RESEARCH ARTICLE

Assessment of Livelihood Security and Diversification of Tribal Dairy Farmers in NEH Region of India

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ABSTRACT

Indian economy is heavily reliant on agriculture and livestock. Approximately two-thirds of rural communities rely on livestock for their livelihood. Livestock has traditionally been an integral part of the framing community of Tripura. The rearing of cattle, pigs, poultry, and other livestock provides livelihood support to the rural masses in the state. The present study was conducted in Tripura during 20221-22 with objective to analyse access the livelihood security and livelihood diversification of the farmers practicing dairy farming. For data collection, three districts (West Tripura, Khowai, and Sepahijala) were selected by the purposive sampling method. Out of total 12 selected villages, a sample of 120 dairy farmers were chosen for primary data collection. The access the livelihood security consists of 7 sub-indicators viz. Food security, Economic security, Health security, Education security, Social security, Infrastructural security, and Institutional security. The findings of the study indicated that there is infrastructural security 78.28 per cent contributed the most to improving the overall livelihood security of farmers, whereas social security 28.33 per cent contributed the least to improve the overall livelihood security of farmers. Majority of respondents had medium 'Livelihood Diversification (67.50%) while 36.7 per cent were found in the category of low 'Livelihood Diversification'. Only 0.83 per cent of respondents in the study area were motivated to highly diversify their livelihoods. Income and land holdings were found to be significant associated variables with livelihood diversification.

***Key words :** Livelihood security; Livelihood diversification; Simpson Index; Dairy farmers; Tripura*

The livelihood comprises the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household' (*Chambers and Conway, 1992*). In recent years researchers have seen that agriculture alone cannot give enough income and employment to Indian households due to expanding population, falling land-man ratios, and increased mechanization in farm operations (*Lokhande and Parmanand, 2012)*. In this context, Livelihood Diversification, or dependence on many sources of income generation, might become one of the most essential possibilities for enhancing

farmers' livelihoods. 'Rural livelihood diversification, we are referring to the phenomenon where rural households engage in multiple activities (either on-farm or off-farm, agricultural or non-agricultural) to survive and to improve their standard of living. 'On-farm' diversification includes the introduction of new crops has a positive effect on equity in terms of income, employment, and poverty alleviation as a livelihood (*Thornton et al., 2002; Birthal and Ali, 2005*).

The Indian economy is heavily reliant on agriculture and livestock. According to the FAO, milk production in India, the world's largest producer, increased by 4.2 per cent to 192 million tons (*Anonymous,2021a*). In India, the livestock industry

contributes 4.11 per cent of GDP and 25.6 per cent of overall agriculture GDP. A total of 20.5 million people rely on livestock for their survival. Small farm households earned 16 per cent of their income from livestock, compared to 14 per cent for all rural households. Two-thirds of rural communities rely on livestock for their livelihood. It also employs approximately 8.8% of India's population (*Anonymous, 2019a*). In rural areas, livestock raising friendly use of natural resources.

Tripura is the second smallest state in the North-Eastern region of India, with a total area of 10,492 square kilometers, 60 per cent of which is mountainous and wooded. There are around nineteen tribal community with Tripuri accounting for 55 per cent of the overall tribal population. The vast majority of indigenous people live in rural regions (97.4%) (*Deka, 2011*). In Tripura, the dairy sector plays an important role in rural livelihood and provide economic and nutritional assistance to small, marginal and landless farmers. With 31 million animals and with 1450 to 1500 MT of milk per year, Tripura ranks third among India's north-eastern states in terms of overall livestock population (*Asish et al., 2021, and Anonymous, 2021b*). The rearing of cattle, pigs, poultry, and other livestock provides livelihood support to the rural masses in the state.

Furthermore, the people of Tripura have to fight several odds: geographical isolation, difficult terrain, slow development of infrastructure, lack of major industries, shrinking land availability, falling agricultural activity, high rural poverty, and low representation of women in the work force. All these factors combine to significantly lower livelihood opportunities and perpetuate poverty in the state (*Ramanuja et al.,2003*). Keeping importance of access of livelihood opportunitie particularly dairy tribal farmers,this study was aimed to measure livelihood security and livelihood diversification of tribal dairy farmers of Tripura.

