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Sustainable Interventions for Improving Food Security among Tribal Communities in Bodoland Territorial Region

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The study examined the determinants influencing food security status among the tribals of Bodoland Territorial Region, Assam. The study randomly selected 400 tribal respondents, 200 Bodo and 200 Rabha respondents. Data was collected through personal interviews and analysed using descriptive statistics, food security index and multiple linear regression. Results of the food security index depicted that about Bodo respondents (19.50%) were food secure, while (80.50%) were food insecure. Similarly, only (18.00%) of the Rabha respondents were food secure, but the remaining (82.00%) of Rabha respondents were food insecure. Further, multiple linear regression analysis revealed that employed members in the respondent's household, annual income, access to credit, and access to the Public Distribution System had a positive relationship with the food security status of Bodo respondents. However, it was found that the age of household head, family size, loss of cultivable land, indebtedness, and food grain used for liquor preparation negatively affected the food security status of the Bodo respondents. In the case of Rabha respondents, factors like employed members in the respondents' household, annual income and operational landholding positively impacted on the food security status of the respondents. In contrast, the age of the household head and family size were negatively significant to the food security status of Rabha respondents. The research suggested that nutritional security can be improved by improving family income. So, the government should emphasise non-farm income-generating activities at a household level or through SHGs and strengthen the Deendayal Antyodaya Yojana - National Rural Livelihoods Mission (DAY-NRLM) activities in BTR. Crops like millets may be introduced after sali paddy harvesting. The government should make policies for increasing crop productivity using modern agricultural production techniques and easy access to credit. The government also increased the number of beneficiaries under the Public Distribution System by changing the criteria.

Keywords: Bodo; food security; food security index; Rabha; tribe; Assam.

1. INTRODUCTION

Food is the basic need for survival. Unfortunately, even though food security has been attained in many nations, many people in the 21st century still lack nutritious food. According to the 1996 World Food Summit, EC - FAO Food Security Programme, [1] mentioned that "food security exists when all people, at all times, have physical, (social) and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life". The term 'social' was introduced in 2002 [2].

India has a self-sufficiency-focused agricultural policy [3]; however, there is a slow transition of food policy in India towards nutritional security [4]. However, the "triple effect of malnutrition" remains a serious issue in the country [5,6,7,8]. As per the Food Security Index 2023, India ranks 117th out of 125 countries [9]. The report shows that India is still lagging behind the rest of the world in its fight against food insecurity. However, there is debate on measurement tools and approaches adopted in preparing the report [10]. Even though India is now self-sufficient in food production [11,12] the country's development goal is still impeded by food insecurity [13]. They also indicated that various parts of India are under food insecure conditions. According to a review conducted by McKay et al. [14], the prevalence of food security in India ranges from 8.7 per cent to 99.00 per cent, though there were differences in methodological approaches. Before COVID-19, malnutrition and food insecurity were widely found in India, and tribes of Southern Rajasthan were severely affected by food security during the pandemic [15]. According to Ganpule et al. [13], India still faces hunger and diet quality-related issues in many areas. About 79.80 per cent of rural residents in India consume less than the recommended 2400 Kcal per day [16]. In a study, Hazarika and Singh [17] also reported that food insecurity exists in Assam.

Food security is a major problem in the state of Assam. It is also reflected through the Assam Food Security (Amendment) Rules, [18], which aims to provide food security to the most vulnerable sections of society [18]. According to the 2011 census, 33.89 per cent of people residing in rural areas and 31.98 per cent of Assam's total population were below the poverty line [19]. Rawal et al. [20] revealed that based on NSS 68th round data, states like Assam, Tamil Nadu and Gujarat had the highest level of

prevalence of undernourishment. They also reported that each state has an undernourished population of more than 45.00 per cent. There are several ethnic tribes scattered throughout the state of Assam [21,22]. As per the 2011 Census, about 12.45 per cent of the state's total population was classified as Scheduled Tribe. People from tribal groups are believed to be the most socioeconomically disadvantaged group [23,24,25,26,27]. According to Sarma [28], Assam is an inhabitant of many tribes like Bodo, Rabha, Mishing, Karbi, Dimasa, Deuri, Sonowal Kachari, Tiwa, Hajong and Garo. Due to inadequate resources, tribal people's standard of living and access to food is lower than that of non-tribal people [29,30]. Most of them struggle with food insecurity [31].

