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Livelihood Strategies and their Sustainability in Rural Areas of Assam, India: An Assessment through Mixed Method Approach

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ABSTRACT

Livelihood strategies are crucial for the development and well-being of rural areas. The present study used the Sustainable Livelihood Framework to study the livelihood strategies of rural households in the Lakhimpur district of Assam. It employed a mixed-methods approach, i.e., combining both quantitative and qualitative methods. Firstly, it uses the K-means clustering method to quantify livelihood strategies, specifically for income analysis. For qualitative content analysis assessing agricultural sustainability, it utilises QSR NVivo software. Data from 400 households from the nine development blocks is randomly collected. The result indicates an average level of livelihood diversification, highlighting a shift from agriculture to various non-agricultural activities, such as wage labour, non-firm business, and non-agricultural self-employment. Additionally, findings on the sustainability of agricultural activities highlight distinct challenges, including declining agricultural productivity, climate variability, soil quality degradation, and natural calamities such as floods, which affect agricultural productivity and output. Thus, livelihood diversification, climate change adaptation and institutional support are the keys to resilience in rural livelihood.

Keywords: Livelihood diversification, sustainable agriculture, rural development, climate change adaptation, mixed methods analysis

JEL Code: O13, Q12, Q15, Q18, R20

I
INTRODUCTION

Rural livelihood comprises a diverse set of livelihood activities through which the households make their living and enhance their well-being. The combination of income-generating livelihood activities that a household pursues to maintain or improve its livelihood is referred to as a livelihood strategy (Ellis, 2000). In developing countries, rural households often engage in a diverse range of income-generating activities to diversify their income base, reduce risk exposure, maintain consumption requirements in the event of shocks, and accumulate wealth (Gombordoj & Gurjav, 2022). These activities may include farming, livestock rearing, wage labour, small-scale trade, farm business, non-farm business, service, and migration, among others. These livelihood activities play a crucial role in determining the resilience and well-being of the communities. Agriculture is the mainstay of rural livelihoods, which contributes significantly to food security, economic growth, and community well-being. In India, 65 per cent of the country's population lives in rural areas, out of which 47 per cent depend on agriculture for livelihood (Press Information Bureau, 2023). However, the study reveals that the share of the agricultural sector in the country's GDP has been steadily declining,

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while the growth rates of the industrial and service sectors have increased (Parida, 2015). Choithani et al. (2021) reveal that India has witnessed a rapid increase in the rate of labour migration to urban areas and a massive shift of employment out of agriculture. This may be due to low productivity in farming and higher profits in other activities compared to agricultural output (Goswami and Ghosal, 2022). Today, the agriculture sector can no longer be relied upon as a single source of living. The primary issue affecting agriculture-dependent households is their reliance on unsustainable agricultural practices, which depend heavily on natural resources and leave them vulnerable to fluctuations in climatic variables that directly impact agricultural production and productivity. Studies show that the agriculture sector alone cannot provide a livelihood for households as they lack agricultural innovation and technologies, low income, and restricted agricultural fields, which led to issues such as immigration, insecurity, and most importantly, livelihood instability and unsustainability (Tayebnia et al., 2020; Miani and Darwish, 2022). Under such circumstances, the most suitable alternative is to adopt an alternative livelihood strategy or diversify the existing one to overcome the loss and sustain livelihood.

Livelihood diversification is a process by which households construct a diverse portfolio of activities and social support capabilities to survive and improve their standards of living (Ellis, 1998). Source reveals that rural households employ several strategies, including agricultural intensification and livelihood diversification, which enable them to fulfil their livelihood requirements and achieve food self-sufficiency (Abera et al., 2021). Further, livelihood diversification improves sustainable household well-being for lower-welfare groups (Peng et al., 2022). It increases household income and welfare, reducing poverty (Patidar and Chothodi, 2021; Thapa et al., 2018; Li et al., 2023), and leads to a secure livelihood system (Rai, 2017).

