Research Article

Indian Journal of Extension Education
Vol. 59, No. 2 (April–June), 2023, (41-45)

ISSN 0537-1996 (Print)
ISSN 2454-552X (Online)

Assessing Composite Livelihood Security and its Determinants Among Rural Households

Maneesh Mishra[1], S. C. Ravi[2]*, Anil Kumar Verma[3], Alok Kumar Gupta[4], Shantanu Kumar Dubey[5] and Rohit Jaiswal[6]

[1]Principal Scientist, Department of Crop Improvement & Biotechnology, [2,3,4]Scientist, Division of Post-harvest Management, [6]Senior Research Fellow, ICAR-CISH, Lucknow, [5]Director, ICAR-ATARI, Kanpur, Uttar Pradesh, India
*Corresponding author email id: ravisc3@gmail.com

ARTICLE INFO

Keywords: Living security index, Principal component analysis, Wealth security, Food insecurity, Small & marginal farmers, Socio-economic factors

http://doi.org/10.48165/IJEE.2023.59209

Conflict of Interest: None

ABSTRACT

The study was conducted during 2022 in Lucknow district of Uttar Pradesh to analyze the livelihood security of rural households. Data was collected from 515 households through personal interview method using kobo collect. Landless and marginal farmers were more food insecure in the region. Forty four % of the households were food insecure. Composite livelihood security index was constructed using six domain indicators *viz*., habitat, health, economic, food, nutrition and social participation security. The weight for each domain indicator was derived from principal component analysis. The composite livelihood security index was 0.44 among the respondents. The livelihood security was high for medium farmers (0.46) followed by small farmers (0.45). Farming experience, social participation, livestock possession, income, calorie intake, body mass index and wealth significantly influenced the livelihood security. Lack of awareness on pest and disease control and poor price realization were the major constraints faced by the farmers. Technological, institutional and policy interventions are necessary to enhance their livelihood status.

INTRODUCTION

Post COVID-19 pandemic, the agriculture and allied industry emerged as the most resilient sector of the economy in India (Cariappa et al., 2021). More than half of the labour force is employed in this sector, and accounts for almost 20 per cent of GDP.As the nation's leading agricultural producer, Uttar Pradesh is known as the "Granary of India" for its abundance of wheat, sugarcane, mangoes, and other staple foods. Around 65 per cent of the state's population works in agriculture, and it also makes a sizable economic contribution to the state. Agriculture in the state is important to national food security, but its low productivity necessitates policies geared toward increasing crop yields (Jose et al., 2022). In addition, 30.4 per cent of its rural population is poor, surpassing the national average of 25.7 per cent (Anonymous, 2021a). This places the state among the poorest in India. Lucknow being the capital city of UP is being acclaimed for its most famous Dashehari mango production. Mall is one of the major fruit belt accounts for mango cultivation over an area of 28,000 ha. Mango cultivation is the major source of livelihood for the farmers. However, its contribution alone to sustain the livelihood is decreasing over the years (Mishra et al., 2019). To become a developed nation, we must prioritize the well-being of its pro-poor marginal and small farmers. Understanding the farmers' socioeconomic status and the resources available and accessible to them is essential before developing strategies to raise farmers' income through diversification, collective actions, and the adoption of technology interventions. This study has been conducted as a part of baseline survey of second phase of ICAR funded Farmer First Project. This project is designed to provide farmer centric research and technical guidance in view of increasing their livelihood security and doubling farm income. In light of these considerations,

Received 25-01-2023; Accepted 07-03-2023

this research fills a gap in our knowledge of the economic stability of rural households in eastern Uttar Pradesh. A livelihoods approach can serve as a checklist of critical factors to be taken into account in order to develop appropriate measures (La Rovere & John, 2007). Every location is different and needs a tailored approach to reshape agricultural growth trajectory, this work differs from previous research in that it examines micro-level data to identify reasons restricting the sustainable livelihood of rural households.

METHODOLOGY

The survey was conducted in three villages of Lucknow district of Uttar Pradesh namely Dhakwa, Bhanpur and Hasnapur. These three villages were chosen purposively as these are the project implementation areas. We used a random selection technique to select 515 houses out of a total of 1604 to participate in the study during 2022. Kobo toolbox/collect was used for personal interview method. Herfindhal index was used to measure the extent of crop diversification (Rahman et al., 2009; Ogundari, 2013).

$$HI = \sum_{i=1}^{N} P_i^2$$

Where, Pi represents acreage proportion of the i^{th} crop in total cropped area. The value of zero indicates complete diversification.