One of Assam's tribal-dominated regions is the Bodoland Territorial Region (BTR), the new Bodoland Territorial Area District (BTAD), comprising four districts comprising of Kokrajhar, Chirang, Baksa and Udalguri [32]. The BTR (erstwhile BTAD) is one of India's most underdeveloped regions [33]. According to BTC Secretariat BTR [32], the major tribes of BTR are Bodos, Rabhas, Sarania-Kachari, Modahi-Kachari, Hira, and Bania. Though many studies have been conducted on tribals of BTR in the past, little attention has been given to the food security and nutrition security status of Bodo or Rabha tribes. Therefore, the study was conducted to investigate the food security condition among selected tribes of the Bodoland Territorial Region and the determinants influencing the food security status of the respondents.

2. MATERIALS AND METHODS

2.1 Study Area

The study was Bodoland Territorial Region (BTR) of Assam, a tribal autonomous council comprising four districts. The BTR lies between 26° 7'12" N to 26° 47' 50"N Latitude and 89° 47' 40" E to 92° 18' 30" E Longitude These are Kokrajhar, Udalguri, Chirang, and Baksa [34]. The tribal communities of the BTR are mainly Bodos, Rabhas, Sarania-Kachari, Modahi-Kachari, Hira, and Bania [35].

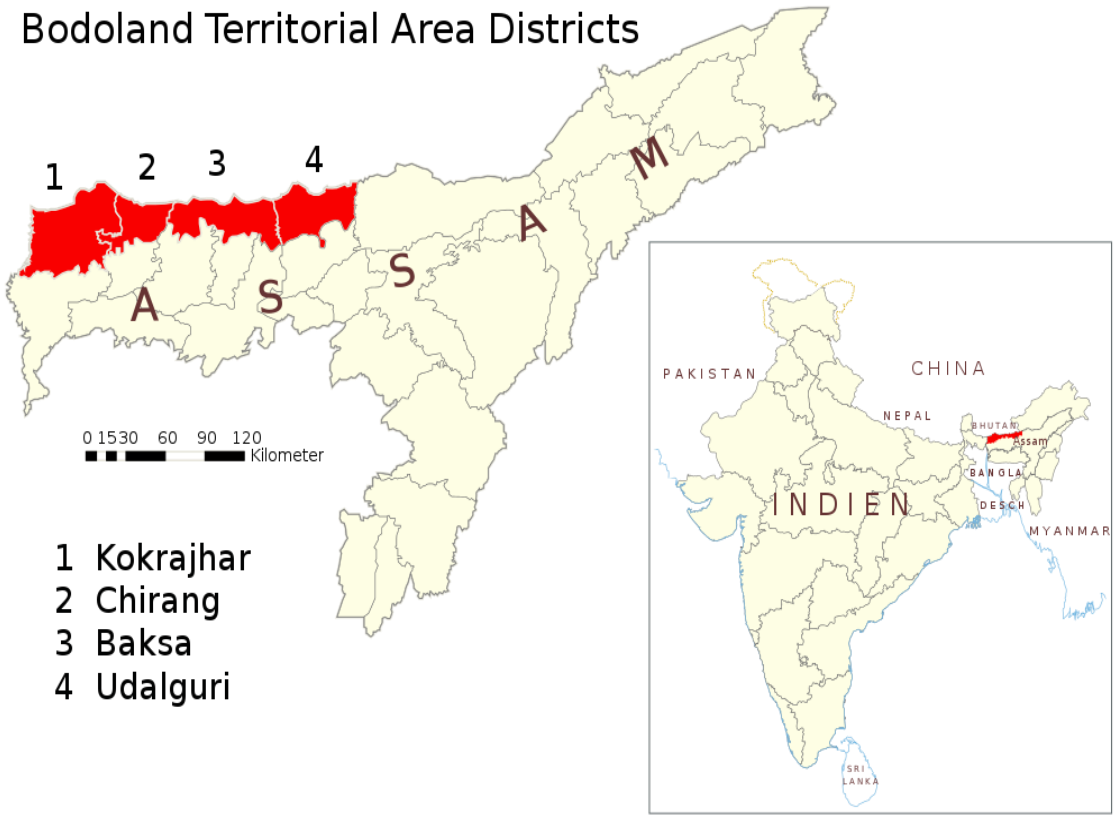

Fig. 1. Map of BTR in Assam also shows India

(Source: By Furfur - This vector image includes elements that have been taken or adapted from this file: CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=37706689)

2.2 Selection of Tribes and Sample

Two dominant tribes, Bodo and Rabha, were selected for the study. A stratified random sampling procedure was followed to select the final respondents. From the BTR, Udalguri and Baksa districts were randomly selected. From each district, two blocks were randomly selected. From Udalguri district, Udalguri and Bhergaon blocks and Baksa district, Goreswar and Tamulpur blocks were chosen randomly. Five Bodo and five Rabha villages from each block were selected randomly based on the tribal population. Thus, ten villages were selected per district. So, 20 villages from two districts were selected for the study.

2.3 Sample Size and Data Collection Tool

From each village, 10 Bodo or 10 Rabha tribe households were selected randomly. The head of each selected household was selected as the respondent. The sample size was calculated with a confidence level of 95%, a margin of error of 5%, and a population proportion of 50%, where the result was found 385 (“Sample Size Calculator,” n.d.). Finally, there were 400 tribal respondents in the sample, of which 200 were Bodo, and 200 were Rabha respondents. As the sample is collected from a limited area, findings may not be generalised on a large scale.

2.4 Data Collection Tool

Data was obtained by conducting personal interviews using a pre-tested interview schedule.

2.5 Analytical Techniques

Based on the objectives, the study used descriptive statistics, food security index and multiple linear regression for processing the data.