Assam is predominantly an agrarian society, with the majority of households residing in rural areas. Employment opportunities are scarce in this region, and households primarily rely on agriculture and its associated activities for their livelihoods. Moreover, the state is highly vulnerable to the impact of climate change (Mohanty and Wadhawan 2021) and has been severely affected by floods. These challenges have severely impacted the agricultural sector, and the reliance on agriculture as the primary source of livelihood has created instability in rural communities. Thus, there is a need for rural households to adopt different livelihood activities. Reardon (1997) finds that in the North-East Region, diversification of livelihood strategies may be a risk management strategy for survival, particularly when agriculture fails to provide sufficient means of livelihood. Further studies in this region show that livelihood diversification has a significant positive impact on income (Priscilla et al., 2021), but its pace is slow (Bora and Mahanta, 2022). Hence, it is essential to examine the current pattern of livelihood strategies prevailing in the study district. The primary objectives of this paper are to quantify the livelihood

strategies of rural households in terms of income and to assess the agricultural sustainability of these households.

II
METHODOLOGY

2.1 Study area

The study is conducted in Lakhimpur district, situated on the northeastern corner of Assam, on the north bank of the River Brahmaputra. It falls under the Upper Brahmaputra Valley zone and the Eastern Himalayan region. The district is one of the most backward districts in Assam and is highly prone to flooding. The climate of the districts is mostly peasant. Rainfall occurs almost throughout the year. However, high humid temperatures and exorbitant rainfall are experienced during the summer. People are poor, and agriculture is a common source of livelihood for many households; however, the agricultural sector's contribution to overall household income varies significantly across households. Besides agriculture, other common livelihood activities in the district include livestock farming, sericulture, fisheries, handicrafts, business, services, and wage employment (Upadhyai et al., 2018; Saikia, 2022).

2.2 Data

The field survey was conducted from February to May 2024. The targeted unit for the study is the rural households. A total of 400 samples is randomly collected from all nine development blocks of the Lakhimpur district. From each block, six villages — three flood-affected and three flood-free — are randomly selected to observe the diversity in livelihood options. From each village, seven per cent of the rural households are surveyed randomly to get the final sample. The questionnaire comprises both quantitative and qualitative inquiries. The quantitative section is based on detailed information about a household's socio-economic elements, including household demographic details, livelihood details such as income from livelihood activities, asset holdings, and institutional support. Further, qualitative inquiries focused on three key questions.

- Are households satisfied with their current livelihood strategy, i.e., whether their current means of livelihood is sufficient, particularly in terms of income generation and ability to meet the basic needs?
- Are they satisfied with the current living environment, i.e., how households are perceiving their surrounding environment in terms of climate conditions, resource availability, etc.?
- Do they feel that their livelihood activity, such as agriculture, is sustainable in the long term, i.e., are the agricultural practices sustainable and resilient enough to undergo the environmental and economic challenges in future?

2.3 Method

The study employed a mixed-methods approach, combining both quantitative and qualitative research methods. This research method has gained popularity in recent years, as it utilises both data in a single study, which provides stronger inferences than using either approach on its own (Creswell, 2014). For quantification of the livelihood strategies, we apply cluster analysis. It is a statistical data reduction method for summarising a large number of sample observations by assigning them to a smaller, tractable number of distinct groups or clusters of observations (Brown et al., 2006).

There are different types of cluster analysis. We use K-means cluster analysis to determine the number of livelihood clusters. It is a non-hierarchical method of grouping data. We use the household's annual income from livelihood activities as a criterion for classifying livelihood strategies, as employed by Nielsen et al. (2013). Qualitative research is a sort of study that focuses on people's personal experiences (Miani and Darwish, 2022). It is a research method used to gather in-depth understanding and insights into human behaviour, attitudes, experiences, and perceptions, aiming to explore and interpret the meanings, beliefs, and motivations underlying individuals' actions and interactions within a specific context (Limna, 2023). We apply content analysis to study the sustainability of agricultural activities in the future. It is a systematic research method that infers textual data within smaller categories based on predetermined principles in a replicable and valid manner (Es'haghi et al., 2022). This method helps researchers quantify, analyse, and interpret the meanings of specific words, themes, or concepts, and determine their relationships. We utilise QSR NVivo software for content analysis. This analysis in NVivo software involves certain processes. The first step is data preparation and importing, where interviews are compiled into Word, Excel, or PDF files and imported to the NVivo workspace. The next step is data familiarisation, where the content is reviewed to understand the basic elements. Following this, a coding framework is created by classifying concepts and generating initial codes. Initially, we extracted 20 codes from the data. These codes are refined through multiple revisions, merging similar ones to establish main themes and sub-themes. The analysis identifies three main themes and nine sub-themes, exploring patterns and relationships through visual tools like word clouds and charts. Finally, insights are interpreted, and conclusions are drawn based on the findings.

