***Original Research Article***

**Sustainability of Agriculture in a North-Eastern Indian Village: Findings from a Micro- Level Study**

**ABSTRACT**

Based on the primary data, the study was conducted in the Potsangbam village of Manipur, India. The village was selected purposively, and information from all the 683 households was collected by using a complete village census approach method with the help of a pre-tested, well-structured schedule during the year 2020-21. With an average operational holding of 0.6 acres, the data shows that majority of the households were landless and marginal farmers. Although the agricultural transformation is in the early stages, the study also revealed that the farm sector in the village is gradually transitioning from traditionally low-income farming to commercialized, driven by crop diversification and technological adoption. However, small operational holding due to land fragmentation impended the adoption of modern farming practices and reduced the economies of scale and, thus employment opportunity and farm income in the whole village economy. Comprehensive policies that emphasize improving rural infrastructures, expanding access to resources and markets, promoting sustainable farming practices and improved technologies, and providing extension and training services are required. In addition, policies that support income diversification, land consolidation, and rural development can help to tackle these issues and build a more resilient and robust farm sector in the village economy.

**Keywords:** Village,Farm sector, Marginal farmers, Employment, Income diversification

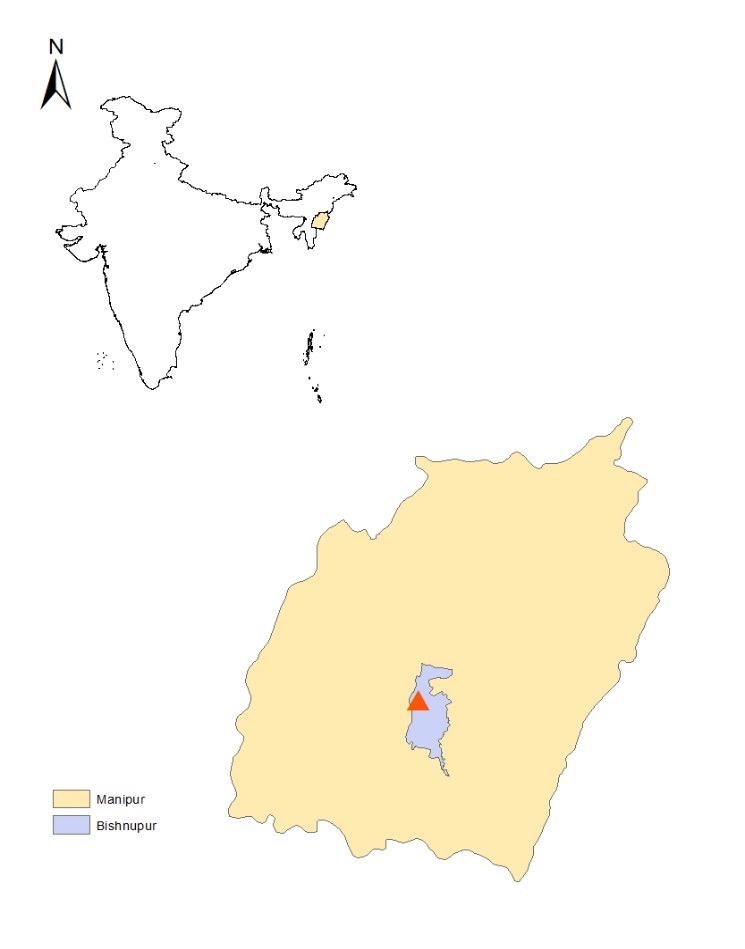
1. **INTRODUCTION**

About 65 per cent of the Indian population lives in rural areas, and 47 per cent of these communities depend on agriculture as the primary source of livelihood (Economic Survey, 2022-23). Despite the growth of other sectors in the rural areas, the village economy is still dominated by agriculture, with more than 58 per cent of the rural households still dependent on it (Wagh and Dongre, 2016), and also the economy generates about half of the national income and more than two-thirds of the employment of the country (Chand et al., 2017). Overall, the rural economy plays a vital role in the economic development of any country and is often the key component of the gross domestic product (Takhumova, 2019). Thus, the farm sector helps to reduce poverty and income inequality between urban and rural areas, as well as within rural areas, by employing poor people who are uneducated and have low skills, as well as supporting the growth of non-agricultural employment in rural areas. Cross-country estimates have shown that agricultural GDP growth is at least twice as effective in eliminating poverty as GDP growth from other sources (Anjum and Tarique, 2017). The agriculture sector has the highest contribution to rural household income and also has an equalizing effect on the income distribution (Priscilla et al*.,* 2021). Thus, boosting resource efficiency and access to agricultural extension, markets, and credit and diversifying into high-value, high-growth industries like animal husbandry and horticulture will increase income in rural areas (Vatta and Budhiraja, 2020; Bhalerao et al., 2022).