2.5.1 Food Security Status and Food Security Index (FSI)

Food security condition is operationalised as the respondent's current ability to obtain and have access to an adequate supply of food that is safe, nourishing, and satisfies their nutritional requirements and food preferences for an active and healthy lifestyle. For assessing the food security condition of the respondents, it is necessary to know the quantities of different foods consumed by the respondents as it indicates dietary diversity and quality of diet. In the present study, the food groups used to evaluate household dietary diversity were referred to by the U.N. Food and Agriculture Organisation (FAO). The food groups identified by FAO were cereals, pulses, vegetables, green leafy vegetables, tubers, meat/fish/egg, edible oil, milk, sugar, and fruits.

Information regarding the food consumption pattern of the respondents was collected using the 24-hour recall method. Data collection using the previous 24-hour recall method provides accurate information, as lengthening the recall period may result in some errors in information due to faulty recall [36]. The National Nutritional Monitoring Bureau (NNMB) used a 24-hour recall method for collecting nutrition-related data rather than measuring the quantities of foods over an extended period [37]. The food quantities consumed by every food item per day at the household level were converted to calories by multiplying the food items by their food energy content using the food composition tables suggested by Gopalan et al. [38]. Daily per capita calorie consumption was calculated by dividing the projected calorie supply to the household by the household size. The resulting value was again divided by the total number of adult equivalents present in the household as it provides information about each family member's contribution to the total household consumption. The use of an adult-equivalent scale is important as it is computed based on calorie requirements according to age, gender, weight, current activity level, and physiological status [39]. So, by adding the adult equivalent for each member of the household, the total number of adult equivalents of the household was obtained for every respondent with the method suggested by the National Council of Applied Economic Research and RDA as given below-

Men above 14 years- 1 adult equivalent

Women above 14 years- 0.8 adult equivalent

Children below 14 years- 0.6 adult equivalent

By observing the resulting value of per capita calories consumed per adult equivalent, the households can be differentiated into food secure or insecure by considering the recommended minimum daily calorie requirement for adults. The recommendation on calorie/energy requirement is important as it indicates overall household food security [36]. Following the

National Institute of Nutrition's recommendation, the Indian Council of Medical Research, Hyderabad, the per capita daily requirement of energy for rural areas is 2400 Kcal.