III

RESULTS AND DISCUSSION

3.1 Household characteristics and livelihood strategies

On average, the household size of the study area is 4.77. Most households are male-headed, while female-headed households account for only 10.8 per cent. This indicates that most of the economic activities taken up by households in the study

area are male-driven (Table 1). The age of household heads is an important determinant of livelihood diversification. It has been observed that the majority of the household heads fall within the age group 40-60, representing experienced and economically active individuals with greater opportunities to engage in multiple sources of income. Further, the higher percentage in older groups (60 and above) indicates that livelihood diversification is not limited to younger generations; older individuals are also diversifying their income sources while continuing traditional agricultural practices. Furthermore, the majority of household heads possess basic education, which enables them to engage in some income-generating activities and diversify their livelihoods. Additionally, the households primarily consist of nuclear families, which may influence their livelihood strategies. The socio-economic status of a household highly depends upon the extent of land it possesses. On average, the land holding size of the sampled households is 7.44 Bighas (3.025 Bighas equal to 1.00 acre). This indicates that households are mainly marginal farmers.

TABLE 1. DEMOGRAPHIC CHARACTERISTICS OF HOUSEHOLDS

Particular	Value
Average size of sample households	4.77
Distribution of the households based on the household head's gender	
Male-headed households	89.3
Female-headed households	10.8
Distribution of the households based on the household-head age group	
20- 40	18.4
40-60	51.7
60 and above	31.13
Distribution of the households based on the household head's education level	
Illiterate	16
Up to High School	40.1
HSLC (10^{th} pass)	18.8
HS 12^{th} pass	17.3
Graduate	8
Graduate and above	0.3
Distribution of the households based on family type	
Joint Family	36
Nuclear Family	64

Source: Primary Data

Table 2 shows the distribution of households by the size of their landholding. Table 2 reveals that marginal farmers are the highest, followed by small farmers, whereas medium and large-scale farmers comprise only 1.8 per cent of the households. This indicates that the households are subsistence farmers, who perform agriculture for subsistence living only. Furthermore, the households in the study area are engaged in various income-generating livelihood activities, including agricultural activities, farm business, non-farm business, wage labour, service, non-agricultural self-employment, pension, and remittances.

TABLE 2. DISTRIBUTION OF HOUSEHOLDS ACCORDING TO SIZE OF LAND HOLDING

Size Category	Percentage
Marginal (0-7.5)	69.3
Small (7.5- 15)	22.8
Semi Medium (15-30)	6.3
Medium and Large (30-75 & above)	1.8

Note: 3.025 bighas equal one acre.
Source:pib.gov.in

Figure 1 below shows the descriptive statistics of the household's primary source of income. It has been observed that wage labour and non-farm business are the primary sources of income for the majority of households, while only 22 per cent of households' primary income source is agriculture. This indicates a shift from agricultural activities to non-agricultural activities. Our results show similarity with those of Sonowal (2022), Rulu and Rahul (2022), and Marchang (2022), indicating a shifting trend from traditional cultivation to other non-agricultural activities, such as transportation and communication, retail sales and petty trades and businesses, the service sector, and weaving.

