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Farmers' Perspectives on Sugarcane Management in Nepal: Empirical Evidence from Logistic Regression Model

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Abstract

The majority of rural poor in this country, as in most developing countries including Nepal, is dependent upon agriculture. In spite of sugarcane is a major economic crop, Nepalese sugarcane growers are getting problem day by day. The study was undertaken to analyze the viewpoints, attitudes, and perspectives of sugarcane growers on sugarcane cultivation and management among Nepalese farmers. The cognitive behavioral theory was applied to better understand how farmers' behaviors and decision-making are influenced by their ideas, thoughts, and attitudes towards the industry. The study is based on explanatory research design and collected primary data using structured questionnaire. Following probability sampling techniques, cluster sampling is used to select 280 sugarcane farmers from at ward no. 3,8,9, and 10 of Kabilashi Municipality, a most sugarcane growers in Sarlahi. Data collection was made using kobo toolbox and observation methods. The Binary Logistic Model was used for analyzing farmers' perspectives on sugarcane management. Results indicate that (80%) sugarcane growers are not getting paid on time and in full. Similarly, the logit model revealed that farmers are well aware of sugarcane management since factors were found to be statistically significant at a desirable probability level in the logit model. The study concludes that although Nepal has a lot of potential to enhance sugarcane production, but the full potential has not yet been fully realized. In this context, the findings of this research will be beneficial for the Ministry of Agriculture, policymakers, and the government to understand the challenges and issues faced by sugarcane growers and to develop policies and solutions to address these issues.

Keywords: Farmers' perspectives; Sugarcane management; Binary logistic regression; Kobo; Sarlahi.

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1. Introduction

Nepal is a predominantly agrarian country, with agriculture being the main source of livelihood for a majority of its population. The majority of the people (65.2%) depend on agriculture for their livelihood [1], It indicates that the pressure of population on agriculture is high. Among total population 69.4% has below 1 hectare of landholders [2]. This shows that Nepali farmers fall in the category of small and marginal farmers. The population is growing at the rate of 1.35% [1] but the food production is not keeping pace with the increase in population. In such case, there is a

pressure to the government to increase food production as well as employment opportunities to the local farmers. Growing sugarcane as an agro-farming is a good option.

Sugarcane is a major cash crop in Nepal, accounting for 2.1 percent of the country's Gross Domestic Product. Sugarcane cultivation for commercial purposes is popular in the Tarai plains [3], and out of 77 districts, five (Mahottrari, Sarlahi, Rauthat, Nawalparasi and Kapilbastu) are the main sugarcane production districts of Tarai region of the country [4]. In Nepal, it is the only source of sugar raw material, which is used to make food products such as syrups, molasses, sugar, fructose, and jiggery, and also 60% of the sugar demand of the country is meet by domestic production of sugarcane. More than 0.1 million sugarcane farmers depend on sugarcane as their primary source of income. There are 14 sugar factories in operation, all of which are producing sugar [5]. In Nepal, only 60% of the country's sugar demand is met by domestic sugarcane production. Although Nepal has improved significantly over the past 53 years in terms of average sugarcane yield, it still falls well short of the world average. In addition, compared to the top three producers in the world, Brazil, China, and India [6], Nepal's production and recovery rate are lower. Since the cost of producing sugarcane and sugar is higher, there are issues such as late payments, price manipulation, labor intensive, technologies problem, consequences of change, factory capacity, and lack of scientific knowledge, and farmers not cultivating recommended seeds for a given region [7]. As a result, the government is attempting to resolve sugarcane issues through various policy initatives [8], such as price stabilization, subsidization, extension, insurance, and import substitution. To explore the opportunities and challenges of the Nepales sugarcane industry, a critical study and evaluation of existing policies, the status of sugarcane industries, and market dynamics in sugarcane is needed [3].

Sugarcane has been farmed for more than a century in Nepal, and at least three generations of farmers have contributed to its production. Due to its extensive use for family consumption and industrial purposes targeted at nutritional and economic sustenance, sugarcane is one of the most significant cash crops in Nepal [9]. The first sugar mill in Nepal was founded in 1882 at Birganj, a city in the southern Terai area, and the industry experienced a rapid expansion at the start of the 20th century, leading to the construction of numerous more mills in the Terai and other parts of the nation. These elements contributed to the crop's viability as a commercial crop for local farmers [10]. By giving sugar mill owners incentives and tax exemptions, the government additionally assisted in boosting commercial sugarcane farming. This made it a lucrative and desirable crop for farmers. Additionally, due to its favorable temperature, the Terai area of Nepal hosts the majority of the country's sugarcane farming. The Terai region provides flat, fertile soil that is excellent for mechanized farming and a good water supply, both of which are necessary for the growth of sugarcane [11]. Sugarcane, which is the world's largest cash crop, is crucial to Nepalese farmers' livelihoods as a direct source of revenue. In contrary, sugarcane farming in Nepal has been facing numerous challenges from decades such as lack of modern technology, limited access to credit, poor infrastructure, insufficient irrigation, climate change, change in temperature and rainfall patterns, soil degradation, increased pest & diseases pressure [12-14], market competition, lack of government support etc. Since economic and agricultural growth is inextricably connected, policymakers and researchers face a significant challenge in managing agricultural risks. And apart from that, Nepal has a large number of small-scale sugarcane farms with many individual farmers to generate income. Due to a lack of proper knowledge about farming and sugarcane farming profitability, farmers in Nepal are having a lot of problems during sugarcane production. Sugarcane is a valuable cash crop it helps to improve the economic condition of local [4]. In the case of the Nepalese economy, the private sector is the most dynamic and economically efficient, and this has made a significant contribution to fulfilling SDGs goals in Nepal [15].

