***Original Research Article***

**Pareto Analysis of Factors Influencing Livelihood Choices of Smallholder Farmers in Climate-Vulnerable Assam State of India and Probable Solutions**

**ABSTRACT**

Under climate change conditions smallholders’ farmers are compelled to change their livelihood strategy as existing are not suitable for new changing situations. So, alternative income sources and diversification of farm enterprises extensively help to get income. In this situation, it is important to know the personal-economic factors which influence small and marginal farmers in choosing the livelihood option for the future. The present study was conducted to identify major determinants influencing farmers’ livelihood options for the future in climate-vulnerable districts of Assam. Cross-sectional survey method was adopted for the study. The study was conducted in Assam state of India. The total sample size was 300 small and marginal farmers. Farmers’ choice for alternate livelihood options was collected through open-ended questions. Farmers’ six characteristics were selected by categorising them into different sub-categories to find out their dominant factors. Pareto chart analysis was done to find out the dominant factors. The findings show that farmers chose 18 livelihood strategies though all were not dominant. Pady, piggery, fishery and vegetable cultivations were major enterprises chosen by the respondents. The Pareto chart shows that among the chosen enterprises their different characteristics played a major role. The Pareto analysis also indicates those four factors along with the determinants identified where the focus should be given to get good results for livelihood strategies. The study recommended that Pareto chart analysis can be used as a tool in analysing farmers’ choices of livelihood strategies.

**Keywords:** Assam, Climate vulnerability, Determinants, Livelihood choice, Pareto analysis, Small and Marginal farmers

1. **INTRODUCTION**

The Assam state of India is highly vulnerable to climate change. A total of 16 out of India’s 25 highly vulnerable districts to climate change exist in Assam. According to the State Action Plan for Climate Change, extreme rainfall will increase by 38% in the state. It also mentioned that the annual mean temperature in the state has increased by 0.59 degrees Celsius in 60 years (1951-2010). Assam is the most vulnerable to climate change among the 12 States/UTs of the Indian Himalayan Region according to the report ‘Climate Vulnerability Assessment for the Indian Himalayan Region using a Common Framework’ (2018-19) as stated by the Ministry of Development of North-East Region, (2023). Because of that, smallholder farmers are more vulnerable to climate change due to adverse rain, drought, temperature variation, and flood-like situations. They have limited resources in terms of capital, like land and money. Under climate change conditions smallholder farmers are compelled to change their livelihood strategies as existing ones are not suitable for new changing situations. So, alternative income sources and extensive diversification of farm enterprises significantly help to get income. Ezung (2021), asserts that diversification has evolved into a strategic approach, enabling individual to meet their basic needs and enhance their overall well-being. Many farmers, based on their resources,are trying to change or adapt their livelihood strategies. Based on socio-economic, demographic, and geographical conditions, rural people experience different problems and prospects for livelihood diversification. Diversification is a constant process where households introduce new activities. The process is more relevant in the context of climate change conditions.

Different literature mentioned that the farmers of Assam are adjusting their livelihood strategies to cope with the changing climate change. Lack of proper knowledge of suitable options, limited resources, and proper handhold support hinders the farmers from selecting appropriate livelihood options. Besides these, their personal, household, and village-level characteristics and government policies are also influencing factors for selecting proper livelihood options. Because of climate change in Assam, smallholder farmers’ livelihood strategies are also changing. Many farmers try to choose new options for future courses of action based on their capacity or resources. In this way, they strive to make themself ready to cope with the situation.

In this situation, it is important to know the personal and economic factors that influence small and marginal farmers in choosing the livelihood option for the future. Once the determinants are known, it is easy for the policymakers, development workers, scientists, and extension functionaries to make necessary interventions based on them. About 70 % of the people are supported by agricultural and allied activities for sustainable livelihood. As available agricultural land decreases day by day, the livelihoods of small and marginal farmers become increasingly unsustainable. According to Surayya *et al.,* (2008), agriculture generates the main livelihoods for Indian farmers, contributing not only to farmer’s well-being but to the rural economy.

