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Decadal Change in Income Diversification of Small and Marginal Farmers of Assam in Climate-Vulnerable Situations

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Authors' contributions

This work was carried out in collaboration between authors. Both authors read and approved the final manuscript.

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ABSTRACT

The cross-sectional, micro-level study was conducted to determine the changing trends of some income-related variables and income diversification in a decade among marginal and small farmers of Assam. The base years were 2010 and 2020. The number of samples was selected randomly to make it three hundred from the three districts of Assam, *viz*., Jorhat, Majuli and Golaghat. Data were collected during 2021. The data were analysed using descriptive statistics and the Simpson Index of Diversity. The findings asserted that between 2010 and 2020, landholding declined among the respondents. The average annual income of respondents also did not increase between 2010 and 2022. Respondents still preferred to stay in the joint family type. The findings show that farmers in 2020 preferred to change income sources. Many farmers' income diversification also increased, though income did not increase. The study identified that in a decade, there was a decrease in

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operational landholdings, no increase in annual income, and marginal and small farmers opted for income diversification. So, it suggested that livestock and non-farm-based income sources may be provided to improve the income of marginal and small farmers of Assam. The study suggests that the scientists and policymakers of government going for more micro-level study would help develop different policies for small and marginal farmers.

Keywords: Assam; climate-vulnerable; decadal change; farmers' income; income diversification; small and marginal farmers.

1. INTRODUCTION

As the population increases, cultivable land is decreasing, and farmers are struggling with reduced natural resources. They are facing the problem of climate change in various forms, leading to low crop productivity and farm incomes [1]. Livelihood is agricultural in rural India (Kaundal et al., 2022), [2,3]. Sustainability is important for improving rural livelihood [4,5,6]. In recent years, livelihood strategy has become central to global development policies, programmes, and practices (Allison & Horemans, 2006), [7,8]. Livelihood diversification is important for improving the economic condition of rural people [9,10]. The concept of livelihood diversification is widely discussed in the literature. One of the highly cited definitions of livelihood diversification is 'the process by which rural families construct a diverse portfolio of activities and social support capabilities to survive and to improve their standards of living' [11].

Agriculture is regarded as an essential component of rural livelihood in rural India. In India, 80 percent of total farm households are small and marginal farmers, and the operated area is around 44 percent, with significant land inequalities [12]. According to NSS Report No.587(2019), the average monthly income per agricultural household was ₹10,218.00. The report stated that most rural households (83.50% rural households) in India were marginal and small landholders possessing below 1 ha of land. The decreasing land size of most rural households compels them to search for alternative livelihood opportunities.

Assam state is situated on the northeast side of India. It is a severely flood-affected state. Predominantly, it is a rice-centric state. Small and marginal farmers are vital for the rural economy of Assam as they constitute 85.00 percent of the total farmers [13]. Due to high floods, frequent floods, drought, high and erratic rainfall, and flash floods, the agriculture of Assam is affected badly [14,15,16]. Paddy land is deteriorating with siltation in many areas, and the production and productivity of many crops are decreasing, resulting in decreased farmers' income [17,18]. It affects the livelihood of farmers, mainly marginal and small farmers of Assam. Farmers try to cope with livelihood diversification to maintain a sustainable livelihood to maintain their life.

In Assam, farming is the principal means of livelihood, involving more than seventy percent of the population. The 'Economic Survey Assam 2023-24' stated that the average land holdings of farmers of Assam is 1.10 ha [13]. It also mentioned that in Assam, 85.00 percent of farmers are small and marginal farmers with an average land holding of 0.36 ha. In the state, out of the gross cultivated area, only 5.40 percent of the area is irrigated, and the average cropping intensity of the state is 145.9 percent [19]. In Assam agriculture, the main problems are rain-fed agriculture, floods, drought in the kharif season, low farm mechanisation, mostly traditional cultural practices in paddy, poor market accessibility, etc. Irregular floods also create uncertainty in kharif cultivation. Farmers of Assam are already facing different challenges in agriculture [20,21,22].

Smallholder farmers need to be involved in other activities besides farming to improve their income [23] for better livelihood. Because of that, changes that occurred among the smallholder farmers within a decade in their profile characteristics relevant to income diversification and the changes in choice on income diversification of small and marginal farmers need to be studied to improve their standard of living. These types of study are not available for Assam conditions at a micro level, so the present study was conducted with the objectives (i) to find out the changes that occurred in some profile characteristics of small and marginal farmers in a decade and (ii) to identify the changing trend of farmers on income diversification in that decade. It is expected that from the micro survey findings, some changes in small and marginal farmers will be reflected in the income diversification aspect, which will help the development organisers' action plan.