Sarlahi district is a border district with India and various socio-cultural and economic factors in sarlahi district is influenced by realm of India. India's price policy and lower production costs have a direct impact on the Nepalese sugar industry [16]. The Fair Remunerative Price (FRP) method of sugar pricing in India takes into account manufacturers, consumers, and farmers [17]. However, the price of sugarcane in Nepal is never dependent on the actual cost of production and sugarcane quality. As a result, sugar mills are reluctant to pay the uniform price for different cane qualities, resulting in conflicts between farmers and sugar mills. Following the conflicts, major issues such as sugar mill closures and reopening, delayed and insufficient payments to farmers, factory capacity utilization, and price fluctuations emerge in the sector [18]. Regier and Redish [19], investigated effects of input factors and price policy in Nepalese sugarcane and found that there is an eminent impact of price policy, payment cycle, and production factors on sugarcane production. The failure to pay on time resulted in damages, financial hardship, a change in sugarcane cultivation, and eventually a reduction in sugarcane area and output [20]. Furthermore, these disputes have a direct effect on postharvest life, such as cane recovery rate and weight, and farmers are compelled to sell their cane below the minimum procurement price in small scale sugar processing industries that are not protected by the government's price policy. Farmers frequently suffer significant losses as a result of the time it takes for their product to reach sugar mills [4].

Several questions such as factors determining farmer’s perspectives on sugarcane masnagement, challenges/issues and managerial strategy for effective sugarcane management has been addressed by the study. Nepali sugarcane producers struggle to stay in business after being left in the lurch and in a bitter plight. Thus, the study will facilitate the development of appropriate educational programs to close the knowledge gap among farmers and to prepare them for an objective view of sugarcane management. The general objective of the study is to analyze farmer’s perspectives on sugarcane management in Sarlahi District, Nepal. The specific objectives are; to analyze the factors determining farmer’s perspectives on sugarcane management, to understand the challenges/issues towards the management of sugarcane and to recommend managerial solution for effective sugarcane management.

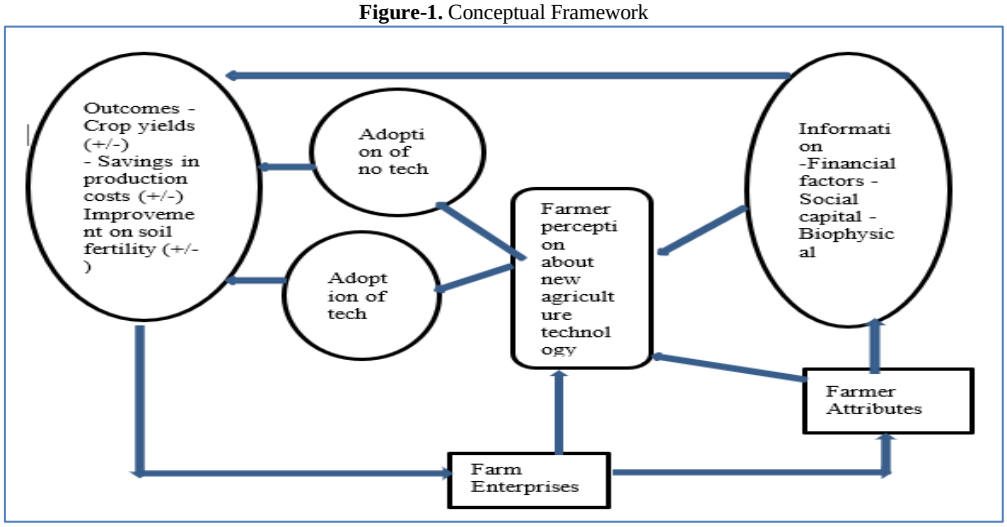
The following is the sequence of the research: After establishing a brief overview of the research's background and the conditions of the problems that enable us to lay the foundation for research assumption, we go on to defining the study's scope and formulating its objectives. Following a full explanation of the methodology and the presentation of the proposed hypotheses, the analysis and discussion of the findings of the study, together with the key conclusions drawn, are presented.