The multifaceted aspects of livelihood security include six domain indicators: habitat, health, economic, food, nutrition and social participation security. Based on the broad literature review and discussion with experts, sub- indicators of the domain indicators were chosen.

The sub-indicators were first normalized (Bhavya et al., 2020; Sridhara et al., 2022, Sendhil et al., 2018) to the scale of zero (0) and one (1), premised on their functional relationship with the livelihood security. The indicator has a positive relationship ("more is better") then equation (a) and if the indicator had negative relationship ("less is better") then equation (b) was employed.

$$Y_{ij} = \frac{K_{ij}\text{-}Min(X_{ij})}{Max(X_{ij})\text{-}Min(X_{ij})} \quad \text{... (a)}$$

$$Y_{ij} = \frac{Max(X_{ij})\text{-}K_{ij}}{Max(X_{ij})\text{-}Min(X_{ij})} \quad \text{... (b)}$$

Where, Where, Y_{ij} is the index for the i^{th} indicator related with j^{th} individual, Max (X_{ij}) and Min (X_{ij}) are the maximum and minimum values of the indicator variable X_i. Further, index for the particular domain was constructed by averaging the standardized indicators.

In our study, Principal component analysis was used for construction of weights. Three components explained 62 per cent of the total variation. The weights from the PCA were calculated with the following equation (Balaganesh et al., 2020).

$$W_i = \sum |L_{ij}| E_j$$

Where, W_i represents weight of the i^{th} variable, L_{ij} represents the Eigen value of the j^{th} factor and E_j represents the loading value of the i^{th} variable on j^{th} factor.

Finally the Livelihood Security Index (LSIs) for each household has been calculated by weighted average method. Livelihood security index, the households were categorized as high, medium and low using mean and standard deviation as represented below (Sendhil et al., 2018; Balaganesh et al., 2020).

- High = Index > (Mean + 0.5 SD) = <0.403
- Moderate = (Mean – 0.5 SD) < Index < (Mean + 0.5 SD) = 0.403 to 0.472
- Low = Index < (Mean – 0.5 SD) = >0.472

RESULTS AND DISCUSSION

The majority of the households relied on agriculture for a living. The total net cropped area (TNCA) was 222 ha, whereas the total gross cropped area (GCA) was 347 ha (Table 1). The cropping intensity was 157 per cent. The region's primary perennial fruit crop, mango, occupies 27 per cent of the gross crop area (GCA), second only to cereals in terms of land use. During the Kharif and Rabi seasons, rice and wheat are the most common cereal crops farmed by farmers of all economic strata. In order to determine the degree of diversification practiced by various types of farm households, the Herfindhal index of crop diversification was developed. Results clearly indicated that medium farmers were more diversified compared to small and marginal farmers. Marginal farmers having very small area cannot diversify as economies of scale may not work, hence collective input procurement, branding and output marketing may be emphasized through formation of producer organization. Thus there is a need to encourage and motivate farmers for collective action.

Livelihood security of the households

These six sub-indicators contributed in different ways to each respondent's overall livelihood security. Habitat security, economic security, composite food security, nutritional security and the overall livelihood security of the households were statistically different across different categories in the study area (Table 2). However, they were indifferent with regard to health and social participation security. The overall livelihood security of the rural households was just 0.44 in the study area. Health security contributed the most (0.91) to the overall livelihood security of the respondents. The results are in line with the study of (Gautam & Jha, 2023). The mean livelihood security levels were high for the medium farmers (0.46), followed by small (0.45) and marginal farm households (0.43). This is because medium-sized farms typically have larger land holdings, giving their owners more options to diversify their farm activities. They not only depend

Table 1. Cropping pattern of the households

Particulars	Marginal	Small	Medium	Overall
Households (%)	40	24	28	100
Gross Cropped Area (ha)	55.22	83.98	208.09	347.26
Net Cropped Area (ha)	31.43	50.59	139.81	221.82
Cropping Intensity (%)	175.69	166.00	148.84	156.55
Crop Diversification Index	0.52	0.41	0.37	0.45