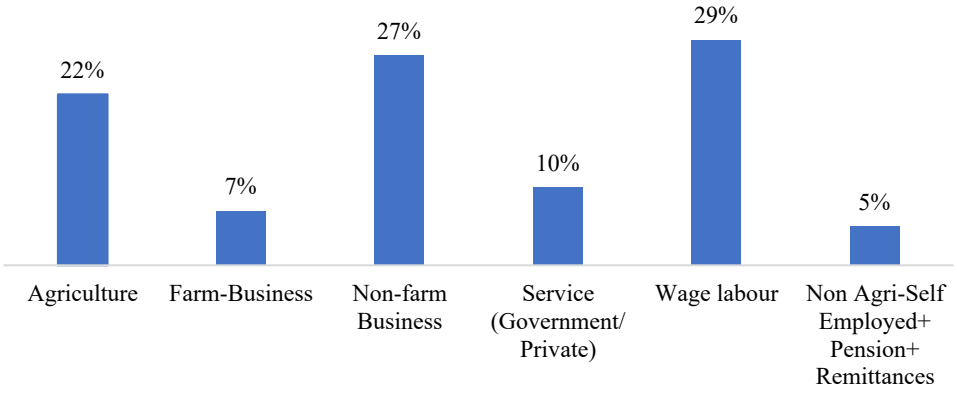

FIGURE 1. PERCENTAGE DISTRIBUTION OF HOUSEHOLDS' MAIN SOURCE OF INCOME
Source: Primary Data

Figure 2 shows that only 4 per cent of the households are solely dependent on agriculture, and the majority of the households rely on agriculture with one additional activity. This shows that households' sole dependence on agricultural activities is not enough to sustain livelihood, and they have to diversify their livelihood to attain sustainable living. This is because the households are mainly marginal farmers (Table 2). The findings show similarity with Saikia (2022), indicating that the majority of households are engaged in occupations other than agriculture.

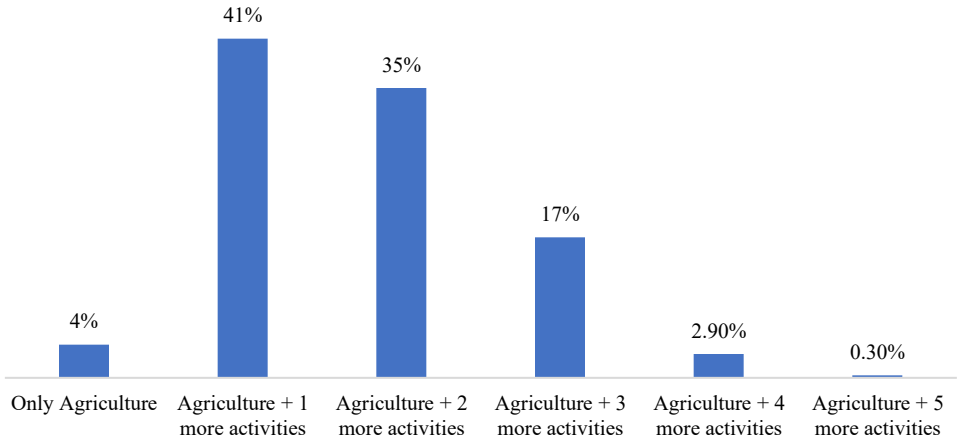

FIGURE 2. AGRICULTURE AND ADDITIONAL ACTIVITIES
Source: Primary Data

Institutional support plays a crucial role in enhancing and sustaining rural livelihoods. It encompasses a comprehensive range of policies and programs aimed at developing rural areas, improving the standard of living, and promoting economic growth.

Table 3 reveals that the beneficiaries of any farmers' scheme and the Kisan Credit Card are low in the study district, whereas the majority possess an MGNREGA job card. This is because agricultural income alone is now insufficient to sustain a livelihood. Hence, there is a limited interest in agriculture-related safety nets among households. Instead, households prefer wage labour, which is the most common source of income (Figure 1). Moreover, most households hold a ration card, which may also reduce their incentive to engage in farming. Further, the extension services are found to be very functional. Comprehensively, the institutional support indicates less involvement of households in agriculture-related safety nets, which may suggest a shift away from traditional farming practices and an increase in alternative non-agricultural activities.