In the present study, 2400 kcal was taken as a food security line. Based on the food security line, those consuming energy of 2400 kcal per capita per day or above were considered food secure, and those consuming below the food security line were considered food insecure. Similarly, the food security index was used to evaluate the respondents' food security status.

The food security status of the respondents was evaluated using the food security index. According to the guidelines of the National Institute of Nutrition, Indian Council of Medical Research in Hyderabad [40], the daily energy needed for rural areas is 2400 Kcal per person. According to the food security line, those who consumed 2400 kcal or more energy per person per day were considered food secure, while people who consumed less were considered food insecure [41].

The food security index used in the present study was as follows-

$$Z = \frac{Households\ daily\ per\ capita\ calorie\ intake}{Recommended\ daily\ per\ capita\ calorie\ requirement}$$

Where Z = food security value.

Z < 1 denotes food insecurity in the household, whereas Z ≥1 denotes food security.

2.5.2 Multiple linear regression analysis

A multiple linear regression model was employed to investigate the factors affecting food security.

The regression model used was as follows-

$$Zi = \beta Xi + Ui$$

Where,

Zi= Food Security Index (FSI);
Xi= Vector of explanatory variables;
Ui= Error term;
β= Vector of parameter estimates.

The model was fitted in the following formula:

$$Zi = \beta_0+\beta_1X_1+ \beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6+ \beta_7X_7+\beta_8X_8+\beta_9X_9+\beta_{10}X_{10}+ \beta_{11}X_{11}+\beta_{12}X_{12}+ \beta_{13}X_{13}+\beta_{14}X_{14}+ \beta_{15}X_{15} +Ui$$

Where,

X_1 =Age of household head (Years)
X_2= Education of household head
X_3= Family size
X_4= Family type
X_5= Employed members in the respondent's household
X_6= Annual Income
X_7= Operational landholding
X_8= Food expenditure
X_9= Access to credit
X_{10}= Perceived food availability
X_{11}= Drinking water facility at home
X_{12}= Loss of cultivable land
X_{13}= Indebtedness
X_{14}= Foodgrain used for liquor preparation
X_{15}= Access to Public Distribution System

3. RESULTS AND DISCUSSION

The findings of the study are presented in the following paragraphs.

3.1 Food Security Status of Bodo Respondents

Table 1 depicts the summary of the food security status of Bodo respondents. The table shows that about one-fifth of the Bodo respondents were food secure with a food security index (Z) 1. However, 80.50 per cent of the respondents could not meet the recommended daily per capita calorie requirements of 2400 kcal and were classified as food insecure. The Food security index for food insecure respondents was 0.27. The number of adult equivalents in food secure Bodo respondents was 3.58. In food insecure respondents, the number of adult equivalents was 4.44. The findings imply that food secure households tend to have more adult members. It could contribute to their food insecurity. However, other factors could also contribute to the situation, such as income, employment and access to food [42].

The average per capita daily calorie consumption among the food secure respondents was 2401.25 kcal, within the recommended requirement. However, the average daily per capita calorie intake for food insecure Bodo respondents was 655.33 kcal, much lower than the recommended calorie requirement. The result indicates that the food insecure Bodo tribe cannot meet their daily calorie requirements, which are much lower than the recommended. The finding implies that most of the Bodo tribes

might be facing many health-related issues. According to McKay et al. [14], such issues are malnutrition, stunted growth, and other health issues. It is important to address the issue of food insecurity in the Bodo tribe and ensure they have access to adequate and nutritious food. No proper report was available about the per capita calorie intake of the Bodo tribe. So, the findings might be considered an initial report about average per capita daily calorie consumption among the Bodo tribe of BTR, Assam.