2. METHODOLOGY

2.1 Selection of Study Area

Assam has six agro-climatic zones, out of which the Upper Brahmaputra Valley Zone was selected for the study as four highly climate-vulnerable districts of India are in the zone. These are Golaghat, Tinsukia, Dibrugarh, and Sivasagar. Of these four, the Golaghat district and two adjudging districts, namely Jorhat and Majuli. In Golaghat district, there has been no normal monsoon in the last 30 years, as reported by Express News Service and Express News Service [24] based on the state's Minister of Science, Technology and Climate Change's statement given to the assembly. The Minister also reported that Golaghat had not witnessed a normal monsoon in the last 30 years, and in 2021, a severe drought hit Assam's wet regions. The Jorhat and Majuli districts were also highly affected by flood, drought, and land erosion. As all three districts were adjusted to each other, it was assumed that the impact of climate vulnerability was likely to be felt in Jorhat and Majuli. Six villages from each district were selected randomly, considering the small and marginal farmers' populations and suitability to collect data during COVID-19. So, 18 villages from the three districts were selected for the survey. The proper selection method was not possible because the study was conducted during the COVID-19 pandemic. This is a limitation of the study as more samples are needed for generalisation of findings.

2.2 Selection of Respondents and Sample Size

The data collection was done during 2021. Considering the time, resources and COVID-19 situation compelled the researchers to reduce the sample size to some extent. A hundred respondents were selected from each district to make a total sample size of 300. The final 300 sample size was adjusted with confidence level=95%, population proportion=50% and margin of error=5.66%. This means, in this case, there was a 90% chance that the real value was within ±5.66% of the surveyed value. The respondents were small and marginal farmers, so 100 respondents were selected randomly from selected six villages in each district. The equation for calculating sample size is shown below.

$$\text{Sample size, } n = \frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2}$$

Where,
n is the sample size
z is the z score
ε is the margin of error
p̂ is the population proportion.

2.3 Selection of Variables

Based on the study objective, operational land holding (marginal/small), education level (Up to Primary school passed/Up to high school passed/Above high school passed), family type (Joint/nuclear), annual income (Rupees), extent of income diversification (SID value), option opted for alternate income sources (Yes/No) were selected for the study. Changes in variables in ten years were compared with the base year 2010 and 2020 in the cross-sectional micro survey in 2021.

In the present study, the Simpson Index of Diversity (SID) measures the extent of income diversification. This study preferred SID to the other approaches used to estimate the degree of income diversification among farm households. This index was used because it counts both the number of income sources and their proportional contribution [25]. The formula for SID is given below:

$$\text{SID}=1-\sum_{i=1}^{n} p_i^2$$

Where,
SID = Simpson Index of Diversification
n =Total number of income sources
pi =Income proportion of the ith income source

The procedure adopted by Sheyin [26] was followed in the study to classify the respondents according to the extent of income diversification, which is given Table 1.

Table 1. Classification of Income diversification

Category	Range
Specialised	0
Less diversification	>0 –($\bar{x} - \sigma$)
Moderately diversified	Between $\bar{x} \pm \sigma$
Highly diversified	> ($\bar{x} + \sigma$) - 1

3. RESULTS AND DISCUSSIONS

3.1 Changing Trend of Operational Land Holding

Table 2 revealed that in 2010, 83.00 percent of respondents were marginal, and 17.00 percent were small farmers. The findings of 2020 were also similar. It was found that in 2020, most respondents (84.00%) were marginal farmers followed by small farmers (16.00%). The table asserted that there was almost a similar percentage of marginal and small farmers in both years, indicating a decrease in landholding of the respondents in 2020. The Agriculture Census Division, Ministry of Agriculture & Farmers Welfare, Govt of India, [27] reported the average farm size of rural India in 2010-11 was 1.15 ha. It also stated that 85.00 percent of farmers had less than 2 ha of land. The average farm size was 0.512 ha in 2019, as mentioned by the National Statistical Office, Ministry of Statistics and Programme Implementation, Government of India [28]. The NSS 77th round (2018-19) reported an increase in annual income of about 8.00 percent in nominal prices and 6.00 percent in real price with base 2011-12 in the case of farmers' income (Development Intelligence Unit, 2023). It was also reported that only 37.17 per cent of income comes from cultivation. In Assam state, the average farm size in 2010-11 was 1.10 ha, which was 1.11 ha in 2005-06, indicating a declining trend as reported by the Directorate of Economics and Statistics, Government of Assam [29]. In the study area, the average land holding was also on a decreasing trend. The landholding size is critical to farmers in income diversification. As the land holdings were decreasing, there were fewer changes for income diversification through farm activities. So, there was less chance for the use of different agricultural income sources to improve the income, which resulted in the low income of the respondents in 2020.