TABLE 3. SOCIAL SAFETY NETS

Safety Nets	Yes (%)	No (%)
Kisan Credit Card	39	61
Beneficiary of any farmers' scheme	37.8	62.2
MGNREGA Job Card	78.8	21.2
Ration Card	89.5	10.5
Any kind of extension services	82.5	17.5

Source: Primary data

3.2 Quantification of livelihood strategies

The study categorised each household into distinct livelihood strategies using 10 livelihood income activities. These activities include crop farming income, livestock farming income, farm business income, non-farm business income, service income, waged agricultural labour income, waged non-agricultural labour income, non-agricultural self-employed income, pension income, remittance income, etc. To run k-means, standardising the data is crucial to ensure that no single income type dominates the results solely because of its larger value range. To determine the livelihood cluster, the elbow method is employed. Based on these results and common-sense checks, the grouping of 4 clusters (k=4) has been identified. Since the data was standardised, the cluster values show how each income type compares to the average. Negative values simply indicate a below-average income, not a loss. Table 4 presents the values of each livelihood activity for each of the five clusters. Each household is assigned a unique livelihood strategy based on the characteristics of its activities.

TABLE 4. LIVELIHOOD ACTIVITIES ESTIMATED VIA K-MEANS CLUSTER ANALYSIS

Clustering variables	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Sig.
Crop farming income	-0.27	0.06	1.43	-0.26	.000
Livestock farming income	-0.18	0.35	1.08	-0.20	.000
Farm business income	-0.30	-0.05	1.01	-0.18	.000
Non-farm business income	6.41	-0.32	0.00	-0.09	.000
Service income	-0.25	-0.09	0.09	-0.01	.819
Waged agriculture labour income	-0.11	10.57	-0.11	-0.07	.000
Waged non-agriculture labour income	-0.69	-0.69	-0.53	0.11	.000
Non-agri self-employed income	-0.14	-0.14	-0.06	0.01	.935
Pension income	-0.11	-0.16	0.78	-0.14	.000
Remittances income	-0.30	-0.01	0.29	-0.05	.091
Number of cases in each cluster	5	3	61	331	
Cluster name	Non-farm business	Agricultural wage labour	Mixed income earners	Non-agricultural wage labour	

Source: Primary data

The first strategy, i.e., cluster 1, is named 'non-farm business' because the non-farm business contribution is the highest and most positive to this cluster, and the contribution from other activities is very little. This cluster includes households with extremely high non-farm business income. The second strategy, i.e., cluster 2, is labelled as 'waged agriculture labour' as waged agriculture labour income dominates this cluster. Moreover, crop farming income and livestock farming income positively contribute to this cluster, but they are less in comparison to waged agricultural labour

income. The third strategy, i.e., Cluster 3, is named Mixed Income Earners. Except for agricultural wage labour income, non-agricultural wage labour income and non-agricultural self-employed income, all the other variables positively contribute to this cluster. The fourth strategy, i.e., Cluster 4, is labelled as 'waged non-agriculture labour' as it is the most dominant livelihood activity in this cluster and comprises the highest number of households. The key features that distinguish this cluster from other clusters are the highest contribution of waged non-agriculture labour income to this cluster. This indicates that waged non-agricultural work is more prevalent among households, and reliance on agriculture and other sectors is very low in this cluster. From these four livelihood clusters, it has been observed that households' dependence on agricultural activities is gradually declining, and other livelihood activities, such as wage non-agricultural labour and non-farm business, are gaining significant importance among households. This is because today agricultural activities can't be considered as a sole source of living. This indicates a diversification of livelihood and a shift in the livelihood strategies from traditional agricultural practices to non-agricultural activities. Our results align with those of Bhandari (2013), Liu and Liu (2016), Rai (2017), and Zhou et al. (2021), which indicate that the agricultural livelihood strategy is decreasing, and more rural residents are engaging in non-farming activities to obtain income and sustain their livelihoods.

