance are essential to support sustained commercialization of potato farming.

CONCLUSION

The findings from the study showed that young age, experience, labor availability, larger landholdings, and subsidies were factors that influenced farmers' willingness to commercialize potato production. Improved market access, availability of improved inputs and market price seemed to be the encouraging factors for commercial production. Unstable prices, lack of capital, and small landholdings were still important constraints. To address these, policy and programs should target quality seeds on time, subsidies, and programs for improving farmers' capacity. Irrigation and storage facilities should also be invested in to reduce production risks and post-harvest losses. Moreover, improving market systems to provide stable and reliable prices would be important for encouraging continuous engagement in commercial potato production. Measure to combat land shortage should be facilitated by subsidies in lease-in or other collective methods.

SUGGESTIONS

Future studies should consider larger samples randomly selected from different agro-ecological zones, and use longitudinal or panel data. The integration of behavioral studies with value chain studies would be important to develop robust commercialization strategies.

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