In North East India, the rural predominance is even higher than in the rest of India. More than 81 per cent of the region's population lives in rural areas and relies heavily on agriculture and related activities for their livelihood. The region's farming system is distinguished by its subsistence nature, with small holding and low cropping intensity (Priscilla et al., 2021; Jain et al., 2022). Despite its enormous natural resources (land, water, forest, biodiversity, etc.), favorable climate, and abundant human capital, the region's agrarian economy has been locked in a vicious cycle of poor productivity, unemployment, low income, and poverty (Barah, 2007). Small and fragmented landholdings, lack of quality inputs, poor irrigation facilities, lack of mechanization and technology, inadequate storage and processing facilities, and lack of proper marketing facilities have contributed to the region's agricultural development challenges (Gogoi, 2019). However, the government has undertaken several initiatives to address these issues and promote the growth of the rural farm sector, including investment in irrigation facilities, modernizing farming practices and technologies, and enacting policies to raise farmer incomes. This will promote sustainable development and the ability to feed a rising population and combat poverty. And studies show that the rural economy in India continued to thrive and even helped the economy during hard times (Abdin and Kumar, 2020). Therefore, promoting agricultural growth in the North East region is the most important strategy for connecting the region to the rest of the country regarding the overall socio-economic development of rural households. Against this backdrop, the present study was conducted to understand better the situation of the rural farm sector at the micro level and to establish policy implications for long-term rural development.

1. **METHODOLOGY**

The present study is based on the complete census approach method of a village named Potsangbam in 2020-21. The village is in the Bishnupur district of Manipur state in North East India. There were 683 households in the village; 46.7 per cent were landless households and the remaining 53.3 per cent owned operational holdings. The information on operational holdings, cropping pattern, production, yield, disposal pattern, income, and employment of the village economy were collected with the help of a pre-tested, well-structured schedule and analyzed through descriptive statistics like average and percentage. Besides these, the Gini coefficient was used to measure the extent of land distribution among the households. Fig. 1 shows the geographical location of the village.



Potsangbam Village

**Figure 1. Geographical location of Potsangbam village**

1. **RESULTS AND DISCUSSION**

**3.1 Household category and population**

The size and distribution of operational holdings in rural areas can considerably impact the socio-economic conditions of the farmers and the rural population as a whole. As the average landholding in the village is so small, the households were categorized into landless, marginal (<1 acre), small (1-2.5 acre), and medium & above (2.5 > acre), and the distribution of households and their population is shown in Table 1. Most households (46.7 %) belonged to the landless category, with a population share of 42.3 per cent and an average family size of 4.8 persons. The remaining households were marginal (26.7 %), small (24.6 %), and medium (1.9%) landholding categories with a population share of 28.7, 25.8, and 2.1 per cent, and average family size of 5.6, 5.8 and 6.0 persons, respectively. The dominance of landless and marginal-holding households in the village shows the prevalence of subsistence agriculture with the endless vicious circle of low productivity, food insecurity, low income, and high poverty.

**Table 1: Household category and population of the village, 2020-21**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Household category | % of households | % of population | | | Average family size  (No.) |
| **Male** | **Female** | **Total** |
| Landless | 46.7 | 20.9 | 21.4 | 42.3 | 4.8 |
| Marginal | 26.7 | 14.4 | 14.3 | 28.7 | 5.6 |
| Small | 24.6 | 13.7 | 13.1 | 26.8 | 5.8 |
| Medium | 1.9 | 1.1 | 1.0 | 2.1 | 6.0 |
| Total | 100 | 50.1 | 49.9 | 100 | 5.3 |

**3.2 Operational holdings**

Operational holding of the households is an important factor affecting the overall socio-economic condition. A larger operational holding can provide a family with more resources for production, leading to higher income and improved living standards. Table 2shows the distribution of operational holdings by household category of the village. Out of the total (430.6 acres) operational holdings, 62.2 per cent of the land was leased-in, and the remaining 37.8 per cent was owned land. The share of owned (19.3%) and leased in (61.9%) was highest in small-holding households and least for medium farmers, with 5.6 and 11.3 per cent, respectively. The overall average operational holding of the households is 0.6 acres, with the highest for medium (3.7 acres) and lowest for marginal (0.6 acres) farm households. It shows that most households were landless and marginalized, lacking access to land and other productive resources, resulting in low productivity and income levels and leading to poverty, food insecurity, and other socio-economic challenges. The Lorenz curve of land distribution of overall households is shown in Fig. 2. The land was more or less equally distributed among the households with an overall Gini coefficient of 0.32.