Additionally, the one-way analysis of variance reveals statistically significant variation in income groups, including crop farming, livestock, farm business, non-farm business, waged agricultural labour, waged non-agricultural labour, and pension income. Following this, Bonferroni post-hoc tests are conducted to determine which specific clusters differ from each other. Appendix A (Table 1) reports the significant pairwise test results. The results confirmed statistically significant pairwise differences between clusters, particularly highlighting the dominance of non-farm business income in cluster 1, exclusive dependence of agricultural wage income in cluster 2, and cluster 3 has comparatively higher earnings from crop, livestock, farm business and pension sources compared to other clusters and cluster 4's shows dependence on waged non-agriculture labour income. These results validate that the clusters differ significantly and have distinct livelihood patterns, supporting the robustness of the k-means clustering.

3.3 Qualitative analysis of livelihood strategies

Assessing the sustainability of livelihood activities requires a comprehensive approach that considers financial stability, environmental resources and societal supports. An analysis of households' responses regarding their satisfaction with current livelihood strategies reveals that all households are satisfied with their current strategy. They believe these strategies enable them to sustain their living and achieve self-reliance. However, differences of opinion are observed regarding their current living environment, as illustrated in Figure 3.

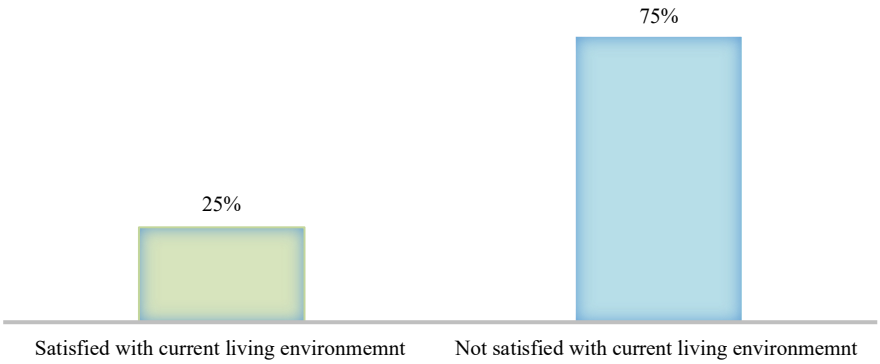

FIGURE 3. HOUSEHOLD'S PERCEPTION OF CURRENT LIVING ENVIRONMENT
Source: Primary Data

Figure 3 shows that the majority of households are dissatisfied with their current living environment due to perceived environmental changes. These changes are due to climate factors, such as rising temperatures, unusual weather patterns, and erratic rainfall, which are affecting their livelihood. Additionally, households believe that technological developments and infrastructure establishments are quite responsible for the degradation of the natural environment, which directly affects farming activities and related livelihoods. Sustainable agricultural practices are crucial for sustainable living. It fosters future food security, generates employment opportunities and improves community living. It relies on good climatic conditions and healthy environmental conditions. However, the pressing issues of climate variation and environmental degradation threaten sustainable practices in the long term. Thus, to assess the sustainability of future agriculture practices, the present study used content analysis. The result shows various factors that challenge the sustainability of agricultural activities, which are presented in Table 5.

Table 5 presents the main themes and sub-themes related to the sustainability of livelihood activities, with a particular focus on agriculture. It identifies the challenges and probable outcomes for sustaining agricultural practices. This analysis highlights the struggle of ensuring sustainable agriculture in the long term, as challenges such as land loss, soil degradation, and a changing climate pose significant threats to agricultural practices. However, by implementing scientific and sustainable practices, long-term agricultural sustainability could improve. Additionally, uncertainties among stakeholders highlight the need for increased awareness of sustainable agricultural practices. A word cloud is a representation of text data, where words are displayed in different sizes based on their frequency of occurrence in the data (Limna, 2023). The word cloud in Figure 4 visually represents the frequency and importance of words related to the sustainability of agricultural practices in the future. It also provides insights into their relationships and interactions.