In Assam state, diversifying agriculture is considered as one of the most important strategies for boosting rapid economic growth and development. The strategies comprise a transformation in the types of crops grown while shifting towards new enterprises. Smallholder farmers, need to grow high-value crops rather than traditional ones but this will depend on their ability and resources. In many places, it involves adopting different allied activities like fishery, dairy, sheep, horticulture, farming, poultry and goat rearing, etc. (Raj, 2010). People use livelihood diversification as a main source for increasing income and well-being (Kisku & Ghosh, 2017). According to the Food and Agriculture Organisation (2001), diversification is the specific source for reducing poverty for small farmers in South and Southeast Asia. Livelihood diversification is a vital approach utilised by people to fulfil their needs and upgrade their well-being. Some researches who studied how farmers changed their incomes found that age of the head of the family, number of family members, education level, farm size and social group were important factors in ways how they changed their incomes (Judit *et al.*, 2017; Khatun and Roy, 2012; Saha and Bahal, 2014; Subramanian, 2018; Walker and Ryan, 1990). The determinants of livelihood diversification are different according to location. Various factors like age of the head of family, general education, gender of the head of the households, agricultural education, size of land holdings, family size, number of children and adults in the family, ownership of livestock, risk-averse attitude of households, gender of the head of the households, amount of assets, income per capita, variability of farm income, access to credit, identified as major determinants of livelihood diversification (Agyeman *et a*l., 2014, Abdulai, Abdulai & Crole-Reese, 2001, Block and Webb, 2001), and Ellis, 2008. )

Various literature on different livelihood strategies, focuses on the livelihood options which provide self-insurance, stability, resilience and flexibility to the livelihoods of rural population (Ellis, 2008; Loison, 2015, Start, 2001,). Washo *et al.,* (2021) indicated that household size, ownership of livestock and access to credit had a positive impact on farm and off-farm activities. Habib *et al.* (2023) reported that social connection, level of education, family labour positively influenced livelihood diversification. Workie (2023) directed that on- and off-farm livelihoods had positive influences through the gender of the household head. Onuwa *et al.* (2022) found that credit access, household size, education level and productive assets had a positive impact on livelihood actions. In Assam’s condition, farmers selected or preferred many livelihood options depending on their conditions (Begum & Mahanta, 2017; Chanu et al. 2023). However, in these conditions, implementing appropriate interventions to achieve the desired outcomes can be challenging. The Pareto chart provides an opportunity to do such a study, however, there is a dearth of literature on Assam’s condition. Therefore, the present study was conducted to identify major determinants influencing farmers’ choice of livelihood options for future courses of action under climate-vulnerable districts of Assam through Pareto Chart analysis.

1. **METHODOLOGY**
   1. **Selection of study area**

The Cross sectional survey method was adopted for the study. The study was conducted in the Assam state of India. The state was selected purposively as it is one of the most vulnerable to climate change in Himalayan region of India. The state has 35 districts out of which 15 out of 25 highly vulnerable districts in India (Express News Service, 2022). From these 15 districts, Golaghat district was selected randomly. In the district there has been no normal monsoon in the last thirty years. Besides this, two adjacent districts called Jorhat and Majuli were also selected for the study since both the districts are also experiencing increased temperature, irregular rainfall and frequent floods (Ramachandran, 2022; Deka *et al*., 2024; Deka, 2025).

**2. 2 Geographic description of the selected districts**

The Majuli district is newly bifurcated from the Jorhat district. It is world’s largest human habitat river island located at the Brahmaputra River. It is regularly affected by heavy flood, high rainfall, land erosion, etc. The district coordinates are between a latitude of 27°54'4. 97"N and a longitude of 95°43'33. 72"E. The latitude of Jorhat district is 26°45'0.00"N and longitude 94°13'12.00"E. The Jorhat district is topographically a level plain and has no lake, beel, or marshy land. The district’s yearly average temperature is 25.67ºC. Jorhat receives about 2262 millimetres of rainfall annually (Roy et al., 2024). The average temperature of Golaghat district is 23.4°C and the annual rainfall is 3130 mm. The Golaghat district is situated at a latitude of 26. 3185°N and a longitude of 94.0907°E(Golaghat, Assam, 2021).