2. Materials and Methods

2.1. Conceptual Framework

Several empirical researches has been carried out across the globe, in the field of sugarcane specially focusing on low yields, high input costs, market fluctuation, soil nutrition and degradation, crop varieties and breeding, irrigation and water management etc. The existing literatue has been insightful in identifying various challenges, and issues regarding sugarcane management. Very few empirical studies has been conducted in developing countries to understand the farmer's perspective towards sugarcane management. It's a burning issue in developing countries as sugarcane farmers facing several difficulties in managing sugarcane farming. After reviewing the all theories and conceptual framework for the different literature; The Theory of Planned Behavior [21, 22], Cognitive behavioral theory [23], Contingency Management Theory [19] Theory of choice under uncertainty [24] and Theory of Reasoned Action [25]. The development of conceptual framework of the study was grounded upon a cognitive model of farmer decision making or Cognitive Behavioral Theory [19]. It focuses on how a person's thoughts, beliefs, and attitudes affect their behavior and emotions. The cognitive behavioral theory can be applied to the setting of sugarcane management to better understand how farmers' behaviors and decision-making are influenced by their ideas, thoughts, and attitudes towards the industry. Using this knowledge, interventions that aim to alter these attitudes and convictions can subsequently be created to support better sugarcane management techniques. This the reason among many other theories Cognitive behavioral theory is more suited in this study. Therefore, this study is based on Cognitive behavioral theory, following……. . The conceptual framework of the study is presented in the figure 1.

Figure-1. Conceptual Framework



Sources: Modified from Jat, *et al.* [11]

The above figure indicates the various factors that understanding the farmer perception on sugarcane management. According to the model, farmers' expectations of conservation agriculture in comparison to other farming methods or technologies influence their decision to adopt or not adopt CA. The model explains about the independent variables that can impact the intention of farmers regarding the sugarcane management. This framework was empirically examined using survey and observation in order to collect information on the behaviors, decision-making processes, and practices of sugarcane farmers in their natural setting. Several techniques such as Logistic regression, multivariate data analysis, and other perception-based model can be employed in order to empirically examine the given conceptual framework. This study follows Binary Logit Model. In this study, 13 independent variables and 4 dependent variables has to been used to examine hypothesized association.

2.2. Definitions Variable

Variables utilized in the study will be explained as follow:

Table-1. Description of the Variables

S.N.	Variable	Explanation	Expected sign
Independent variable	Age	Age, measured as a continual variable, is used as a proxy for experience in farming.	+
	Sex	Gender is used as proxy for involvement in farming operation (1= Male, 0= Female, 2= others	+
	Education	Number of years of formal education	+
	Economically active members	Proportion of household members economically active	+
	Occupation	Dummy (1= only sugarcane farming, 0= otherwise additional sources)	-/+
	Training	Training received (1 = Yes received, 0 = otherwise) (Dummy)	+
	Members Household	Number of family members involved in farming operations	+
	Income	Household income	-
	Access to credit	Have access to credit for agriculture (1 = Yes received, 0 = otherwise (Dummy)	+
	Experience in farming	The variable used a proxy to measure farmers' knowledge about farming, which is acquired over time	+
	Land size	Land size of arable land (Ha)	-
	technology	Modern technology in Sugarcane management	+
	Credit	Dummy Variable (1= if loan is taken, 0= otherwise No)	-/+
Dependent Variable	Timely payment	1 if the farmers'' get timely payment 0 = otherwise	-/+
	Effect in livelihood	1 if the payment affect farmers' livelihood 0 = otherwise	-/+
	Sugarcane Challenges	1 if there's any challenges in sugarcane cultivation 0 = otherwise	
	Decrease Motivation in Sugarcane Cultivation	1 if the sugarcane challenges decrease motivation of farmers to cultivate sugarcane 0 = otherwise	-/+

2.3. Study Area and Population

The research is based on explanatory research design. By employing a survey or interview technique to collect information from farmers on their current management practices and views regarding sugarcane cultivation, explanatory research design can be connected with farmers' viewpoints on sugarcane management. The explanatory research design was utilized to find any gaps in the farmers' comprehension of sugarcane management as well as patterns and relationships between their opinions and management practices. The study area chosen for the study is Sarlahi district which is found in province 2 of Nepal. Out of 77 districts, five (Mahottrari, Sarlahi, Rauthat, Nawalparasi and Kapilbastu) are the main sugarcane production districts of Tarai region of the country [25]. Sarlahi grows sugarcane over 26000 hectares of land, making it the largest producer in Nepal. The assembly of sugarcane is seemed to be significant within the district. The Indushankr Chini Udhog Limited Company (Indu Shankr Sugar Mills) could be a notable factory within the district [26]. The Annapurna Sugars and General Industries Private Limited Company located in Dhankaul Village Development Committee in Sarlahi, is undoubtedly one of the country's largest sugar mills. Sarlahi District consists of twenty municipalities, out of which eleven are urban municipalities and nine are rural municipalities. The survey is conducted in ward no. 8, 9, 10 & 3 of Kabilsahi Municipality which is the most sugarcane growing wards in the municipality. These selected wards cover more than 90% of sugarcane field. Total population of those ward is 3068.70 to 75% of the farmers of Kabilsahi Municipal are Sugarcane growers [27].