METHODOLOGY

The present study was conducted in Tripura, the northeastern state of India, divided into eight districts covering 10,492 sq. km. area (*Anonymous, 2019b*). Livestock has traditionally been an integral part of the farmer's household of Tripura. For data collection, three districts (West Tripura, Khowai, and Sepahijala) were selected by the purposive sampling method. From each of the selected districts, two blocks were selected purposively and from each of the selected

blocks, two villages were selected purposively. Thus a total of 12 villages were selected for the study. For each village list of tribal livestock farmers were prepared and 10 dairy farmers were randomly selected from each village. Thus, a sample comprises 120 dairy farmers was selected for the collection of primary data. Primary data pertaining to the various parameters including socio-economic profile, food security, economic security, health security, education security, social security, infrastructural security, and institutional security, livelihood diversification etc. were collected from respondents during July 2021 to March 2022. A semi-structured interview schedule was developed. The study has been conducted under ICAR-NDRI, Karnal funded project "*Promotion of dairy farming for upliftment of socio-economic status of tribal farmers through technological interventions in NEH Region of India*". To draw significant findings and reasonable conclusions, the primary data have been organized, tabulated, and analysed using following methodologies. *Livelihood security* : "Livelihood security" defined as having sufficient income resources to satisfy fundamental necessities such as food and nutrition, health care, habitat protection, educational opportunities, and community engagement and social integration. The farmer's livelihood security was assessed by creating an index for it. The index was created by taking into consideration a variety of measures of farmer livelihood security by consulting several kinds of literature on the "Livelihood Index" (*Sullivan et al., 2006; Lindenberg, 2002*). Food security, economic security, health security, educational security, social security, institutional security, and infrastructure security were the seven indicators of livelihood security used for this study. The following formula was used to calculate the 'Livelihood Security Index' for each indicator:

$$LSi = \frac{\sum Zindj}{N}$$

Where,
LSi = Livelihood security for i[th] indicator (indicators are Food, economic, health, educational, social, institutional, and infrastructure security)
$\sum Zindj$ = Summated standardized score of all respondents for one indicator
N = Number of households covered in the study

"Livelihood Security (LS) Index" composite for all indicators was calculated by using the formula given as below:

$$LS = \frac{\sum WiHLSi}{\sum Wi}$$

Where,
LS= Livelihood Security

HLSi = Household Livelihood Security
ΣWi = Summated value of weightage of all indicators

Livelihood diversification : The "Simpson Index of Diversity" was used to assess the diversification of livelihoods of selected dairy tribal farmers of Tripura (*Simpson, 1949*).

Considering the objectives of assessing the extent of diversity in livelihood security, Simpson's Index has been used in the present study. The index provides a clear dispersion of livelihood security options among dairy tribal farmers of the study barea. The Index ranges between 0 and 1. If there exists complete specialization, the index moves towards 0 and perfect diversification if index is 1. The formula for calculating index is given below-

$$SID=1-\Sigma PI^2$$

Where ,

SID= Simpson Index of Diversity

P_I is proportion of ith activity in total the number of diversified activities

Correlation analysis between livelihood security diversification index and SE characteristics : To find out the correlation analysis between various socio-economic factors affecting livelihood security and diversification, the Spearman correlation coefficient (r) was measured.

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

Where

n= number of data points of the two variables

di= difference in ranks of the "i^{th}" element

RESULTS AND DISCUSSION

Socio-personal characteristics of respondents: The socio-personal profile of farmers helps in the understanding their social, economic, and cultural backgrounds. It could be observed from Table 1 that the majority of the respondents were (43.33%) belonged to the young age (<35 years) group followed by the middle age (36-50 years) group, and the old (>50) group respondents with 39.17 per cent, and 17.50 per cent, respectively. The similar findings were reported by *Balakrishna, (1997); Mary, (2001)*. In the context of gendermost of the respondents, 75 per cent, were male, followed by 25 per cent of females, according to the study's findings and it is in accordance with finding of *Olaoye et al. (2013)*. In the case of family type, the majority of farmers (99.17%) belonged to nuclear families, however, a small per centage of respondents (0.83%) also lived in joint families. Results show that

the majority of respondents 67 per cent had a large family (five or more individuals). Only 32 per cent of respondents had a small family (<5 individuals). This observation is comparable to that of *Ali et al., (2008)*. Concerning to educational status of the dairy tribal farmers, the majority of respondents (30.83%) had a primary level of education, followed by middle level of education (23.33%), secondary level of education (15.83%), and graduate & above the level of education (12.5%). Furthermore, 6.6 per cent of respondents were also found illiterate, whereas 10.83 per cent of respondents read and write. In the context of land holding size, the majority of respondents (88.33%) have small land holdings; 11.67 per cent have marginal land holdings, and there are no respondents with medium land holdings or large size land holdings. These finding is similar to the *Goswami and Samajdar, (2011)*.