3.2 Food Security Status of Rabha Respondents

Table 2 presents the results of the food security status of Rabha respondents. Evidence from Table 2 indicates that most Rabha respondents (82.00%) were food insecure while only 18.00 per cent of them were food secure. Table 2 shows that food insecure respondents' food security index (Z) was 0.28, and 1 for food secure respondents. The result further revealed that the number of adult equivalents in food insecure and food secure respondents were 4.52 and 3.77, respectively. Food insecure respondents' per capita daily average calorie intake was 678.10 kcal, less than the minimum requirement. For food secure respondents, per capita daily average calorie intake was 2401.00 kcal. Like the Bodo tribe, the literature does not mention the specific per capita daily average calorie intake of food insecure Rabha respondents or the recommended requirement for calorie intake. As the average calorie intake of the food insecure Rabha tribe was found to be low, special steps should be taken to improve the situation.

Overall, the food security situation of the Bodo and Rabha tribes was almost similar. Works of literature also do not mention anything about the food security situation of the Bodo and Rabha tribes. Both tribes mostly suffered from food insecurity, which needs to be improved through different social safety net programmes and policies. According to Sharma et al. [43], after comparing the Indian diet with the EAT-Lancet reference diet, reported that 'average daily calorie consumption in India is below the recommended 2503 kcal/capita/day across all groups compared, except for the richest 5% of the population'.

3.3 Determinants Influencing the Food Security Status of the Selected Tribals of Bodoland Territorial Region

The results regarding the Multiple linear regression analysis on the determinants influencing the food security status of Bodo and Rabha respondents were presented in Table 3. The result depicted that in the case of Bodo respondents, the coefficient of determination (R^2) for Bodo respondents was 0.753, indicating that the determinants considered in the model explained about 75.30 per cent of changes in the food security status of the respondents. The probability of Bodo respondents being food secure or food insecure was determined by the age of the household head, family size, employed members in the respondent's household, annual income, access to credit, loss of cultivable land, indebtedness, foodgrain used for liquor preparation and access to Public Distribution System.

Table 1. Distribution of Bodo respondents according to their food security status

n_1=200

Food security indices	Food secure respondents	Food insecure respondents
Number of respondents (No.)	39	161
Percentage of respondents (%)	19.50	80.50
Food security index (Z)	1	0.27
Adult equivalent	3.58	4.44
Per capita daily calorie availability (kcal)	2401.25	655.33

Table 2. Distribution of Rabha respondents based on their food security status

n_2=200

Food security indices	Food secure respondents	Food insecure respondents
Number of respondents (No.)	36	164
Percentage of respondents (%)	18	82
Food security index (Z)	1	0.28
Adult equivalent	3.77	4.52
Per capita daily calorie availability (kcal)	2401	678.10

Table 3. Multiple linear regression analysis for determinants influencing food security status of Bodo and Rabha respondents

Variables	Bodo (n_1=200)			Rabha (n_2=200)		
	Coefficients	Std. error	*t*-value	Coefficients	Std. error	*t*-value
Constant	0.554**	0.092	6.033	0.643**	0.092	6.992
Age of household head (yrs)	-0.003***	0.001	-1.886	-0.003*	0.001	-2.245
Education of household head	-0.001	0.003	-0.279	-0.002	0.002	-0.952
Family size	-0.053**	0.010	-5.515	-0.051**	0.008	-6.582
Family type	0.063	0.049	1.282	-0.002	0.037	-0.049
Employed members in the respondent's household	0.260**	0.050	5.179	0.249**	0.037	6.790
Annual income	0.000**	0.000	5.392	0.000**	0.000	4.255
Operational landholding	0.010	0.012	0.821	0.034*	0.015	2.312
Food expenditure	0.000	0.000	0.459	0.000	0.000	1.175
Access to credit	0.056***	0.032	1.761	0.023	0.029	0.810
Perceived food availability	-0.015	0.031	-0.471	-0.027	0.055	-0.484
Drinking water facility at home	0.041	0.042	0.973	-0.027	0.025	-1.098
Loss of cultivable land	-0.043***	0.026	-1.693	-0.027	0.023	-1.132
Indebtedness	-0.070*	0.027	-2.554	-0.023	0.028	-0.818
Foodgrain used for liquor preparation	-0.059*	0.029	-2.029	-0.010	0.027	-0.391
Access to Public Distribution System	0.074*	0.032	2.269	0.035	0.028	1.259
R^2 value	0.753			0.789		
Adjusted R^2	0.732			0.771		
F value	37.102**			44.747**		