**Table 2: Operational holdings of the households, 2020-21**

**(Per cent)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Household category | Owned | Leased in | Total area | Average land holding  (Acre) |
| Marginal | 12.8 | 15.3 | 26.7 | 0.6 |
| Small | 19.3 | 41.2 | 61.9 | 1.6 |
| Medium | 5.6 | 5.7 | 11.3 | 3.7 |
| Total (Acre)  (%) | 162.9  (37.8) | 267.7  (62.2) | 430.6  (100) | 0.6 |



**Fig. 2:** The Lorenz curve of land distribution of the households

**3.3 Cropping pattern**

As farming in the state is mainly rainfed and subsistence in nature and farmers grow paddy during the kharif season, and the majority leave their fields free in the other seasons. However, farmers’ access to irrigation facilities and new technologies grew vegetables after the paddy harvest. It is not the case for those farmers who do not have access to irrigation. Table 3 shows the cropping pattern of the households. Out of the total operational area (430.6 acres), around 61.55 acres were access to irrigation facilities, and the farmers grew vegetables after paddy harvesting. Among the rabi vegetables that are grown in the village were potato (23.43 acres), pea (11.2 acres), cabbage (4.3 acres) and cauliflower (2.2 acres), and pre-kharif vegetables, french bean (8.7 acres), colocasia (8.4 acres), tomato (3.4 acres). Thus, the total gross crop area in the village was 492.2 acres, and out of this, 369.07 acres were rainfed, and 123.1 acres were under irrigated area.

**Table 3: Cropping pattern of the households, 2020-21**

**(Acre)**

|  |  |  |  |
| --- | --- | --- | --- |
| Crops | Area under rainfed | Area under irrigated | Total gross crop area |
| *Kharif* | | | |
| Paddy | 369.07 | 61.5 | 430.6 |
| *Rabi* | | | |
| Potato | - | 23.4 | 23.4 |
| Pea | - | 11.2 | 11.2 |
| Cabbage | - | 4.3 | 4.3 |
| Cauliflower | - | 2.2 | 2.2 |
| *Pre-Kharif* | | | |
| French bean | - | 8.7 | 8.7 |
| Colocasia | - | 8.4 | 8.4 |
| Tomato | - | 3.4 | 3.4 |
| Total area | 369.1 | 123.1 | 492.2 |

**3.4 Cropping intensity**

Cropping intensity, which refers to the number of crops grown on a piece of land in a given year, is an important factor in determining a farmer's income by increasing the crop yield and better utilization of resources. The diversified natures of land use pattern, cropping pattern, and irrigation intensity have increased the cropping intensity over the period (Deshmuk and Tanaji, 2017). The cropping intensity of different sizes of operational holdings is shown in Table 4. The overall cropping intensity was found to be 114.3 per cent. Among the various size groups, the cropping intensity was highest among the small holding households with 114.9 per cent followed by marginal (114.3%) and medium (110.8%) households. The combination of factors that include the subsistence nature of crop farming, rainfed, mono-cropping, low input/low output and technologically lagging mixed agricultural system, poor infrastructure and marketing system, poor socio-economic status of the households, and land tenure systems may be the primary reasons for the area's low agricultural productivity and cropping intensity.

**Table 4**. **Cropping intensity of the households, 2020-21**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Household  category | Operated area  (Acre) | Cropped Area  (Acre) | Cropping intensity  (%) | Remarks |
| Marginal | 115.0 | 131.4 | 114.3 | >Unity |
| Small | 266.7 | 306.6 | 114.9 | >Unity |
| Medium | 48.9 | 54.2 | 110.8 | >Unity |
| Overall | 430.6 | 492.2 | 114.3 | >Unity |