2.4. Sampling Procedure and Data Collection

The Cluster sampling technique was used to collect data on farmers' perspectives on sugarcane management. Firstly, by observing the government statistics, the study area (Sarlahi district) was selected on the basis of volume of production. Additionally, sampling was done with the intention of choosing municipalities and VDC that had a

higher sugarcane producing area and sugarcane farmers inside the Sarlahi district. In accordance with those criteria, the municipality of Kabilsahi was chosen. Additionally, based on focus group discussions held at the Agriculture Knowledge Center, farmers who were producing sugarcane on more than 0.16 hectares were listed for the sampling frame. A sufficient number of respondents from each ward of the Kabilsahi municipality were attained via a proportional allocation of sugarcane farmers. A complete of 280 farmers was taken as a sample. All of the farmers were willing to have interaction, thanks to their knowledge with their actual farming practices. Data was collected through questionnaire of household and household are selected on the premise of cane growers. The sample size was calculated by using the formula, n = N*X / (X + N – 1), where, X = $Z_{\alpha/2}^2$*p*(1-p) / MOE^2. And Zα/2 is that the critical value of the traditional distribution at α/2 (e.g., for a confidence level of 95%, α is 0.05 and also the critical value is 1.96), MOE is that the margin of error, p is that the sample proportion, and N is that the population size. A Finite Population Correction has been applied to the sample size formula. X = (1.96)2*0.73(1-0.73) / (0.05)2 = 303. Now, Sample size (n) = 3066*303 / (303+3066-1 = 276. Thus, sample size taken for study was 276. Further 5% sampling error was calculated and added to the number of respondents need to gather for data collection and analysis. Finally, 280 repondents were needed for this study to be representative. Thus, the interview consisted of total of 280 respondents from Sarlahi district after sample size determination (i.e., Known population). In order to collect the data, the survey was conducted during the month of April to June, 2021 using Kobo toolbox.

2.5. Data Analysis

The information gathered from the survey of sugarcane farmers was coded, entered into a Microsoft Excel spreadsheet, and examined using STATA software. Both descriptive and inferential analysis was conducted in the study.

3. Results

3.1. Socio- Demographic Characteristics

The study analyzed the socio-demographic characteristics of the respondents, including their age, gender, education, marital status, employment, and income. The majority of the respondents were male (98.57%) and the majority of them were in the age group of 41-50 (27.86%). The respondents had a range of education levels (i.e., no formal education to above master levels), with the majority being farmers. Most of the respondents were married (91.43%), and the majority of them were involved in farming (76.42%). The households were mostly joint families and had more than one member employed, with a majority earning below 20000 as monthly incomes. The study also found that the ratio of nuclear families among the respondents was comparatively lower than joint families. Overall, the results suggest that the majority of the respondents were involved in farming, had a family business in farming, and had more than one member employed in their households.

3.2. Factors Affecting Sugarcane Management

While discussing the factors affecting sugarcane management, the findings reveal that out of 280 respondents, 96.07% do not receive training regarding sugarcane management. The average land size of the respondents is 15 Katha for sugarcane management, with the minimum and maximum landholding size being below 40 katha and 161 to 200 katha, respectively. Similarly, it was also revealed that the majority of the respondents did not rent land for sugarcane management in the Sarlahi District (i.e., Out of 280 respondents, 83.57% did not rent land for sugarcane cultivation). The survey also shows that the respondents are not taking credit for sugarcane cultivation, with 81.79% not having any credit. Data reveals that out of 280 respondents, 92.14% use technology in sugarcane farming. They use different types of modern technology in sugarcane cultivation, which affects the sugarcane management. The data shows that 89.29% of the respondents use tractors in sugarcane farming, while 76.43%, 70.36%, 38.57%, and 2.5% use rotavators, cultivators, power tillers, and other equipment, respectively. There is also a difference between the farmers' experience, with the maximum number of respondents belonging to the 6-10-year experience group.