TABLE 5. THEMES AND SUB-THEMES ABOUT SUSTAINABILITY OF FUTURE LIVELIHOOD ACTIVITIES

Main themes	Sub-themes	Concepts
Unsustainable	Agricultural land loss due to construction, population pressure, and flooding.	Infrastructure constructions such as roads, railways, and towers in agricultural fields can lead to land loss. The increasing population leads to a decline in agricultural land as people build houses and other establishments on previously agricultural land. Further, natural calamities such as floods also lead to loss of agricultural land.
	Agriculture production decline	Declines in soil quality, climate variability, and the excessive use of chemicals in agriculture are leading to a decrease in agricultural production.
	Climate variability	Changes in temperature and rainfall
	Expensive agricultural inputs	High prices of quality seeds, machinery, and equipment, as well as chemical fertilisers, etc.
	Less interest by the younger generation	Lack of interest and practice by the next generation in agriculture.
	Machine use and reduced yield	The use of machinery, such as a tractor, leads to a reduction in crop yield as the soil structure becomes compacted, which limits the growth of roots.
	Soil fertility loss	Decline in soil quality due to excessive use of chemical fertilisers, machinery, etc., leads to a decrease in agricultural productivity.
Sustainable	Sustainable but less production	Agricultural activities will be sustainable in the future, but changes in climate conditions and loss of soil quality lead to reduced crop production.
	Sustainable with proper measures	Agricultural activities will be sustainable if proper sustainable measures are undertaken. Practice agriculture scientifically by combining traditional methods with modern approaches, taking into account local climate conditions, the proper use of fertilisers, irrigation facilities, and pesticides. Further, control natural calamities such as floods, etc.
Uncertain about sustainability	Not sure whether agricultural practices will be sustainable or not in future.	

Source: Primary data

FIGURE 4. WORLD CLOUD OF ALL THEMES
Source: Primary data

The word cloud highlights prominent terms such as "unsustainable," "sustainable," "production," "declining," "agriculture," "climate," "changing," "rainfall," "fertility," "productivity," "flood," "temperature," and "crops." The term 'unsustainable' appears most frequently in the context of future agricultural sustainability. This suggests that the majority of households believe agricultural activities may not be sustainable in the future. Other prominent words reflect various factors directly or indirectly influencing agricultural sustainability. Comprehensively, the word cloud depicts significant concerns, such as declining production, climate variability, loss of land fertility, and flood impacts, which threaten sustainable agricultural practices in the future. These findings align with Shalaby et al. (2011), who identified degradation of natural resources, environmental challenges, population growth, outdated cultivation techniques, inadequate marketing information, poverty, and institutional constraints as key challenges to sustainable agricultural development.

The graphical representation of the three main themes (Figure 5) illustrates concerns about future agricultural practices.

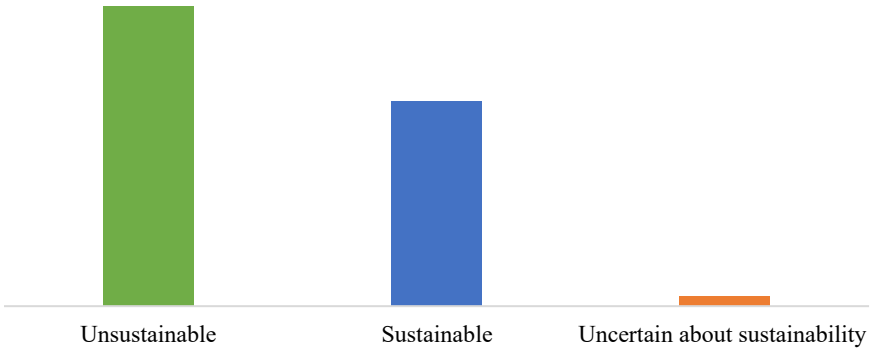

FIGURE 5. MAIN THEMES REGARDING THE SUSTAINABILITY OF AGRICULTURAL ACTIVITIES
Source: Primary data

Figure 5 shows that the majority of the households perceived the unsustainability of agricultural practices in future. This may be due to the influence of factors such as climate variability, soil fertility degradation, production decline and other issues (Figure 6). However, a significant portion of the data reflects sustainability in agriculture by implementing scientific and sustainable methods, along with institutional support and policies, to address the unsustainable challenges in agricultural practices.