3.3 Changing Trend of the Annual Income

Regarding the changing trend of the annual income of both marginal and small farmers, Table 3 reflected that most of the respondents (82.00%) who belonged to marginal farmers in 2010 had an annual income of range ₹ 12,000-₹1,12,459.00 whereas 77.67 percent of respondents who were marginal farmers were under the range of ₹15,000.00-₹ 1,28,999.00 during the year 2020. In the case of small farmers, about 16.00 percent of total respondents were under the range of ₹ 12,000.00-₹ 1,12,459.00 and about 13.00. percent of total respondents had an annual income range of ₹ 15,000.00-₹ 1,28,999.00. The standard deviations in both years were higher than the mean value. This indicates that the income of respondents is highly spread out from the mean, and extreme values exist. Since the mean value was towards the lower income side, it can be assumed that farmers' incomes, even in the lower category, were also highly dispersed.

The findings reflected that most marginal and small farmers had the lowest income group in 2010 and 2020. It was found that the average annual income in 2020 was increased than in 2010. According to the price index value (95.63%), in the true sense, income has not increased in the last ten years. The Situation Assessment Survey of Agricultural Households conducted by the National Statistical Office (NSO) average monthly income per agricultural household (Considering paid out expenses only) during the agricultural year July 2018 to June 2019 was ₹10,675.00 [30]. If it is compared with the findings, then, in the study areas, the monthly average income of small and marginal farmers ₹ 5542.75 in 2020, almost half of the national level. So, sample farmers faced more problems than other parts of the country to improve their income. The reason might be that no increase in land size among the respondents, which is crucial for increasing farmers' income. With a lower farm size, opportunities for income diversification are also limited. If such a situation prevailed for a decade, it might lead to low income. So, there was no increase in income among the respondents.

3.4 Changing Trend of Family Type

Table 4 revealed that regarding the changing trend of family type, 39.00 percent of the total respondents who belonged to marginal farmers had joint families in 2010, whereas this increased to 45.00 percent in 2020. Most of the marginal farmers are doing family farming [31], so in this study area, they may be preferred for joint family type because it provides more labour to them and can depend on natural resources. In the case of small farmers, the change was also negligible. So, the study showed that the majority of the small and marginal farmers of both years preferred joint families to hold their land holding. The findings are not at par with a report based on Census data given by Shaikh [32], who mentioned that in rural India, the number of nuclear families was increasing.

Table 2. Frequency and percentage distribution of respondents according to changing trend of operational land holding n=300

Category	2010		2020	
	Frequency (% among total respondents)	Mean land holding ($\bar{x}$) and Standard Deviation(σ)	Frequency (% among total respondents)	Mean land holding ($\bar{x}$) and Standard Deviation (σ)
Marginal(<1ha)	249(83.00%)	$\bar{x} = 0.69\ ha$	252(84.00%)	$\bar{x} = 0.67 ha$
Small (1-2 ha)	51(17.00%)	$\sigma = .29$	48(16.00%)	$\sigma = 0.29$
Total	300		300	

Table 3. Frequency and percentage distribution of respondents according to changing trend of annual income n=300

Annual Income category (₹)	2010			2020			
	Farmers' category	*f*	Mean annual income and standard deviation	Annual Income category (₹)	Farmers' category	*f*	Mean annual income and standard deviation
12000-112459	Marginal	246 (82.00%)	₹24190.83	15000-128999	Marginal	233 (77.67%)	₹66513.67
	Small	48 (16.00%)	(σ= ₹47901.90)		Small	39 (13.00%)	(σ= ₹91281.67)
112460-223720	Marginal	1 (0.33%)		129000-242999	Marginal	12 (4.00%)	
	Small	2 (0.67%)			Small	2 (0.67%)	
223720-334979	Marginal	0(0.00)		243000-356999	Marginal	0(0.00)	
	Small	1 (0.33%)			Small	6 (2.00%)	
334980-446239	Marginal	1 (0.33%)		357000-470999	Marginal	3 (1.00%)	
	Small	0(0.00)			Small	2 (0.67%)	
446240 & above	Marginal	1 (0.33%)		471000 & above	Marginal	1 (0.33%)	
	Small	0 (0.00)			Small	2 (0.67%)	

3.5 Changing trend of Choice for Alternative Income Sources Options

Regarding alternate income source options**,** more than half of the respondents (51.67%) who belonged to marginal farmers in 2010 thought of changing alternate income sources (Table 5). A similar trend was found even in 2020 among the marginal farmers (55.33 % of the total respondents). Even in the case of small farmers, more than fifty percent of farmers (28 respondents out of a total of 48 small farmers) in 2020 also want to change alternative income sources for income generation. Since marginal farmers' farm size is low, it is difficult for them to increase their income. They probably wanted to change their income sources to the non-farm sectors. Many smallholders want to change their income sources in different parts of the World [33,34]. The overall findings indicated that the existing income diversification of 2010 was not sufficient for the respondents to increase their income. So, most of the respondents want to change their income sources in 2020.