While discussing about the factors affecting sugarcane management the findings reveal that out of 280 respondents that 96.07% of the farmers don't have receiving the training regarding sugarcane management. The average land size of respondents is 15 Katha for sugarcane management. The minimum and maximum size of landholding of the respondent farmers is below 40 katha and 161 to 200 katha respectively. It is revealed that the majority of the respondent really had not rented land for sugarcane management in Sarlahi District. Out of 280 respondents 83.57% of the respondent had not rented land for sugarcane cultivation. The survey also shows that the respondents are not taking credit for sugarcane cultivation. Out of 280 respondents 81.79%respondents not had any credit. Data reveal that out of 280 respondents 92.14% of the respondents using technology to in sugarcane farming. They use different types of modern technology in sugarcane cultivation which effects the sugarcane management. The data shows that the 89.29% of the respondents uses tractor in sugarcane farming. Likewise, respondents' uses rotavator, cultivator, power tiller and others are 76.43%, 70.36%, 38.57% & 2.5% respectively in sugarcane farming. There is also difference between the farmers' experience. The data also reveals that the maximum number of respondents belongs to the experience of 6-10-year experience.

3.3. Challenges on Sugarcane Management

Sugarcane management is faced with many challenges, including low cane prices, payment uncertainty and delays, discriminatory government policies, lack of modern technologies [28], and lack of financial assistance. These challenges are caused by a variety of factors, such as sugar mills, government, society, family, individuals and

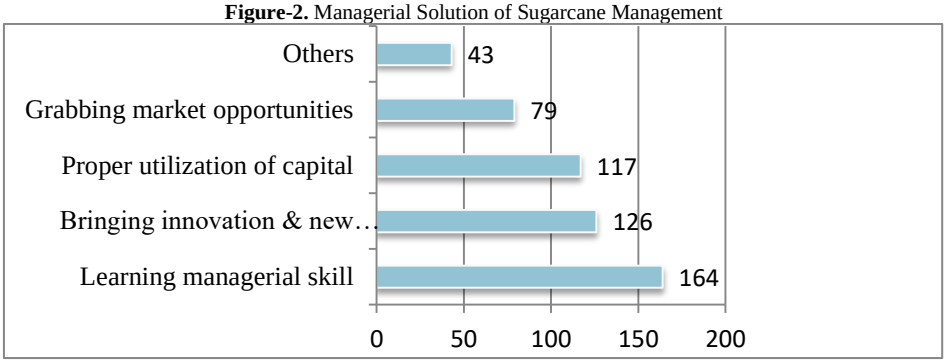
others. Other hurdles could be finding the right inputs, dealing with labor and workforce issues, or having trouble maintaining or boosting crop yields and productivity. The difficulties in managing sugarcane may also be influenced by factors like climate change [29, 30], outbreaks of pests and diseases, and changes in the structure of the global markets.

According to the data, 77.5% of the respondents stated that sugar mills are the major responsible for these challenges, while 74.29% of the respondents said that the government is responsible. Additionally, farmers reported deep dissatisfaction with sugar millers for delaying payments for sugarcane. Only 54 out of 280 respondents are receiving timely payment. The delay in payment affects farmers' daily operations as 62% of the respondents mentioned that it has an impact on their daily activities. As a result, many farmers are forced to sell their produce at very low prices because they did not receive or only received partial payments for their most recent harvest. It's vital to remember that the difficulties in managing sugarcane may differ depending on the nation, the region, and the particular crop management techniques.

3.4. Managerial Solution

Currently, there are a number of problems and challenges that must be solved in order to ensure the sugarcane industry's long-term viability. Some of the managerial solution of sugarcane management are presented in figure 2:

Figure-2. Managerial Solution of Sugarcane Management



Sources: Field Study

Sugarcane management is a complex and multi-faceted issue that requires the cooperation and collaboration of various stakeholders, including farmers, sugar mills, and government. According to a survey of 280 respondents, 91.79% of the respondents said that government is the major responsible party for improving sugarcane management. To establish a sustainable and healthy sugarcane industry, a number of concerns and obstacles must be addressed. One of the key issues is the need for better collaboration between farmers and sugar mills. The government can play a vital role in this regard by providing agricultural equipment at low-cost rates, financial support, agricultural loans at low interest rates, and by ensuring the availability of irrigation seeds and the best infrastructure for sugarcane farming. This will help to decrease the production cost of sugarcane and improve the overall management of the industry. Additionally, it is suggested that sugarcane prices should be set based on recovery rates, rather than the current weight-based method. This will ensure a fair and sustainable price for farmers in the long run, and promote the growth of the sugarcane sector as a whole.

3.5. Inferential Analysis

Diagnostic test (i.e., Pretest and Posttest) and final regression analysis was examined in inferential analysis.

3.5.1. Pre and Post Estimation Test

While examining pretest three different test was performed: i.e Specification error by hat and hatsq, Goodness of fit by lfit test and other diagnostic test by fit test. By conducting link test, we found that _hat value (i.e 0.079) was significant and _hatsq value (i.e 0.016) was insignificant. We can therefore draw the conclusion that we have selected important predictors and the variables are reliable. Likewise, the value obtained from lfit test showed the model is a good fit and provided green signal for further analysis. The value obtained from Fit-test showed that count Rsquare value is 0.864 which is above the cut-off criteria. Thus, the result obtained from Pre-test is satisfactory.