**2.3 Agricultural scenario of study areas**

Agriculture is the mainstay of the Majuli District economy, providing employment to 90% of the district's population. Farmers made on average 80.63 % of the workforce. The soil of Majuli is fertile. Most of the farmers of Majuli are engaged in the cultivation of food grains, rice, potato, oil seeds pulses garlic, and several kinds of vegetables. The majority of the farmers are small and marginal farmers. Rice is the staple food grain crop cultivated by the farmers. Three types of rice viz., Sali, Ahu and Bao (Deep Water) are cultivated on the river island. Commercial vegetable cultivation is more prevalent in *Char-Chapori* areas of Majuli. The *Char-chapori* are the local name for riverine areas of the river Brahmaputra and its tributaries (Directorate of Char Areas Development, Govt. of Assam, 2024). Fertiliser consumption is quite low specially in the district and by default it is organic. The total cropped area of Jorhat is 1.19 lakh ha. However, only 5.4% of the gross cultivated area is irrigated (State profile of Assam, 2016). Paddy is generally grown as both Sali (winter) and Ahu (autumn) in the kharif season. Sesamum, paddy, green gram, mustard, black gram, chiliies, lentil, pigeon peas, sugarcane, turmeric, ginger, and other minor crops are grown in the district. Generally, the crop rotations followed are paddy-pulses, paddy-fallow-paddy, or oilseeds, pulses-vegetables. Flood is a major problem in many locations of the district.Total net cropped area of Golaghat district is 1,505.61 sq. km (State Profile of Assam, 2016). Agriculture plays a significant sector in the district and is a foundation of livelihood for the majority contributing to the agrarian economy. The main crops grown in the district are paddy (Ahu and Sali), vegetables, and sugarcane.

**2.4 Selection of respondents**

A total of three districts namely Golaghat, Jorhat, and Majuli were selected for the study. Considering the climate vulnerability area, five villages from each district were selected purposively. The villages were regularly flood- affected and most of the population belonged to small and marginal farmers. Their main livelihood activity was farming. In the selection of respondents, from each village, 20 numbers of small and marginal farmers were selected randomly based on their willingness to take part in the survey process to provide information. Finally, from each selected district, 100 samples were selected randomly making a total sample size of 300 in numbers. The sample design was flexible due to geographical location, time and fund constraints. So, the the findings should not be generalised for another situation.

**2.5 Selection of variables**

For the study, some farmers’ characteristics were selected as variables to determine the influencing factors for small and marginal farmers to choose the alternate livelihood option. The farmers’ characteristics were selected by examining various literature and the situation of the study area. Only those variables had been selected, which had got relevance in the study area. Based on the objective of the study, variables were categorised into different categories as mentioned in Table 1.

**Table 1. Variables and their categories**

|  |  |  |
| --- | --- | --- |
| **Variables** | **Categories** | **Measurement criteria** |
| Age | < 36 yrs | Researcher’s category |
| Between 36 to 50 Yrs |
| >50 yrs |
| Educational level | Up to primary level | Formal education passed |
| Up to high school level |
| Above high school level |
| Net annual family income | ≤ Rs 46000/- | Categories were made based on the median value Rs 46,000.00 |
| >Rs 46,000/- |
| Farm size | 0.01-0.40 ha | Based on the median value of farm size of the respondents |
| 0.41-0.99 ha |
| 1-2 ha |
| Family type | Joint | The family where multiple generations lived together under one roof. |
| Nuclear | The family consists of a wife, a husband, and their children. |

**2.6 Pareto chart analysis**

In the selection of livelihood options, various factors that might influence the farmers’ decisions were selected. The researchers conducted a Pareto chart analysis to identify these determinants. A Pareto chart can be a valuable tool in analysing farmers' choices of livelihood strategies. It helps identify the most significant factors influencing their decisions by applying the 80/20 rule—where 80% of the outcomes are often driven by 20% of the causes. Pareto chart analysis depicted the factors behind the selection of enterprises. In this analysis, both bar and line diagrams were involved where the frequency of farmers was represented in descending order by bars, and the cumulative percentage was represented by the line. The findings may not be precise but help extensively in focusing on the right effort. It helps in concentrating effort on 20% of farmers to get maximum results as the remaining 80% are not so prominent for giving attention. Baliyan (2009) and Fortea *et al*., (2022) also used such a method in their research study.