The result shows that respondents were using different income sources, as reflected in SID value (Table 6). However, such income diversification was not enough for economic well-being. Low farm sizes and lack of non-farm income sources may be the reasons for low income. As farmers' income was not supported by the present market price in the last ten years (2010-2020), so they might be more interested in alternative income source opportunities like migration to other states, which is a more prominent income source now in Assam.

3.6 Changing Trend of the Extent of Income Diversification

In this micro-survey, the researcher analysed the extent of income diversification of small and marginal respondents in 2010 and 2020. The extent of diversification was measured by calculating the SID value of respondents in both years.

Results were presented in Table 6, which indicated that in 2010, about 24.33 percent of the respondents had a SID value of 0. It reflected that this group of respondents depended on one enterprise for their livelihood. The result indicated that around 22.00 percent of respondents had a SID value of >0-0.28>. It was also affirmed that most of the respondents were under the SID range of 0.28>-0.56>, which indicated that about 37.33 percent of respondents were diversified. The Table also pointed out that only 16.67 percent of respondents were highly diversified (SID under the range group of > 0.56). The mean SID indicates that in most of the cases, respondents were less diversified. It may be due to fewer resources, low income, and low farm sizes.

Likewise, in 2020, about 4.33 percent of respondents had one livelihood activity with a SID value of zero (0). Around 57.00 percent of the respondents had highly diversified with SID value > 0.59 to 1, followed by SID value > 0.29-0.59> with 31.67 percent. On the other hand, only 7.00 percent of respondents had diversified with value range > 0-0.29>.

The evidence from the result stated that the average SID for the years 2010 and 2020 were 0.31 (*SD*=0.31) and 0.57 (*SD*=0.22). The table states that more than fifty percent of respondents were diversified during the year 2020 as compared to the year 2010, probably because of low income, more people tried income diversification in 2020.

Table 4. Frequency and percentage distribution of respondents according to family type n=300

Category	2010		2020	
	Marginal	Small	Marginal	Small
Joint	119 (39.67%)	18 (6.00%)	135 (45.00%)	17 (5.67%)
Nuclear	130 (43.33%)	33 (11.00)	117 (39.00%)	31 (10.33%)

Table 5. Frequency and percentage distribution of respondents according to changing trend of choice for alternative income sources options of marginal and small farmers n=300

Category	2010		2020	
	Marginal	Small	Marginal	Small
Yes	155(51.67%)	22(7.33%)	166 (55.33%)	28(9.33%)
No	94 (31.33%)	29(9.66%)	86(28.67%)	20(6.67%)

Table 6. Frequency and percentage distribution of respondents according to changing trend of extent of income diversification n=300

2010					2020				
SID value	**Marginal farmer**	**Small farmer**	**Total (%)**	**Mean and SD**	**SID value**	**Marginal farmer**	**Small farmer**	**Total (%)**	**Mean and SD**
	f and (%)	**f and (%)**				**f and (%)**	**f and (%)**		
0	59 (19.67%)	14 (4.67%)	73 (24.33%)	$\bar{x}$ =0.31	0	9 (3.00%)	4 (1.33%)	13 (4.33%)	$\bar{x}$=0.57
>0-0.28>	50 (16.67%)	15 (5.00%)	65 (21.67%)	(σ =0.24)	> 0-0.29>	13 (4.33%)	8 (2.67%)	21 (7.00%)	(σ =0.22)
0.28>-0.56>	98 (32.67%)	14 (4.67%)	112 (37.33%)		>0.29-0.59>	90 (30.00%)	5 (1.67%)	95 (31.67%)	
>0.56 -1	42 (14.00%)	8 (2.67%)	50 (16.67%)		> 0.59 -1	140 (46.67%)	31 (10.33%)	171 (57.00%)	

4. CONCLUSION

The study found that joint families did not decrease during the decade. So, it is suggested that the situation be considered at a micro level to support such people. Respondents' landholding size and income level have also not increased in ten years. As many farmers preferred to choose alternate income sources it is better to provide scope for such sources. Livestock and non-farm sectors will be suitable sources for such smallholder farmers. Though income diversification occurred in 2020, income level indicates these were unsuitable options. As the study was conducted at the micro level, it is suggested that policymakers may greater use of micro-data when developing policies.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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