These cross-sectional data was further performed for post estimate. Post test was used to examine the heteroscedasticity and multicollinearity problems among the explanatory variables. The Variance Inflation Factor (VIF) test was employed to address the multicollinearity issue. The findings revealed that the VIF score of all the independent variables was 1.57, which was less than 10. This postulated that the dataset has no multicollinearity issues and can be further analyzed. Heteroscedasticity testing was conducted to comprehend outliers in the data set. The assumption of P-value less than 5% was not met in our study, which indicated that there is heteroscedasticity issue in the dataset. To correct this issue, we calculate Robust Standard Error. Likewise, there was no issue of normality, as the data set was greater than 30 (i.e., 280 respondents). Thus, the result of Pre and Post estimation test validated the model and boosted the confidence in the outcomes and the capacity to make predictions based on the model.

The overall mean regression of the variable is jointly important for understanding the farmers' perspectives on sugarcane management. The final regression of the study analyzed four dependent variables: sugarcane challenges,

payment, affect on daily activities, and decrease in motivation. The log likelihood was found to range between -84.231626 and -150.8561, indicating that the data is somewhat consistent with the model but not perfectly so. Similarly, the log-likelihood values were lower than anticipated, and the negative sign suggests that the fit is not ideal. The Mean VIF values were less than 10 in all models, indicating that there is no multicollinearity in the study. The "hat_" and "hat saq" values are most likely the p-values connected to the statistical test(s) used to assess the correlation between the "impact on daily activities" variable. Additionally, the hat_and hat_saq values of the dependent variable "affect on daily activities" were 0.00 and 0.778 respectively, indicating that it is statistically significant and statistically insignificant. Similarly, the total percentage goodness for all models was higher than 60% after post-estimation, confirming that the model is fit for the study. Furthermore, the value of the count R2 and Pseudo-R 2 ranged from 0.70 to 0.87 and 0.18 to 0.36 respectively, which are explained by the variables.

Logistic Regression

Variables	***Model 1*** Sugarcane Challenges		***Model 2*** Timely payment		***Model 3*** Effect in livelihood		***Model 4*** Decrease Motivation	
	Odds Ratio	Marginal Effects	Odds Ratio	Marginal Effects	Odds Ratio	Marginal Effects	Odds Ratio	Marginal Effects
sex	14.49***	0.239***	0.180	-0.168*	0.471	-0.135	14.49***	0.239***
ageinyrs	1.068**	0.00586**	0.923***	-0.00790***	0.969*	-0.00563*	1.068**	0.00586**
lev_edu	0.876	-0.0118	0.792*	-0.0229*	0.764**	-0.0483**	0.876	-0.0118
occupation	1.185	0.0152	1.407	0.0335	0.488***	-0.129***	1.185	0.0152
mem_househd	1.266**	0.0211**	0.639***	-0.0440***	0.990	-0.00184	1.266**	0.0211**
eco_act_mem	0.645**	-0.0392**	1.784**	0.0567***	0.772	-0.0464	0.645**	-0.0392**
income_mnt	1.000	1.44e-06	1.000	8.37e-07	1.000**	-4.28e-06**	1.000	1.44e-06
training	0.325	-0.101	11.78***	0.242***	1.286	0.0452	0.325	-0.101
exper_yrs	0.937*	-0.00579*	1.045	0.00434	1.018	0.00316	0.937*	-0.00579*
land_size	0.982**	-0.00163**	1.045***	0.00427***	0.996	-0.000678	0.982**	-0.00163**
tec_farm	1.119	0.0101	0.368	-0.0979	0.731	-0.0563	1.119	0.0101
credit	3.383**	0.109**	0.370*	-0.0975*	0.440**	-0.148**	3.383**	0.109**
Constant	0.0421*		28.76**		636.3***			
Observations	280	280	280	280	280	280	0.0421*	

*** p<0.01, ** p<0.05, * p<0.1

Source: Researchers' calculation from field data

Table 3 presents the logit result estimating the farmers' perspective on sugarcane management in Nepal.

Model 1: Sugarcane Challenges

In Model 1, seven variables were found to be statistically significant with our dependent variable i.e Sugarcane challenges. Such variables were Sex, Age, Members household, economically active members, Experience, Land size and credit. Among these significant variables, Sex was found to be significant at 1% level of significance, which indicated that male farmers may engage in sugarcane activities in hazardous way than female. Variables such as Age, Members household, economically active members, land size and credit were statistically significantly related at 5% level of significance. However, economically active members and land size showed negative association, which indicates that if there are economically active members in family, they may face more challenges in growing and harvesting sugarcane, as they may not have enough resource. And also if the farmers have large land

size, then they may not be able provide right sets of resources such as capital, labor, inputs etc. which ultimately leads to decrease in production. Other variable such as experience in farming showed statistical significance at 10% level of significance and had negative association, which indicates that as the experiences increase individual adaptability and continues learning towards knowledges and technologies declines creating a challenges for farmers.