Note: Eight % of the sample respondents were landless

Table 2. Indicators of livelihood security index of the sample households

Particulars	Marginal	Small	Medium	Landless	Overall	F value
Habitat security	0.71	0.76	0.83	0.59	0.75	23.68**
Health security	0.91	0.93	0.90	0.94	0.91	0.30^{NS}
Economic security	0.10	0.13	0.21	0.09	0.14	62.49**
Food security	0.43	0.43	0.46	0.37	0.44	7.08**
Nutrition security	0.56	0.61	0.56	0.49	0.56	2.62*
Social participation security	0.07	0.04	0.05	0.07	0.06	0.92^{NS}
Livelihood security	0.43	0.45	0.46	0.39	0.44	11.04**

Note: ** and * - significance at one and five per cent, respectively and NS - Non significant

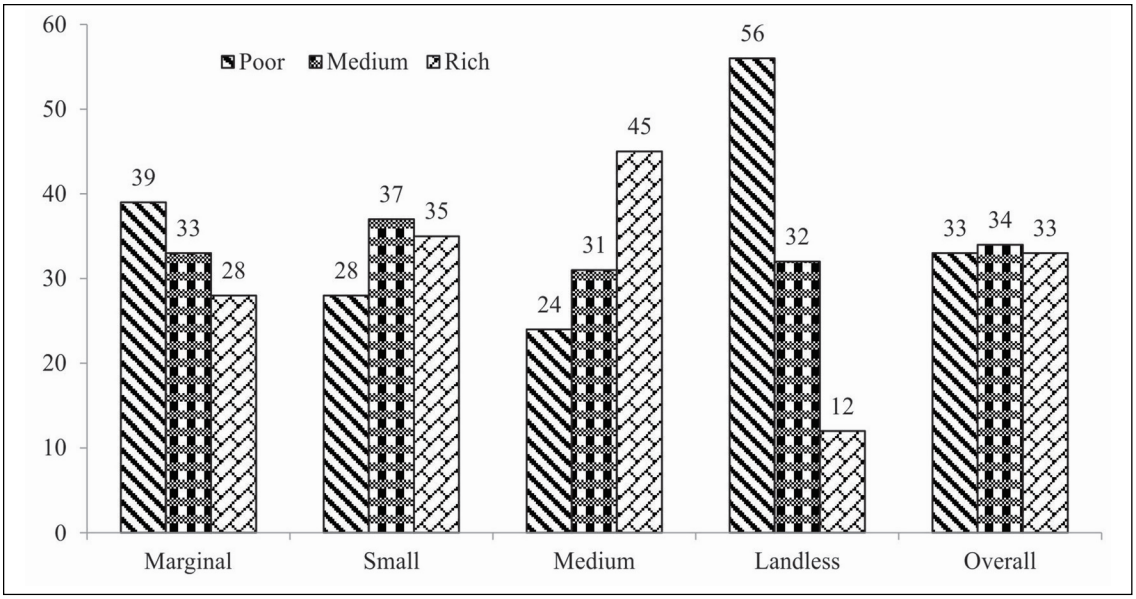

Figure 1. Categorization of households according to livelihood security (%)

upon farming but also invested their income into various other ventures which helped them to achieve higher livelihood in comparison. Marginal and small farmers had very less farm area and because of the operation of diseconomies of scale, diversification was also less and their livelihood was also dependent upon daily wages. Landless households had very low livelihood security level (0.39) owing to the fact that their livelihood was mainly dependent upon daily wages and the availability of work was highly fluctuating.

The households had very high level of health security (0.91) and habitat security (0.75) in the region. This is due to the availability of good health facilities at free of cost from the Government and majority of the households possessed Ayushman card (Pradhan Mantri Jan Arogya Yojana). The households were also the beneficiaries of various Government schemes/programmes such as Pradhan Mantri Avas Yojana (PMAY), Swachh Bharat Mission, Ujjawala yojana which helped them to achieve higher level of habitat security. However, the habitat security of landless households needs to be increased. The households had very low social participation and economic security. The income of the households was lower than the national average which needs to be enhanced through various technological interventions. It is also necessary to create avenues in the rural areas to check migration. Majority of the farmers are ready to quit agriculture if an alternative option is available. Social participation of the area needs to be enhanced by the creation of producers' organization and Self help groups in the study area. Economies of scale can be assured through collective input procurement and marketing. The female households need to be educated on the calorie intake requirements for healthy life and they should be given with a balanced consumption plan by the concerned department according to the local food habits.