**3.5 Crop production and yield**

Crop production and yield are closely related and significantly impact socio-economic conditions in rural households by increasing employment, income level, and food security. Table 5 **s**hows the production and yield of different crops of the households. With a total cropped area of 430.6 acres, the total paddy production in the village was 9243 quintals, and the average yield was 21.5 quintals per acre. Among the different vegetables that are grown in the village, the overall total production for potato, pea, cabbage, cauliflower, french bean, colocasia, and tomato were 1119, 270, 465,204,556,212, and 328 quintals with an average yield of 21.4, 47.7, 24.2, 107.8, 95.1, 64.1, 26.5 and 96.0 quintals per acre, respectively. Among the land category, the smallholder households have the largest share of the total crop production in the village. The different crops grown by them were paddy, potato, pea, cabbage, cauliflower, French bean, colocasia, and tomato, with a total production of 5775, 635, 181, 296, 174, 40, 181, and 177 quintals and an average yield of 21.6, 48.2, 24.4, 106.7, 93.5, 65.7, 97.3 and 24.8 quintals per acre, respectively. For the marginal households, the various crops grown by them were paddy, potato, pea, cabbage, cauliflower, french bean, and tomato, with a total production of 2328, 402, 73, 169, 30, 64, and 147 quintals, and an average yield of 20.2, 46.4, 23.5, 109.0, 96.8, 64.5 and 94.8 quintal per acre, respectively. And for the medium households, the crops that were grown were paddy, potato, pea, french bean, and colocasia, with a total production of 1139, 82, 16, 85, and 35 quintals and an average yield of 23.3, 52.9, 25.8, 68.5 and 28.2 quintals per acre, respectively. The findings show that the productivity of different crops shows a positive relationship with farm size, i.e., the larger the farm size, the higher the yield. These findings were supported by Chand *et al.* (2011) and Gaurav and Mishara (2015).

**Table 5: Production and yield of different crops of the households, 2020-21**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Crops | Marginal | | Small | | Medium | | Overall | |
| **Production** | **Yield** | **Production** | **Yield** | **Production** | **Yield** | **Production** | **Yield** |
| Paddy | 2328 | 20.2 | 5775 | 21.6 | 1139 | 23.3 | 9243 | 21.4 |
| Potato | 402 | 46.4 | 635 | 48.2 | 82 | 59.9 | 1119 | 47.7 |
| Pea | 73 | 23.5 | 181 | 24.4 | 16 | 25.8 | 270 | 24.2 |
| Cabbage | 169 | 109.0 | 296 | 106.7 | - | - | 465 | 107.8 |
| Cauliflower | 30 | 96.8 | 174 | 93.5 | - | - | 204 | 95.1 |
| French bean | 64 | 64.5 | 407 | 65.7 | 85 | 68.5 | 556 | 64.1 |
| Colocasia | - | - | 177 | 24.8 | 35 | 26.3 | 212 | 25.6 |
| Tomato | 147 | 94.8 | 181 | 97.3 | - | - | 328 | 96.1 |

Note: Production in quintals and yield in quintals per acre

**3.6 Disposal pattern**

The disposal pattern of food grains and vegetables in rural areas is often closely tied to the socio-economic conditions of the area. As most farmers were marginal and small, food grains were mainly produced for household consumption and had very little marketable surplus due to low productivity and small holdings. The disposal pattern of different crops of the households by overall and social category is shown in Table 6. The findings show that out of the total paddy production, 47.1 per was used for home consumption and the remaining 52.9 per cent for sold and other payments. For the vegetables, except potatoes, more than 90 per cent of the total produced was sold and used for other payments. Among the land categories, the marginal and small households have sold 58.2 and 57.9 per cent of their total paddy production, while the medium households sold 48.4 per cent of the total production. For vegetables, all the land categories have shown a similar disposal pattern. Most products were sold as the products were highly perishable except for potatoes and colocasia. Due to immediate financial requirements for household consumption and lack of proper storage facilities for the farm products, farmers go for distress sale. The findings also revealed that medium land-holding households have a better retention capacity of food grains among the households.

**Table 6: Disposal pattern of different crops of the households, 2020-21**

**(Per cent**)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Crops | Marginal | | Small | | Medium | | Overall | |
| **Household**  **consumption** | **Sold & other payment** | **Household**  **consumption** | **Sold & other payment** | **Household consumption** | **Sold& other payment** | **Household consumption** | **Sold& other payment** |
| Paddy | 43.4 | 58.2 | 45.3 | 57.9 | 51.6 | 48.4 | 47.1 | 52.9 |
| Potato | 14.9 | 85.1 | 15.43 | 84.7 | 19.5 | 80.5 | 15.5 | 84.5 |
| Pea | 5.5 | 94.5 | 6.62 | 93.4 | 6.2 | 93.7 | 6.3 | 93.7 |
| Cabbage | 1.7 | 98.2 | 1.7 | 98.3 | - | - | 1.7 | 98.3 |
| Cauliflower | 3.3 | 96.6 | 1.14 | 98.8 | - | - | 1.5 | 98.5 |
| French bean | 7.8 | 92.1 | 7.4 | 92.6 | 7.0 | 92.9 | 7.4 | 92.6 |
| Tomato | 0.7 | 99.3 | 0.5 | 99.4 | - | - | 1.0 | 99.0 |
| Colocasia | - | - | 9.0 | 90.4 | 8.6 | 91.4 | 8.9 | 91.1 |