Model 2: Timely Payment

Model 2 pertains to the payment related to sugarcane management and includes 280 respondents in its analysis. The results indicate that certain factors have a positive impact on the payment of sugarcane management in Nepal, such as the age of the farmer, the number of household members, the number of economically active members, training, the size of the land, and the availability of credit facilities. Conversely, other factors were found to have a negative impact on payment, such as the sex of the farmer, occupation, income, experience, and technology. Similarly, in this model there are seven independent variables that significantly impacted on the timely payment. Such variables are age, level of education, member's household, economically active members, training, land size and credit. In this model, explanatory variables such as age, member's household, training and landside were statistically significant at 1% level of significance. But age and members household showed negative association which indicates that, the probability of timely payment decreased if the farmers were not matured, and if there were only few members of family involved in sugarcane farming. Similarly, economically active active members were statistically significant at the 5% level of significance and had a positive sign. This indicated that having more people in the household who are generating income can increase the overall financial stability of the household. Likewise, level of education and credit were statistically significant at the 10% level of significance. Both level of education and credit showed negative association which indicated that farmers lacks financial literacy and negotiating power with intermediaries if they are not well educated, and lack of availability of credit source, may decrease the magnitude of farmers for their timely payment.

Model 3: Effect in Livelihood

Model 3, which examines the impact of daily activities on sugarcane management, reveals that farmers' perspectives on sugarcane management are associated with factors such as age, level of education, occupation, income, and credit. In this model, five variables were found to be statistically significant with the dependent variable (i.e., effect in livelihood). Such variables were age, level of education, occupation, income and credit. Among these significant variables, occupation was found to be significant at 1% level of significance and had a negative association. This indicates that farmers may be dependent on single crops and may be exploited by sugar mills which may adversely affect their livelihood. Likewise, level of education, income and credit were statistically significantly related at 5% level of significance and had a negative association. All the variables were found to be negative associated which indicates that lower level of education and income and limited access to credit could lead to limited access to financial resources and hinder farmer's ability to invest in their farms and improve their productivity. Similarly, other variable such as age of the farmer showed statistical significance at 10% level of significance and had negative association, which indicates that older people face physical limitation and motivation to perform physically demanding task as well as older farmers may have limited access to credit and other financial resources.

Model 4: Decreased Motivation

Additionally, Model 4 illustrates that factor such as sex, age, household members, economically active members, experience, land size, and credit facility are positively associated with decreased motivation among farmers regarding sugarcane management. In this model, seven explanatory variables were found to be statistically significant with the dependent variable (i.e., Decreased Motivation). These variables were sex, age, members household, economically active members, land size, experience and credit. In this model, sex was statistically significant at 1% level of significance and had a negative association, which indicated that gender inequality and discrimination in the workplace lead to decreased motivation of the farmers. Similarly, age, members household, economically active members, and land size were statistically significant at the 5% level of significance. Member's household and age of the farmers showed positive relationship which indicated that as the number of young households increases the level of motivation towards sugarcane farming also increase. Economically active members and land size showed negative relationship with dependent variables which means that if the family members are only engaged in sugarcane farming and not additional sources of income; there level of motivation may decrease for sugarcane farming. Also, if the farmer has large farm size, it increases the workload, decrease personal involvement, dependency on hired labor and lack of control, which leads to decreased in the level of motivation of the farmers. Similarly, other variable such as experience of the farmer showed statistical significance at 10% level of significance and had negative association, which indicates that as the years of farming increase, the motivation level of sugarcane farming decreases. This indicated that the probability of timely payment increased with the increase in the age, members household, training and land size of farmers.

4. Discussions

Sugarcane, as the world's largest cash crop, is vital to Nepalese farmers' livelihoods as a direct source of revenue [32]. Farmers were divided into groups using cluster analysis based on 12 similar criteria in their perceptions of sugarcane output. Most of the mean values were less than 1, the mean value was deemed to be greater than 0.000 "high perception." Each cluster's accurate perception of sugarcane production is summarized [31]. The study by [32] found that majority of the youths are willing to go for agricultural entrepreneur and management whereas the study revealed that in age between 41-50 participants are highly aware about the sugarcane management.