It was found that 77.5 per cent of the respondents

Table 1. The socio-economic and socio-personal status of the dairy farmers (N=120)

Variable	Category	No.	%
Age (years)	Young(<35)	52	43.33
	Middle aged (36-50)	47	39.17
	Old(>50)	21	17.50
Gender	Male	90	75.00
	Female	30	25.00
Education level	Illiterate	8	6.66
	Read and write	13	10.83
	Primary	37	30.83
	Middle	28	23.33
	Secondary	19	15.83
	Graduate and above	15	12.50
Family type	Joint family	1	0.83
	Nuclear	119	99.17
Family size (No,)	Small	81	67.50
	Large	39	32.50
Landholding	Marginal	14	11.67
	Small	106	88.33
Farming experience	Up to 3 years	17	14.17
	Above 3 to 10 years	93	77.50
	More than 10 years	10	8.33
Annual income	Up to Rs. 50,000	0	0.00
	> Rs.50,000 to 1 lakh	53	44.17
	>Rs. 1 lakh to 1.50 lakh	51	42.50
	> Rs.1.50 lakh	16	13.33

had experience of dairy farming ranging from 3 to 10 years, 14.17 per cent had the experience less than three years and only 8.33 had an experience above ten years. These findings are consistent with *Pandey and Upadhyay, (2012).*

Concerning the annual income of the dairy farmers, 44.17 per cent respondents had annual income of between Rs. 50,000 to Rs. 1 lakh, followed by 42.50 per cent of respondents had annual income of between Rs.1 lakh to Rs.1.50 lakh, and 13.33 per cent had annual income of above Rs. 1.50 lakh.

Livelihood security : On the basis of overall 'Livelihood Security,' distribution of respondents into three categories: low, medium, and high (Table 2). Food security, economic security, health security, educational security, social security, institutional security, and infrastructural security were used to calculate an individual farmer's total score for 'Livelihood Security.' The total score for the 'Livelihood Security Index' of the respondents in the study area was calculated by multiplying each sub-indicator of Livelihood Security by its relevant weightage.

Out of 120 respondents, the majority (71.67%) had medium livelihood security, followed by 17 respondents (14.17%) had high livelihood security, and 16 respondents (13.33%) had the poor livelihood security category. These findings were consistent with *Lokhande and Parmanand, (2012)* findings, which indicated that the majority of respondents (40.00%) had medium livelihood security, followed by 37.92 per cent who had low livelihood security, and 22.08 per cent who had high livelihood security.
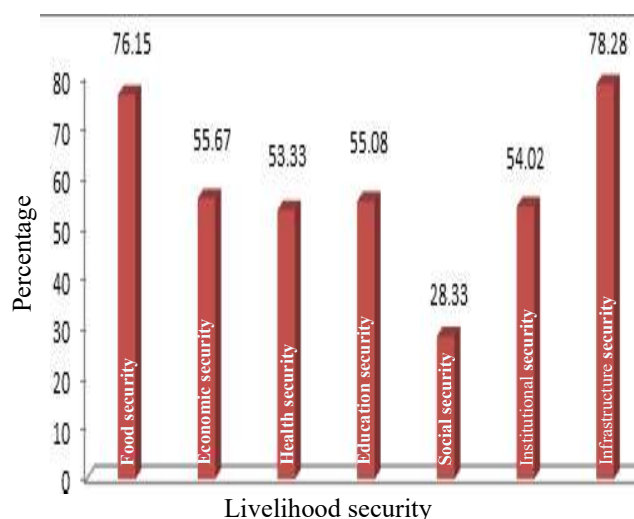
Fig.1. Per centages of different livelihood security components of dairy farmers

Table 2. Distribution of respondents on the basis of existing livelihood security in the study area

Livelihood security index	No.	%	Mean
Low (<0.60)	16	13.33	
Medium (0.60-0.70)	86	71.67	0.65
High (>0.70)	17	14.17	

Contribution of different sub-indicators to overall livelihood security of the respondents : The contribution of different various sub-indicators to the total livelihood security of the respondents of the study is depicted in Fig.1 through a diagram. Each respondent's total livelihood security was influenced by these seven sub-indicators in distinct ways. While calculating the security score for each indicator, it was discovered that infrastructure security contributes the most (78.28%) to the respondent's total livelihood security, followed by food security (76.15%), economic security (55.67%), education security (55.08%), institutional security (54.02%), health security (53.33%). Institutional security, on the other side, contributed only 28.33 per cent to the respondent's overall livelihood security. That is to suggest, that there is an imperative need to improve respondent's access to the various social standing and social involvement to improve their institutional security. Further their overall livelihood security because the various institutions in the community play a critical role in providing timely assistance and information in improving livelihood conditions. Although educational, economic, health and institutional security accounted for nearly half of the total security, there is still a need to raise this per centage of these indicators, then respondents will have sufficient livelihood security in the study area.