1. **RESULT AND DISCUSSION**

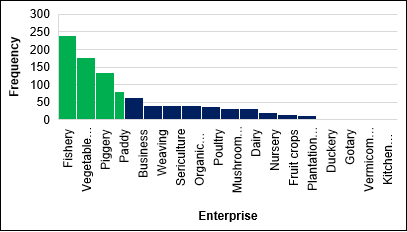
**3.1 Future Alternative livelihood choices by the respondents**

Pareto chart 1 reflects that the respondents chose a number of alternate livelihood options for the future. Out of 300 respondents, 18 different options were found. It indicated that there were no dominant options available for maximum farmers. Under the situation, the Pareto chart (Chart-1) indicates a good picture for identifying the dominant options. The chart shows that out of 18 options five options were more dominant. These were: i) Paddy+Fish+Veg; 2) Pig+Veg+Fishery; 3) Integreted fish+Veg+Poultry/Pig; 4) Fishery+Field crops+Veg; and 5) Veg+Fishery+Business.If effort is given to these options for solutions, then almost 80% of issue will be resolved. However, there are four more options that can be considered in the case.These are 6) Nursery+Business+Weaving+Mushroom; 7) Poultry+Pig+Fishery+Organic farming; 8) Paddy+Pig;and 9) Dairy+Fishery+Pig .Then with 30% effort, 70% of options can be solved to a greater extent which, will be achieved with less effort and resources.

**CHART 1: Pareto chart on smallholder farmers’ choice of alternate livelihoods**

Ovah et al., (n.d.) used the Pareto principles to find out the farmers’ constraints in the highlands of Papua New Guinea. They examined the distribution and correlation of diverse constraints encountered by farmers in the production, postharvest, and selling of sweet potato, Irish potato, and bulb onion.

**3.2 Distribution of farmers according to choice of enterprises**



**CHART-2: Distribution of respondents according to their choice of livelihood option**

Chart 2 shows that majority of farmers selected fishery, vegetable cultivation, paddy and piggery as their livelihood options for the future. The frequency was calculated based on multiple responses from a total of 300 respondents. The chart indicates that majority of respondents preferred to add fishery, vegetables, piggery, or paddy as their future livelihood option. Therefore, these four enterprises were analysed to determine the influencing factors for their choice.

**3.3 Pareto chart analysis to identify the determinants of small and marginal farmers’ choice of paddy as livelihood strategies**

In case of determinants of small and marginal farmers’ choice of livelihood strategy, Chart 3 shows that in case of paddy, in choice of alternative livelihood option farmers having above high school passed education, income group of ≤Rs 46000, farm size having 0.41-0.99 ha , joint family, age of head of the family were the 70% dominant over other characteristics. It might be because paddy is a staple crop of the respondents. Respondents who were in joint families and nuclear families preferred paddy as traditionally they did not wish to purchase staple crops. Respondents of all categories of income chose paddy as an option. Farmers whose farm class size was 0.41-0.99 ha, also chose paddy. The chart indicates the determinants that were most dominant over others. If development agencies, policymakers, and extension agencies focus on these determinants then with 30% effort they will be able to deliver about 70% results. Though the Pareto principle is concerned with 80/20 rules, it has some flexibility in interpretation (Lipovetsky, 2009). It depends on the context.