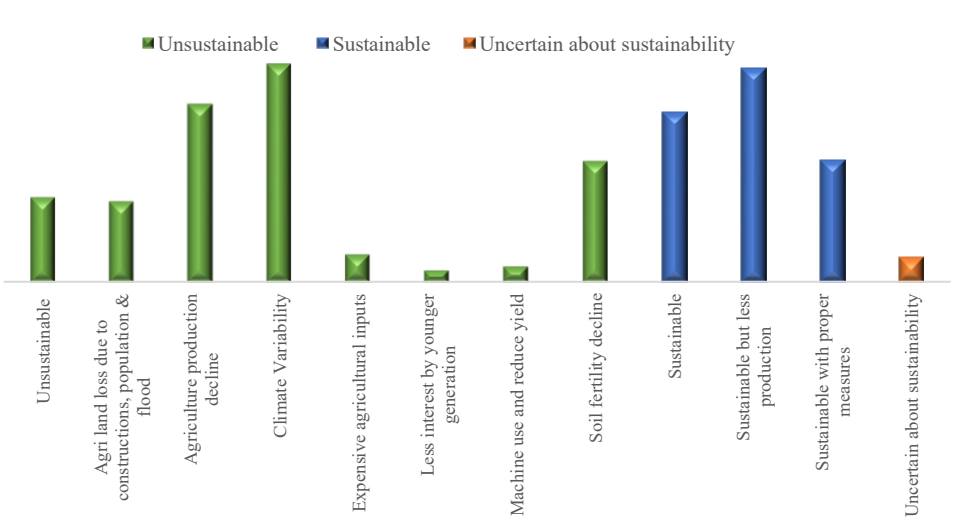

FIGURE 6: GRAPHICAL REPRESENTATION OF ALL THEMES REGARDING THE SUSTAINABILITY OF AGRICULTURE ACTIVITIES
Source: Primary data

Figure 6 illustrates the graphical representation of the three main themes and their sub-themes related to agricultural practices and sustainability in the future. The findings highlight significant concerns regarding the unsustainability of current agricultural practices. Under the unsustainable category, the primary issue is climate variability (changes in temperature and rainfall), which significantly affects agricultural activities and production. A significant decline in agricultural production and loss of soil fertility also have considerable impacts on agricultural sustainability. Additionally, agricultural land loss due to infrastructural development, population pressure, and floods also contributes to the decline in land availability and agricultural sustainability. The high cost of agricultural inputs (seeds, fertilisers, pesticides, machinery, and equipment) is also imposing a financial burden on farmers. However, factors such as mechanisation and reduced yields, as well as less interest among the younger generation, show comparatively less concern. These results align with studies by Deshpande (2017) and Das et al. (2020), which identified climate change, shrinking land holdings, dependence on monsoons, irrigation challenges, soil nutrient imbalances, and population growth as key issues impacting agricultural productivity.

Under the sustainable category, the most prominent sub-theme is 'sustainable but less production', which highlights that agriculture may remain sustainable, but production levels are expected to decline due to climate variability, loss of soil quality, and flood conditions, among other factors. The second sub-theme, sustainability through proper measures, suggests that implementing appropriate institutional measures and sustainable practices can ensure agricultural sustainability and future production. Thus, addressing unsustainable elements with appropriate measures is necessary to attain sustainable agricultural practices with ideal productivity.

IV

CONCLUSION

The study highlights a substantial shift in rural livelihoods, moving away from traditional agriculture towards wage labour, non-farm businesses, and non-agricultural self-employment. This move may be a result of inadequate agricultural income to sustain livelihoods, as agriculture in the district is small-scale in nature and institutional support for agriculture is limited. Most households are incorporating agriculture with other non-agriculture income-generating activities, reflecting average livelihood diversification. Moreover, the future sustainability of agricultural activities faces distinct challenges, as the majority of households perceive agriculture as gradually unsustainable due to factors such as climate variability, soil quality degradation, and decline in productivity. Despite these challenges, some households perceived the prospects for sustainable agriculture as promising if suitable institutional and sustainable measures were undertaken. Thus, to secure sustainable livelihoods, sustainable farming practices, climate adaptation strategies, and improve

institutional support are essential. Hence, it can be concluded that diversification is essential for resilience and a balanced sustainable livelihood strategy for rural households.

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