**3.7 Share of farm employment**

A stable and suitable occupational status of an individual is critical. It plays a crucial role in shaping the socio-economic condition of the household in general and economic development in rural areas. The share of farm employment in the village economy is shown in Table 7. Of the total workers, 38.2 per cent were engaged in the farm sector, and the remaining 61.9 per cent were in the non-farm sector. Among the farm sector, 19.9 per cent were in crop farming, 12.9 per cent in agricultural allied activities, and 5.6 per cent as agricultural laborers. Out of the total workers, 62.7 per cent were male, and the remaining 37.2 per cent were females. Of those engaged in the farm sector (38.2 %), 17.6 per cent were male, 20.7 per cent were female, and for the non-farm sector (61.9%), 45.1 per cent were male, and 16.6 per cent were female. This shows that the work participation of females was more in the farm sector than in the non-farm sector in the village. The findings also revealed that most of the working population was engaged in the non-farm sector, which became the primary source of their livelihood as the farm sector has limited scope. This finding is supported by Priscilla *et al.* (2021), as the non-farm sector becomes the primary source of livelihood in the region.

**Table 7: Share of farm employment to the village economy, 2020-21**

**(Per cent)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sectors | Male | | | Female | | | Overall | | |
| **Main** | **Marginal** | **Total** | **Main** | **Marginal** | **Total** | **Main** | **Marginal** | **Total** |
| Crop farming | 8.2 | 2.1 | 10.3 | 3.8 | 5.7 | 9.5 | 12.1 | 7.8 | 19.9 |
| Allied activities | 6.4 | 0.4 | 6.8 | 0.9 | 5.1 | 6.0 | 7.4 | 5.4 | 12.9 |
| Agril. labor | 0.3 | 0.1 | 0.4 | 2.5 | 2.7 | 5.2 | 2.8 | 2.7 | 5.6 |
| Sub-total farm | 15.0 | 2.6 | 17.6 | 7.4 | 13.3 | 20.7 | 22.3 | 15.9 | 38.2 |
| Non-farm | 41.9 | 3.2 | 45.1 | 9.1 | 7.5 | 16.6 | 50.9 | 10.9 | 61.9 |
| Total | 56.9 | 5.8 | 62.7 | 16.3 | 20.9 | 37.2 | 73.2 | 26.8 | 100 |

**3.8 Share of farm income**

The different income sources of the households were categorized into three groups, i.e., farm income, non-farm income, and transfer/other incomes. The farm income includes income from crop farming, allied activities like livestock/fishing, and agricultural labor, and the non-farm consists of income from non-agricultural labor, salaried government and private employee, own business, and others (MGNREGA) and the transfer/other incomes include incomes from rental, remittances, pensions, and social securities. The share of farm income to the total village economy is shown in Table 8. The findings show that farm income accounts for 22.2 per cent of the total income; the remaining was by non-farm (70.3 %) and transfer/other income (7.5 %). Among the different households, the share of farm income was highest in medium (44.7 %) followed by small (32.5%), marginal (20.6%), and landless (14.8%) households. For the non-farm income, the share was highest in landless (78.2 %), followed by marginal (72.0%), small (59.9%), and medium (50.9%) households.