**CHART 3: Pareto chart depicting dominant characteristics of smallholder farmers’ choices on paddy as an alternative livelihood option**

**3.4 Pareto chart analysis to identify the determinants of smallholder farmers’ choice of fishery as livelihood strategies**

In case of selecting fishery as a future option, all total five determinants viz. average annual net income ≤ Rs. 46,000.00, education above high school passed, age group between 36-50 years,a family having any members, and farm size 0.41-0.99 ha were more dominant than other factors (Chart-4). The findings show that low-income groups having low farm size and above high school farmers should be focused on fishery to include livelihood options. These 20% of factors are more dominant than the remaining 80% of factors. It will be achieved with 20% effort as per Pareto analysis or 80/20 ratio rule.

**CHART 4:** **Pareto chart analysis to identify the determinants of smallholder farmers’ choice of fishery as livelihood option**

**3.5 Pareto chart analysis to identify the determinants of smallholder farmers’ choice of vegetable cultivation as a livelihood option**

Chart 5 shows that a total of five determinants were responsible for selecting vegetable cultivation as a future option. From the figure, it can be concluded that age between 36-50 years, average annual income ≤ Rs 46,00.00, educational level above high school passed, farm size of .01-.99 ha, family size of ≥ 5nos., and all types of family types (Joint and nuclear) were dominant over other characteristics in selection of vegetables as a livelihood option. It will provide 70% achievement by making an effort on these determinants. Instead of giving effort to all factors only 30% effort will get the desired result.

**CHART-5: Pareto chart analysis to identify the determinants of smallholder farmers’ choice of vegetables cultivation as livelihood option**

**3.6 Pareto chart analysis to identify determinants of smallholder farmers’ choice of piggery as livelihood option**

Likewise, in the case of selection of piggery as a future option, five determinants were responsible.These are average annual income ≤ Rs.46,000.00, education level above high school passed, farm size of 0. 01-0. 04 ha, age group of 36-50 years and all types of family (joint and nuclear), and family size ≥5 .These 20% factors are dominant over the rest factors. If effort will give to the farmers having these characteristics, then 80% result will achieved with 20% effort.

**CHART-6: Pareto chart analysis to identify the determinants of small and marginal farmers’ choice of piggery as livelihood strategies**

The Pareto analysis shows that it can be able to identify the important determinants of choices of livelihood as found by various past studies. The findings of the study may be utilised for the study location for planning and extension activities.

1. **CONCLUSION**

The study was conducted to determine the major determinants in the choice of alternate livelihood of smallholder farmers in climate- vulnerable situations in three districts of Assam. The study adopted Pareto Analysis to determine the dominant factors. It was found that though farmers had many choices, only a few were dominant. These were paddy, fishery, piggery and vegetables. Therefore, instead of giving full focus to all the choices only the dominant choice should be intervene properly. The pareto chart in this case suitably shows where effort should be made to get maximum results. It will ultimately save resources and farmers will also benefit from them properly. The study also suggests that in such a type of study, Pareto analysis can be used easily, and focus on the main points of intervention which is generally not practised in agriculture. The study implies that in farmers’ decision-making, minor factors are influencing, so factors should be critically analysed.

Disclaimer (Artificial intelligence)

Option 1:

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**

Abdulai, A. & A. Crole-Reese (2001), Determinants of Income Diversification amongst Rural Households in Southern Mali, *Food Policy*, 26( 4)437-452.

Agyeman B. A. S., S. Asuming-Brempong & E. E. Onumah (2014), Determinants of Income Diversification of Farm Households in Western Region of Ghana, *Quarterly Journal of International Agriculture*, 53( 10), 55-72.

Begum, A., & Mahanta, R. (2017). Adaptation to climate change and factors affecting it in Assam. *Ind. Jn. Of Agri. Econ.*, *72*(3), 446–455. Retrieved from <https://www.isaeindia.org/wp-content/uploads/2020/11/16-Article-Ratul-mahanta.pdf>

Block, S., & Webb, P. (2001). The dynamics of livelihood diversification in post-famine Ethiopia. *Food Policy*, *26*( ), 333–350.