In addition, we divided the households into groups based on their level of livelihood (Figure 1). Majority of the landless (56%) and marginal farm households (39%) had poor livelihood security. About 30 per cent of households across all the category of households had medium level of livelihood security. Most of the respondents (45%) from medium farmers had high overall livelihood security and 24 per cent of them had low livelihood security. Based on the analysis, it appears that the majority of respondents are in a precarious livelihood situation. Thus there is a need to enhance the livelihood of the farmers of the region through various technological interventions. Government agencies and policy makers need to focus on improving various parameters of socio-economic development in the study area not only to improve the livelihood security but all facets affecting it.

Factors influencing the livelihood security of the households

The factors affecting livelihood stability were evaluated using a multiple linear regression model. According to the coefficient of multiple determinations, the factors in the model explain 60 per cent of the variance in livelihood security. The model was significant at one per cent level of significance with an F stat of 62.95 (Table 3). Age was negatively and significantly influencing the livelihood security. Young age households are very energetic, eager and their desire to learn, seek jobs and risk taking ability is higher while these factors gets reduced as age proceeds. Majority of household head are young and it would be simple to persuade young people to use better technology. Workineh et al., (2020) found that the likelihood of technological adoption decreased significantly as the age of the household head increased. Studies by Mishra et al., (2020) & Pradhan et al., (2021) have also reported the negative relationship between age and livelihood security. Farming experience had a positive effect on livelihood status. Since most of them have moderate experience in farming (24 years), adopting new technologies may not have significant challenges. As experience increases, their capacity to cope with adverse situation increases thus making them to adopt suitable corrective measures to maintain their livelihood. The results are in line with Gautam & Jhan (2023) but contradict with the study of Pradhan et al., (2021).

The farmers who had involved in social participation had higher livelihood status. Collective action among the households increases the bargaining capacity which helps them to achieve the common goal collectively and plays a significant role in technology adoption (Kumar et al., 2017). Having access to formal credit and increased bargaining power are just two of the many benefits that farmer organizations like cooperatives and Farmer Producer Companies offer their members (Partiban et al., 2015; Marbaniang et al., 2019; Vijayakumar, 2021; Kumari et al., 2022). Other benefits include increased incomes, lower input and transaction costs, and new avenues for value-added activities like processing, distribution, and marketing (Bikkina et al., 2018). The results are in line with the work of Ramya et al., (2017); Pradhan et al., (2021); Gautam & Jhan (2023). Livestock ownership was associated with increased financial stability. In addition to providing essential sustenance, they are a vital asset and safety net for the disadvantaged, especially women (Hegde, 2006; Saxena, 2020).

Table 3. Factors affecting the livelihood security of rural households

Variables	β coefficient	t value
Gender of household head	0.0053^{NS}	0.81
Age	-0.0017**	-5.96
Education (years)	0.0002^{NS}	0.45
Family size (No.)	0.0003^{NS}	0.31
Farming experience (years)	0.0007**	2.46
Social Participation	0.0823**	11.81
Livestock Possession	0.0106**	2.11
Per-capita income (Rs./annum)	$1.48E^{-07**}$	2.43
Calorie intake (Kcal/CU/day)	$4.41E^{-05**}$	4.7
Wealth of the households	0.0099**	4.26
Nutritional security (BMI)	0.0052**	8.82
Farm land holdings (acre)	0.0049^{NS}	1.76
Intercept	0.2217**	7.69
Coefficient of multiple determination (R^2)	0.60**	F = 62.95

Note: ** - significant at one % and NS- Non Significant

Livestock possession has a considerable positive impact on equity in terms of income and employment and poverty reduction in rural areas, according to a number of empirical researches (Ali, 2007; Randolph et al., 2007; Deshingkar et al., 2008; Saxena et al., 2017). Income also positively influenced the livelihood. When one's financial situation is stable, they are in a better position to take advantage of novel approaches that strengthen their ability to make a living. The present finding is in line with Sunanda et al., (2014); Pradhan et al., (2021), Dagar & Upadhyay, (2022); Gautam & Jhan (2023). Calorie intake had a positive relationship with livelihood as energy is the important component to do work and carry out all activities needed to uplift their livelihood conditions. Wealth index and body mass index (BMI) positively influenced the livelihood.

Constraints faced by the farmers

The constraints faced by the farmers are presented in Table 4. Lack of awareness on pest and disease control, poor price realization, low productivity of mango, labour scarcity and lack of alternative livelihood avenues in rural areas were the major constraints faced by the farmers in the region.