Livelihood diversification : Livelihood diversification, is one of the most remarkable characteristics of rural livelihoods.It is defined as "the process by which rural families construct a diverse portfolio of activities and social support capabilities in order to survive and to improve their standards of living" (*Ellis, 1998*). In the study area livelihood diversification' was measured using Simpson Index of Diversity (SID) and respondents were categorised into three groups (low, medium, and high) based SID (Table 3). It was found that the majority of dairy tribal farmers had medium livelihood diversification (67.50%) followed by low level of livelihood diversification (36.7%) and high level of livelihood diversification (0.83 %). This results suggests that a greater proportion of farmers

should be encouraged to diversify their livelihoods, relying on more than one source of income to increase their total livelihood stability. The pattern of livelihood diversification of dairy tribal farmers in the study area is presented in Fig.2. The agriculture, livestock, fisheries and non agricultural activities were livelihood opportunities available with farmers to rely for their source of income and livelihood.

Determinants of livelihood security and livelihood diversification: The correlation between various socio economic factors and the livelihood security of dairy farmers is represented in Table 4. It can be seen that there was a positive significant relationship between annual income, land holding of family and livelihood security at 1% level of significance (p<0.01), whereas correlation between the family size and livelihood securitywas found negative and significant at 5% level of significance (p<0.05). The other personal profile variables given in the table were found non-significant. It can be explained from the results that as annual income increases their livelihood security also increases.

Table 5 indicated the correlation between various socioeconomic factors and the livelihood diversification of dairy farmers. It can be seen that there are positive significant relationship between annual income, land holding of family and livelihood diversification at 1% level (p<0.01). The correlation in livelihood diversification and other socioeconomic factors were positive but non significant.

CONCLUSION

**Table 3. Distribution of respondents based on the extent of livelihood diversification in the study area (N=120)**

Livelihood diversification	No.	%	Mean
Low diversified (<0.37)	38	36.7	
Medium diversified (0.37-0.71)	81	67.50	0.46
Highly diversifies (>0.71)	1	0.83	

Table 4. Correlation analysis between various factors affecting Livelihood security

Factor	(r)
Age	0.125
Gender	0.059
Family type	0.111
Family size	-0.109
Educational qualification	0.012
Experience in Dairy farming	0.107
Annual income	0.357**
Landholding	0.336**
** Significant at 1% level of significance	
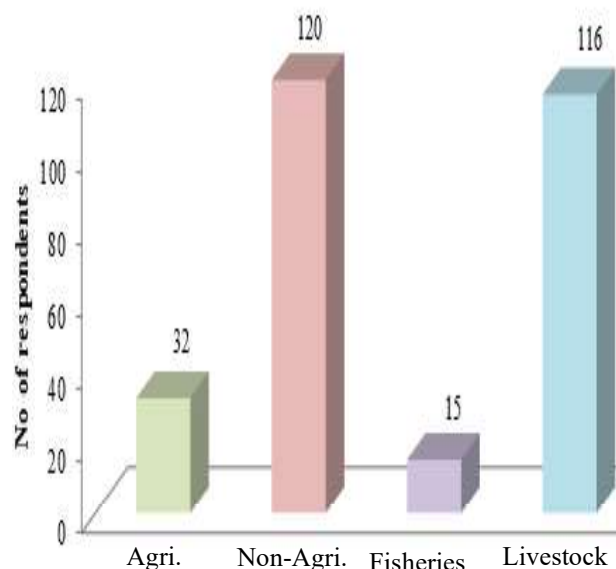
Fig. 2. Distribution of dairyrespondents into different livelihood activities

Table 5. Correlation analysis between various factors affecting Livelihood diversification

Factor	(r)
Age	0.07
Gender	0.059
Family type	0.127
Family size	0.109
Educational qualification	0.042
Experience in Dairy farming	0.106
Annual income	0.213**
Landholding	0.436**
** Significant at 1% level of significance	

It can be concluded from study that overall livelihood security of farmers in the research shows that farmers had medium (71.67%) livelihood security, followed by 14.17 per cent and 13.33 per cent farmers had the poor livelihood security. Level of diversification of livelihood indicates alternative opportunities available with farmers and it reduces risks involve with one livelihood option amd also stabilise livelihood. The result indicate that only 0.83 per cent of dairy farmers are motivated towards highest category of livelihood diversification. Farmers mostly sustain themselves through non-agricultural (labour) enterprises followed by animal husbandry being the most popular livelihood option for dairy tribal farmers in Tripura. A positive and significant relationship between annual income, land holding of family and livelihood security and family size and livelihood security was found negative and significant.

From findings of this study, it can be suggested that there is a need to improve social standing and social engagement by maintaining and participating in social networks to improve the farmers' overall degree of livelihood security of dairy farmers in Tripura state.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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