**Table 8: Share of farm income to the total village economy, 2020-21**

**(Per cent)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sectors | Landless | Marginal | Small | Medium | Overall |
| Crop Farming | - | 11.5 | 22.5 | 37.1 | 10.8 |
| Livestock /Fishing | 11.5 | 7.2 | 8.4 | 7.6 | 9.3 |
| Agril. labour | 3.3 | 2.0 | 0.6 | - | 2.0 |
| Sub –total of farm | 14.8 | 20.6 | 31.5 | 44.7 | 22.2 |
| Non-farm | 78.2 | 72.0 | 59.9 | 50.9 | 70.3 |
| Transfer & others | 7.0 | 7.4 | 8.7 | 4.4 | 7.5 |
| Total | 100 | 100 | 100 | 100 | 100 |

1. **CONCLUSIONS**

The study examined the status of the rural farm sector in the Potsangbam village of Manipur, India. The findings show that most households were landless and marginal farmers with an average land holding of 0.6 acres. The study also revealed that the village's farm sector is developing, gradually transitioning from traditionally low-income agriculture to a more commercialized farming system. Still, it has yet to reach the desired stage of growth. It has faced many issues, such as small land holdings due to land fragmentation, which makes it difficult to achieve economies of scale and implement modern farming practices resulting in a decrease in the share of rural agricultural employment and income in the whole village economy. In conclusion, agriculture plays a vital role in the village economy, contributing to employment, income, and food security. The sector needs continued support and investment from the government to sustain and enhance its contribution to the country's economy. Comprehensive policies that emphasize improving rural infrastructures, expanding access to resources and markets, promoting sustainable farming practices and improved technologies, and providing extension and training services are required. In addition, policies that support income diversification, land consolidation, and rural development can help to tackle these issues and build a more resilient and robust farm sector in the village economy.

**Declaration of Conflict of Interest:** The authors declare that there are no conflicts of interest regarding the research, authorship, or publication of this article.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

**REFERENCES**

1. Abdin, M. S. and Kumar, R. 2020. Rural economies of India helping India become a 5 trillion-dollar economy: contribution, opportunities, and challenges. *Journal of Interdisciplinary Cycle Research* 12(5):1006-1026.
2. Anjum, S and Tarique, M. 2017. Agriculture and poverty reduction in India: An empirical study. *North Asian International Research Journal of Social Science & Humanities* 7(9):35-48.
3. Barah, B. C. 2007. Strategies for agricultural development in the north-east India: Challenges and emerging opportunities. *Indian Journal of Agricultural Economics* 62(1) 13–31.
4. Chand, R., Prasanna, P. L. and Singh, A. 2011. Farm size and productivity: Understanding the strengths of smallholders and improving their livelihoods. *Economics & Political Weekly* 46(26-27): 5-11.
5. Chand, R., Srivastava, S.K. and Singh, J.2017. Changing Structure of Rural Economy of India Implications for Employment and Growth. Discussion Paper, NITI Aayog, New Delhi.
6. Deshmukh, M. S. and Tanaj, S. V. 2017. Cropping intensity index and irrigation intensity in India.*North Asian International. Research Journal of Social Science & Humanities* 3(2): 3-10.
7. Gaurav, S. and Mishra, S. 2015. Farm size and returns to cultivation in India: Revisiting an old debate. *Oxford Development Studies* 43(2):165–93.
8. Gogoi B. 2019. Problem, prospect and role of agriculture in rural development in North-East India. *International Journal of Applied Social Science* 6(7):1944-1951.
9. Priscilla, L., Kar. P., Singh, O. K., Nivetina, L. and Sharma, P. R. 2021. Economic impact of crop diversification in North-East India: Evidence from household-level survey. *Indian Journal of Extension Education* 57(4):104-109.
10. Priscilla, L., Singh, O.K. and Vatta, K. 2021. Effects of income sources on inequality among agricultural households in North-east India. *Indian Journal of Agricultural Economics* 76(4): 658-671.
11. Takhumova O (2020) Rural development as a leading factor in economic growth. *Proceedings 6th International Conference on Social, Economic, and Academic Leadership*. pp 257-279. Atlantis Press: Amsterdam, The Netherlands.
12. Wagh, R and Dongre, A.P. 2016. Agricultural sector: Status, challenges and it’s role in Indian economy. *Journal of Commerce and Management Thought* 7(2):209-218.
13. Vatta, K and Budhiraja, P. 2020. Farmers’ income in India: trends and prospects for future growth. *Agricultural Economics Research Review* 33(2):177-189.
14. Bhalerao, A. K., Rasche, L., Scheffran, J., & Schneider, U. A. (2022). Sustainable agriculture in Northeastern India: how do tribal farmers perceive and respond to climate change?. International Journal of Sustainable Development & World Ecology, 29(4), 291-302.
15. Jain, A., Sheekha, N. M., & Mandal, S. T. (2022). Agricultural sustainability in the North Eastern region of India: A sustainable livelihood security index (SLSI) approach. Ecology, Economy and Society-the INSEE Journal, 5(2), 21-42.