According to the households with a larger number of members are more likely to engage in farming, as larger families are thought to have more labor available for agricultural operations such as weeding, planting, and

harvesting. However, this assumption is not always correct, because labor availability is determined not just by the size of a home, but also by the ages and types of people that live there [33]. Although joint family were larger than nuclear family, the findings revealed that this did not translate to additional labor available on the farm, but rather to high levels of economic hardship in such households. These findings are in similarities with those of previous research [34] . Ridde, *et al.* [35], in their study in Zashuke, KwaZulu-Natal province found that, despite the fact that farmers' household size was larger, the proportion of economically active members was somewhat greater for non-adopters' larger household than for smaller. Sugarcane farmers cultivated larger pieces of land, had lower incomes, and had less credit, according to the study's findings.

As Daoud [36] the binary logit model's dependent variable was chosen to be the compatibility of four components in sugarcane production. Binary logistic regression used in study revealed that factors have significant impact on the sugarcane management in Sarlahi. The result from Paudel, *et al.* [37] indicates the age is a significant factor in sugarcane management. Study depicts that the variable of farmers on sugarcane management was negatively related to the likelihood of a farmer and absence of multicollinearity among the independent variables because the variance inflation factors (VIFs) for the independent variables were less than 5 [38].

Farmers will have a more positive subjective norm and perceived moral obligation [39] when they are worried about sugarcane management. The majority of sugarcane farmers in the study region are from low-income families and they are more dependent on the credit access to manage the sugarcane production challenges. To improve sugarcane production, farmers' ideas and views of new agricultural methods must be changed in farming communities. Negative perceptions are linked to a lower likelihood of sugarcane cultivation, according to the study. Positive impressions are linked to higher yields, according to the descriptive analysis [40]. Farmers must be trained in technology to increase their understanding of the procedures, particularly in locations where farmers have limited access to and exposure to formal education [12].

According to Neupane, *et al.* [41] in order to establish a sustainable and healthy sugarcane sector, various concerns and obstacles must be addressed at the time. Delays in payments have resulted in a number of negative socioeconomic consequences, including the inability to manage daily expenses, educate their children, execute marriage and other cultural rites, and meet other household obligations. Sugarcane farmers and sugar mills are mutually beneficial; one cannot live without the other. As a result, an enabling environment for the mills to operate should exist, including adequate and high-quality raw materials (sugarcane) as well as employment options for farmers in the sugar mills to grow their livelihood [42]. Furthermore, prohibiting middlemen from acquiring "receipts," paying a price when buying sugarcane, and government attempts to facilitate dialogue and agreements between sugarcane growers and sugar producers would all be beneficial [40].

5. Conclusion

The research focuses on understanding farmers' perspectives on sugarcane management in the Sarlahi District of Nepal. The goal of the study was to identify the key factors that influence sugarcane cultivation and management in the area. The specific objectives are to analyze the factors that shape farmer's perspectives, understand the challenges and issues faced by farmers and recommend solutions for effective sugarcane management. Despite its growth in recent years, sugarcane farming has not yet reached its full potential in Nepal. Factors such as the availability of sufficient land, human resources, and technological expertise are crucial in maximizing potential for sugarcane production.

Sugarcane cultivation is a vital source of income and employment for farmers, and it is a key contributor to the local economy. However, the cultivation and management of sugarcane is not without its challenges. A survey conducted in the area reveals that the main problems faced by sugarcane growers include disputes with sugar producers over the price of cane, delayed payments, and limited access to low-interest financing and discriminatory government policies. Participants in the survey criticized the government for not paying enough attention to the sugarcane industry. In order to ensure a sustainable and healthy sugarcane sector, these concerns and obstacles must be addressed. One of the major issues is the pricing mechanism of cane, which is the root of the dispute between cane growers and sugar mill owners. The average price of sugarcane in Nepal is Rs.520 per quintal, which is considered too low by the farmers. Additionally, the delay in payments is demotivating farmers to cultivate the sugarcane.

The findings of this research will be beneficial for the Ministry of Agriculture, policymakers, and the government to understand the challenges and issues faced by sugarcane growers and to develop policies and solutions to address these issues. The study can assist policymakers and the government in improving the management of sugarcane, mitigate the problems and challenges of sugarcane cultivation, provide best managerial solutions for sugarcane cultivation/management and increase farmers' livelihoods by making policies regarding payments. Overall, this study has the potential to contribute to the growth and sustainability of the sugarcane industry in the Sarlahi District.

Similarly, research on sugarcane management in Nepal provides valuable insight for new researchers in the field. The study addresses various agricultural and sugarcane management theories and uses a logistic model to examine the factors that influence sugarcane cultivation and management from the perspective of farmers. The findings of the study can assist policymakers in making informed decisions about sugarcane management and improving the livelihoods of farmers. However, it is important to note that the study only looked at one municipality in the Sarlahi district, and there are many areas that warrant further research. The study can serve as a framework for further research in different districts of Nepal and on the effects of sugarcane policy on agriculture and related sectors.

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Conflict of Interest

The authors declare no conflict of interest

Ethical Approval

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Informed consent

Informed consent was granted with the respondents before proceed the survey with them.

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