** Significant at 0.05 per cent probability level*
***Significant at 0.01 per cent probability level*
****Significant at 0.1 per cent probability level*

However, in the case of Rabha respondents, 78.90 per cent of the change in the food security status of respondents was explained by explanatory variables considered in the model. The variables like age of household head, family size, employed members in the respondents' household, annual income and operational landholding were positively significant in explaining the variation in the food security status of the Rabha respondents.

Table 3 depicted that regression coefficients of age of household head were negatively significant for Bodo respondents (b= -0.003) and Rabha respondents (b= -0.003). This indicates a negative relationship between food security status and the age of the household head. The probability of the household being food secure will decrease with the increase of age. This was because young individuals, compared to older people, tend to be more active and capable of expanding and diversifying their incomes. As the age increases, the capacity to work for off-farm jobs reduces. Indeed, aged respondents often face difficulties finding off-farm jobs, which can lead to food insecurity. The present study indicates that respondents, who were primarily elderly, cultivated paddy as sali crop. For the rest of the season, the cropland remained almost fallow. The situation can be improved by introducing crops like millet. It is a nutritious and climate-resilient crop that can be a suitable alternative for improving regional food and nutritional security [44,45]. Adopting millet cultivation in BTR by Bodo and Rabha tribes may help improve the food security status among them.

Table 3 further reveals that family size was negatively significant to the food security status of Bodo and Rabha respondents, with regression coefficients of b= -0.053 and b= -0.051, respectively. The result indicates that the more family members, the less chance the household is food secure. The most likely explanation was that demand for food would increase along with family size. The family must manage each member's consumption needs from the available resources. As the size of the family increases, expenditure will increase to match household

consumption. Bodo and Rabha respondents consisted of marginal landholding, so, they could not manage their family's food demand with limited production. A lack of employment opportunities was another reason for the respondents' limited economic access to food. The result was in line with the findings of Regmi et al. [46], who reported that larger families and higher dependency ratios in rural households increased the likelihood of food insecurity and insufficient dietary diversification.

Employed members in the respondent's household were observed to be positive and significant to the food security status of the respondents belonging to both the Bodo tribe (b= 0.260) and Rabha tribe (b= 0.249) as expected that the food security of the respondents increased with increase in employed members in the respondent's household. This was because as more family members become employed, their revenue sources will be more diverse, enabling the household to provide the family with the quality and quantity of food they require. According to Bashir et al. [47], the number of earners in the home positively impacted food security.

Table 3 also indicates that the regression coefficient of annual income was positive and statistically significant for Bodo respondents (b= 0.000) and Rabha respondents (b= 0.000). The result signifies a positive relationship between food security status and annual income. Similarly, the result indicates that since income gives the means to support a household's livelihood, food security rises with an increase in annual income. The result depicts that the family's annual income determines how much food each household can afford; thus, as income rises, households will have easier access to healthy food products in the desired quantities. As a result, the household will have food security due to the variety in consumption. The finding was consistent with Jeyarajah [48], who found that as household income rises, food security increases because more food can be produced or bought. However, the study of Ngema et al. [49] reported that household income was significant and correlated negatively with the level of food security in the home, contrary to the present study's findings.

Table 3 further reveals that the coefficient of operational landholding (b= 0.034) was positive and statistically significant to the food security situation of Rabha respondents. This means there was a positive relationship between food security status and operational landholding of Rabha respondents. It indicates that a higher operational landholding will increase the likelihood of food security. Similarly, the result indicated that more landholdings would increase production and enable the respondent to cultivate a wider variety of crops. This results in diversified food consumption, enhancing the respondent's current food security situation. Therefore, larger operational landholding or higher cropping intensity would provide more food security than smaller operational landholding. The research of Opaluwa et al. [50] conformed with the findings of this study that increased farm size, which frequently reflects the farmer's output, increases the probability of food security in the households.