Deka, H. (2025). Assam to see higher temps, lesser rainfall by 2040: study. *The Times of India*. Retrieved from [https://timesofindia.indiatimes.com](https://timesofindia.indiatimes.com/)

Deka, P., Chowdhury, G., & Saha, A. K. (2024). Impact of land use and land cover changes on population dynamics in flood-prone Majuli Island, Assam, India. *Human Ecology*, *52*(3), 531–548. <https://doi.org/10.1007/s10745-024-00504-6>

Directorate of Char Areas Development, Govt. of Assam. (2024). *History | Directorate of Char Areas Development | Government of Assam, India*. Retrieved from <https://dircad.assam.gov.in/about-us/history-0>

District Agricultural Office | Majuli District | Government of Assam, India. (2022). Retrieved from https://majuli.assam.gov.in/departments/district-agricultural-office

Ellis, F. (2000). *Rural Livelihood and Diversity in Developing Countries*, Oxford University press, New York.

Ellis, F. (2008). Determinants of rural livelihood diversification in developing countries. *Journal of Agricultural Economics*, *51*(2), 289–302.Ellis, Frank (1998), Household Strategies and Rural Livelihood Diversification, *Journal of Development Studies*, 35(1), 1-38.

Ellis, F. (1999). Rural livelihood in developing countries: Evidence and policy implications. *Natural Resource Perspective*, *40*, 1–10.Express News Service. (2022, September 16). Climate change: Assam has 15 of India’s 25 most vulnerable districts. *The New Indian Express*. Retrieved from <https://www.newindianexpress.com/nation/2022/Sep/16/climate-change-assam-has-15-of-indias-25-most-vulnerable-districts-2498876.html>Ezung , T. Z. (2021). Livelihood diversification in Nagaland. *International Journal of Management and Social Sciences*, 6(2),28-32.

Food and Agriculture Organization. (2001). *Farming systems and poverty: improving farmers’ livelihoods in a changing world*.Retrieved from https://www. fao. org/family-farming/detail/en/c/273641/

Fortea, C., Antohi, V. M., Zlati, M. L., Ionescu, R. V., Lazarescu, I., Petrea, S. M., & Cristea, D. S. (2022). The dynamics of the implementation of organic farming in Romania*. Agriculture*, 12(6), 774. Retrieved fromhttps://doi.org/10.3390/agriculture12060774

Habib, N., Rankin, P., Alauddin, M., & Cramb, R. (2023). Determinants of livelihood diversification in rural rain-fed region of Pakistan: Evidence from fractional multinomial logit (FMLOGIT) estimation. *Environmental Science and Pollution Research International*, 30(5), 13185–13196. Retrieved from https://doi.org/10.1007/s11356-022-23040-6

ICAR-CRIDA. (n.d.). *State:Assam-Agriculture Contingency Plan for District: Jorhat*. Retrieved from https://www.icar-crida.res.in/CP/Assam/ASSAM19-Jorhat.pdf

Jorhat climate: Weather Jorhat & temperature by month. (n.d.). Retrieved from https://en.climate-data.org/asia/india/assam/jorhat-764433/

Judit, J; Bruno Wichmann & Brent, M. Swallow (2017), Characterizing Social Networks and their Effects on Income Diversification in Rural Kerala, India, *World Development*, 94(June), 375-392.

Khan, F. S., Islam, M., Gatoo, A., Bhat, G., Parrey, A., Bakshi, & Atta, U. (2024). Socioeconomic determinants of livelihood dependence on forestry resources in Leh Himalaya, *India. Journal of Scientific Research and Reports*, 30(12), 494–502. Retrieved from https://doi.org/10.9734/jsrr/2024/v30i122694

Khatun, D.& B. C. Roy (2012), “Rural Livelihood Diversification in West Bengal, *Agricultural Economics Research Review*, 25( 1), 115-124.

Kisku, D. , & Ghosh, S. (2017). Crop diversity and farmers’ livelihood in an agriculturally prosperous district of West Bengal. *Indian Journal of Extension Education*, 53(1), 15–20.