Table 4. Major constraints faced by the farmers

Constraints	Rank
Lack of awareness on pest and disease control	I
Poor price realization	II
Low productivity of mango	III
Labour scarcity during peak season	IV
Lack of alternative livelihood avenues in rural areas	V
Huge post harvest loss and lack of processing facilities	VI
Lack of space utilization in orchards	VII
Lack of awareness on Government schemes	VIII
Lack of green fodder availability	IX

CONCLUSION

Crop diversification was low for marginal farmers enlightening the need of collective actions to reap the benefits of economies of scale. Though majority of the rural households were the beneficiaries of Public Distribution System (PDS), food insecurity was prevailing among them. There is a need to increase awareness regarding diversified consumption basket and energy obtained from consumption of such food. It was also observed that 67 per cent of the households belonged to poor and medium livelihood security level. Age, farming experience, social participation, livestock possession, income, calorie intake, BMI and wealth were the significant factors affecting the livelihood security. Based on the constraint analysis technological interventions such as diversification of farm activities, adoption of GAP in mango, creation of producer's organization, empowering rural women and youth for on farm processing of fruits and vegetables, weather based crop and pest management advisories are necessary to enhance their livelihood status.

REFERENCES

Ali, J. (2007). Livestock sector development and implications for rural poverty alleviation in India, *Livestock Research for Rural Development, 19*(2), 1-14.

Anonymous. (2021a). *Agricultural statistics at a glance 2021*. Department of Agriculture, Cooperation & Farmers Welfare, Directorate of Economics & Statistics, Government of India, pp 10.

Anonymous. (2021b). *Statistical Appendix Table 1.1 of Economic Survey 2021-22*. Ministry of Finance Department of Economic Affairs Economic Division, North Block, New Delhi. Government of India. (https://www.indiabudget.gov.in/economicsurvey/doc/stat/tab11.pdf)

Balaganesh, G., Malhotra, R., Sendhil, R., Sirohi, S., Maiti, S., Ponnusamy, K., & Sharma, A. K. (2020). Development of composite vulnerability index and district level mapping of climate change induced drought in Tamil Nadu, India. *Ecological Indicators, 113*, 1-11

Bhavya, A. P., Ashwini, B. C., & Umesh, K. B. (2020). livelihood security of farm households in eastern dry zone of Karnataka - An economic analysis. *International Journal of Current Microbiology and Applied Sciences, 9*(8), 2951-2960.

Bikkina, N., Turaga, R. M. R., & Bhamoriya, V. (2018). Farmer producer organizations as farmer collectives: A case study from India. *Development Policy Review, 36*(6), 669-687.

Cariappa, A. A., Acharya, K. K., Adhav, C. A., Sendhil, R., & Ramasundaram, P. (2021). Impact of COVID-19 on the Indian agricultural system: A 10-point strategy for post-pandemic recovery. *Outlook on Agriculture, 50*(1), 26-33.

Dagar, A., & Upadhyay, R. (2022). Factors affecting livelihood security of the tribal women in crop based livelihood activities. *Indian Journal of Extension Education*, *58*(2), 163-166.

Deshingkar, P., Farrington, J., Rao, L., Akter, S., Sharma, P., Freeman, H. A., & Reddy, J. (2008). Livestock and poverty reduction in India: findings from the ODI livelihood options Project. *ILRI Discussion Paper*.

Gautam, P. K., & Jha, S. K. (2023). Analysis of livelihood security of households: a case study from rural areas of Bundelkhand. *Indian Journal of Extension Education*, *59*(1), 146-149.

Hegde, N. G. (2006). Livestock development for sustainable livelihood of small farmers. Souvenir of the 39th Annual General Meeting and 48th National Symposium on Emerging Rural India – A Challenge to Livestock Industry (CLFMA), Manesar, Haryana, pp 50-63.

Jose, S., Hussain, S., & Gulati, A. (2022). *Performance of Agriculture in Uttar Pradesh Region Wise Analysis. Indian Council for Research on International Economic Relations (ICRIER)*, pp 11-12.

Kumar, S., Shamna, A., & Jha, S. K. (2017). Adoption of production technologies among jute growers in West Bengal. *Journal of Community Mobilization and Sustainable Development*, *12*(2), 216-222.