Variable access to credit was another important predictor affecting food security status of Bodo respondents. Access to credit was observed to be positive and significant, with the regression coefficient being b=0.056, implying that with the increase of access to credit, food security status of Bodo respondents increases. Similarly, the result implies that if the household gets credit, they can buy various food items needed for a balanced diet. Additionally, if the household obtains credit on time, they can buy the agricultural inputs needed to cultivate crops. This will increase crop productivity and improve the household's food security. This contradicts the finding of Ngema et al. [49], who reported that households' levels of food security were significantly and negatively associated with their access to credit.

Table 3 indicates that the coefficient of loss of cultivable land (b= -0.043) was negative but statistically significant to the food security situation of the Bodo respondent. This indicates a negative relationship between the food security status of the Bodo respondent and loss of cultivable land. In other words, as the loss of cultivable land increases, the food security situation of the Bodo respondent decreases. Floods were a common problem in the study area that reduced crop output. Respondents had to deal with significant product losses each year due to flooding. Most of the respondents' croplands were affected by the flood. As a result, the respondent was unable to maintain an adequate quality and quantity of food needed to maintain a balanced diet, leading to food insecurity.

Indebtedness from Table 3 shows a negative regression coefficient (b= -0.070) and is statistically significant at a 5.00 per cent probability level in case of Bodo respondents, suggesting a negative relationship between food security status of Bodo respondents and indebtedness. Similarly, the result indicated that the likelihood of food insecurity will increase as household debt increases. This was because the household purchasing power decreased because of the increase in food product costs. Therefore, high transaction costs and interest rates may restrict credit usage and negatively impact the respondent's level of food security. The respondents obtained credit from unofficial sources to cover home consumption needs and medical costs. However, the respondent could not utilise the credit amount effectively due to the high- interest rate, which had a detrimental effect on food security. The work of Ahmed et al. [51] conformed with outcome of the research, that the level of household food security was being impeded by rising debt.

Food grain used for liquor preparation was negatively significant to the food security situation of the Bodo respondent with a regression coefficient (b= -0.059). This might be because the respondents prepared traditional liquor using foodgrain (rice), which was also the amount kept for consumption. Ultimately, it reduces their food grain for consumption. Although some respondents sold the liquor, they could not fetch higher prices as they sold it within the villages [52].

Table 3 further reveals that access to the Public Distribution System was a significant determinant of the food security status of Bodo respondents. The regression coefficient of access to Public Distribution System (b= 0.074) was found to be positively significant, depicting that with the increase in access to the Public Distribution System, likelihood of the respondents having food security will rise. This was anticipated because some respondents could not purchase enough food because of their poor economic condition. Furthermore, floods affected the staple crop paddy. As a result, having access to the public distribution system will enable the respondent to purchase food at a discounted rate, improving their current level of food security.

4. CONCLUSION

The study assessed the determinants influencing food security status among the tribals of Bodoland Territorial Region, Assam. From the findings, it could be concluded that nearly 20.00 per cent of Bodo and Rabha respondents were food secure, while the remaining 80.00 per cent were food insecure. Based on the findings, the study recommended improving the food production system among the Bodo and Rabha tribes. For that purpose, an increase in household income is necessary. For that purpose, access to accessible credit facilities, subsidy facilities, and access to the Public Distribution System needs to be strengthened. The formation and capacity building of SHGs for establishing enterprises for income generation should be emphasised by the tribes. Here, Deendayal Antyodaya Yojana - National Rural Livelihoods Mission (DAY-NRLM) can play a crucial role, so its activities should be strengthened. Through NRLM activities, the government needs to increase awareness of the nutritional value of foods and proper dietary patterns to promote healthy living. It is crucial to assist households in intensifying various non-farm income-generating activities that could boost their income and broaden their asset base. As agriculture was the main occupation of the respondents, the government should make policies that emphasise increasing crop productivity with modern agricultural production techniques. After harvesting of sali paddy, most of the field crops areas remain fallow, so crops like millet should be introduced in that area. It will increase cropping intensity, nutritional security and increase farm income.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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