Lipovetsky, S. (2009). Pareto 80/20 Law: Derivation via random partitioning. *International Journal of Mathematical Education in Science and Technology* (Taylor & Francis), 40(2), 271–277.Retrieved from https://doi.org/10.1080/00207390802213609

Loison, S. A. (2015), Rural Livelihood Diversification in Sub-Saharan Africa: A Literature Review, *World Development*, 51( 9), 1125-1138.

Ministry of Development of North-East Region. (2023). *Vulnerability to climate change.* Retrieved from https://pib.gov.in/PressReleasePage.aspx?PRID=1907725

Onuwa, G., Mailumo, S., Chizea, C., & Alamanjo, C. (2022). Socioeconomic determinants of livelihood diversification among arable crop farmers in Shendam, plateau state, Nigeria. *Agricultural Socio-Economics Journal*, 22(4), 301–309. Retrieved from https://doi.org/10.21776/ub.agrise.2022.022.4.7

Ovah, R., Aku, R., Sar, S., Okrupa, M., & Hati, H. (n.d.). The vital few and trivial many: An empirical analysis of the Pareto distribution of farmer constraints and policy intervention in the Highlands districts of Papua New Guinea. *https://www.academia.edu/*. Retrieved from https://www.academia.edu/41014490/The\_vital\_few\_and\_trivial\_many\_An\_empirical\_analysis\_of\_the\_Pareto\_Distribution\_of\_farmer\_constraints\_and\_policy\_intervention\_in\_the\_Highlands\_districts\_of\_Papua\_New\_Guinea

Raj,T. (2010). Diversification of small and marginal farms in Himachal Pradesh. *UP* *Journal of Agricultural Economics,* 7(4),7-16.

Ramachandran, N. (2022). Climate change and disappearing habitats: the case of Majuli Island in northeast India. In *Springer eBooks* (pp. 87–100). Retrieved from https://doi.org/10.1007/978-3-031-12586-7\_5

Roy, P., Chakraborty, M., Roy, S., Kunar, S., Chowdhury, P., Bhattacharjee, A., . . .& Biswas, B. (2024). *District survey report, Assam. Jorhat*. Retrieved from https://jorhat.assam.gov.in/sites/default/files/public\_utility/DsrJorhat.pdf

Saha, B. & R. Bahal (2014), Livelihood Diversification Pattern among the Farmers of West Bengal, *Economic Affairs*, 59, ( 3), 395-409.

Shah Khan,F.A., Islam M.A., Gatoo A.A. , Bhat, G.M. , Parrey A.A. , Bakshi M.R.,&Ummar Atta(2024) Socioeconomic determinants of livelihood dependence on forestry resources in Leh Himalaya, India. *Journal of Scientific Research and Reports*.30(12)494-502 Retrieved from https://journaljsrr.com/index.php/JSRR/article/view/2694/5789

Start, D. (2001). The rise and fall of rural non-farm economy: poverty impacts and policy options. *Development Policy Review*, 19 (4), 491–505.

Subramanian (2018). *Participation of rural households in farm, non-farm and pluri-activity: evidence from India*, Working Paper 412, Institute of Social and Economic Change, Bangalore.

Surayya, T.;Krishna, K;. Sharma, R.; Karla, S.; Kujur, S.S,; Bala, S.; & Basnayat, B. (2008). Sericulture based micro enterprise as a source of rural livelihood and poverty alleviation: A case study of Anantapur. *Journal of Rural Development* 27(1): 149-176.

Walker, T. S. & Ryan, J. G. (1990), *Village and Household Economies in India’s semi-Arid tropics, Baltimore*.John Hopkins University Press.

Washo, J. A., Tolosa, S. F., & Debsu, J. K. (2021).Determinants of rural households’ livelihood diversification decision: The case of Didessa and Bedelle District, Bunno Bedelle Zone, Oromia Regional State, Ethiopia. *African Journal of Agricultural Research*, 17 (12), 1573–1580.

Workie, Dejene Mamo,( 2023). Livelihood Diversification Strategies and Determinants by Smallholder Farmers in the Highland Areas of North Shewa Ethiopia, *Journal of Agribusiness and Rural Development*, University of Life Sciences, Poznan, Poland, vol. 68(2).