Kumari, N., Malik, J. S., Arun, D. P., & Nain, M. S. (2022). Farmer producer organizations (FPOs) for linking farmer to market. *Journal of Extension Systems, 37*(1), 1-6.

La Rovere, R., & John, D. (2007). Operational guidelines for assessing the impact of agricultural research on livelihoods. *Good practices from CIMMYT.* No. 560-2016-38864.

Marbaniang, E. K., Chauhan, J. K., & Kharumnuid, P. (2019). Farmer producer organization (FPO): the need of the hour. *AGRICULTURE & FOOD: e- Newsletter (www. agrifoodmagazine. co. in) e-ISSN*, 2581-8317.

Mishra, B. P., Kanwat, M., Gupta, B. K., Meena, N. R., Mishra, N. K., & Kumar, P. S. (2020). Correlates of adoption of improved apiculture practices in Arunachal Pradesh. *Indian Journal of Extension Education, 56*(2), 51–54.

Mishra, M., Gurjar, P. S., Verma, A. K., & Rajan, S. (2019). Socio-economic and resource profile of three villages in Malihabad, Uttar Pradesh. *Green Farming, 10*(3), 387-390.

Ogundari, K. (2013). Crop diversification and technical efficiency in food crop production: A study of peasant farmers in Nigeria. *International Journal of Social Economics*, *40*(3), 267-287.

Parthiban Sakthi, R., Nain, M. S., Singh, R., Kumar, S., & Chahal, V. P. (2015). Farmers' producer organisation in reducing transactional costs: a study of Tamil Nadu mango growers' federation. *Indian Journal of Agricultural Science, 85*(10), 1303-1307.

Pradhan, S., Naberia, S., Harikrishna, Y. V., & Jallaraph, V. (2021). Socio-economic correlates of livelihood security of small farmers in Jabalpur District of Madhya Pradesh. *Indian Journal of Extension Education*, *57*(3), 57-59.

Rahman, S. (2009). Whether crop diversification is a desired strategy for agricultural growth in Bangladesh? *Food policy*, *34*(4), 340-349.

Ramya, H. R., Satya Gopal, P. V., Prasad, S. V., & Raja, L. (2017). Characteristics determining the livelihood security of the tribal farmers. *International Journal of Current Microbiology and Applied Sciences*, *6*(7), 4462-4470.

Randolph, T. F., Schelling, E., Grace, D., Nicholson, C. F., Leroy, J. L., Cole, D. C., Demment, M. W., Omore, A., Zinsstag, J., & Ruel, M. (2007). Invited review: Role of livestock in human nutrition and health for poverty reduction in developing countries. *Journal of Animal Science*, *85*(11), 2788-2800.

Saxena, N. C. (2020). Land, livestock and the rights of women in rural India. In *Women, Land & Power in Asia* (pp. 224-247). Routledge India.

Saxena, R., Singh, N. P., Choudhary, B., Balaji, S. J., Paul, R. K., Ahuja, U., Joshi, R., Kumar, R., & Khan, M. S. (2017). Can livestock sector be the game changer in enhancing the farmers' income? reinvesting thrust with special focus on dairy sector. *Agricultural Economic Research Review*, *30*, 59-76.

Sendhil, R., Jha, A., Kumar, A., & Singh, S. (2018). Extent of vulnerability in wheat producing agro-ecologies of India: Tracking from indicators of cross-section and multi-dimension data. *Ecological Indicators*, *89*, 771-780.

Sridhara, S., Gopakkali, P., Manoj, K. N., Patil, K. K. R., Paramesh, V., Jha, P. K., & Prasad, P. V. (2022). Identification of sustainable development priorities for agriculture through sustainable livelihood security indicators for Karnataka, India. *Sustainability*, *14*(3), 1831.

Sunanda, T., Singh, M. K., Ram, D., & Chaudhary, K. P. (2014). Assessment of the sustainable livelihoods of Loktak Lake islanders in Bishnupur district of Manipur. *Indian Research Journal of Extension Education*, *14*(3), 70-74.

Vijayakumar, A. N. (2021). Farmer producer organisation: an emerging business model for empowering small and marginal farmers in India-a case study. *International Journal of Indian Culture and Business Management, 24*(4), 481-502.

Workineh, A., Tayech, L., & Ehite, H. K. (2020). Agricultural technology adoption and its impact on smallholder farmers welfare in Ethiopia. *African Journal of Agricultural Research, 15*(3), 431-445.