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RESEARCH PAPER

Assessing Livelihood Security of Farmers Adopting Integrated Farming Systems: A Study in Nadia District, West Bengal

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ABSTRACT

The present investigation assesses the livelihood security of the respondents who are mainly involved in practicing the Integrated Farming System (IFS) in various regions of Nadia District in West Bengal. The methodology used the ex-post facto research design. A seven-dimensional Livelihood security index was developed. The different dimensions identified were economic security, food security, social security, health security, educational security, infrastructural security and institutional security. Data were gathered from 80 farmers across eight villages in the district. Results showed that a low level of livelihood security index (LSI- 0.295) revealed that the occupation agriculture solely is not able to secure the livelihood of the farmers. This implied that intensification and diversification of farming enterprises played an important role in narrowing down the gaps between the socio-economic groups and remove the regional disparities in the livelihood security levels of farmers.

HIGHLIGHTS

- The study investigates livelihood security of farmers practicing Integrated Farming Systems (IFS) in Nadia District, West Bengal.
- This low LSI indicates agriculture alone is inadequate for securing farmer livelihoods.
- Intensification and diversification of farming enterprises are deemed essential.

Keywords: Agricultural diversification, ex-post facto study, integrated farming systems, livelihood security index

Livelihood is the means by which individuals sustain themselves, livelihood security is attributed to sustainable access to resources which allow social systems to fulfil their basic needs. This encompasses sufficient access to food, clean water, healthcare, education, housing and opportunities for community engagement and social inclusion. A livelihood includes the assets such as resources, skills and activities necessary for sustaining a living. Livelihoods of households are secured when they have the ownership or access to the resources as well as various income-generating activities.

In India, where a significant portion of the population (70%) relies on agriculture as a profession, the integration of various farming enterprises or the Integrated Farming Systems (IFS) may be included as one of the strategies to enhance the adaptability, resilience and sustainability in agricultural scenario.

Integrated Farming Systems (IFS) are widely adopted to enhance productivity and sustainability

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but there is a lack of multidimensional assessment of livelihood security at the regional level, particularly in Nadia District of West Bengal. Farmers focus mainly on economic or agronomic benefits, with limited attention to broader livelihood aspects such as food, health, education, infrastructure and institutional support. This study addresses the gap by developing a seven-dimensional Livelihood Security Index within an ex-post facto framework, offering localised, data-driven insights into the role of IFS in improving livelihood security and reducing socio-economic disparities.

Literature Review

Mishra and Debata (2021) developed a Livelihood Security Index (LSI) to assess the livelihood security of respondents, considering factors such as habitat security, health security, food security, and economic security. Their findings indicate that participation in the program positively and significantly enhances livelihood security.

In a study conducted by Singh and Nayak (2020), which examined seven dimensions of livelihood security namely infrastructure security, agricultural sustainability, economic security, social security, food security, environmental security, and health security it was found that the Bundelkhand region has the lowest livelihood security compared to other agro-climatic zones. The main reasons for this lower livelihood security include limited access to essential services, inadequate social and health support, and a heavy reliance on agriculture for income.

Singh and Hiremath (2010) noted that the sustainable livelihood security index can help reconcile the interests of various groups, such as economists, environmentalists, and egalitarians, by addressing their shared concerns. This index can provide guidance for achieving sustainable development and serve as both an educational tool and a policy framework to promote a holistic perspective among planners, administrators, and development professionals.

Methodology

An ex-post-facto research design has been adopted for this present investigation, as the phenomenon under investigation had already occurred. As per Kerlinger (1973), an ex-post-facto research is a systematic empirical inquiry in which the researcher does not have direct control over the independent variables because their manifestations have already occurred or they may not be inherently manipulated.

The geographical area selected for this study encompassed the Nadia District of West Bengal, specifically focusing on key agricultural areas within its four subdivisions: Krishnanagar Sadar, Kalyani, Ranaghat and Tehatta. From the numerous community development blocks within these subdivisions, a targeted selection was made. Specifically, Kaliagangh, Nakashipara, Chapra, Krishnanagar I, Krishnanagar II, Nabadwip, and Krishnagangh (Krishnanagar Sadar); Chakdaha and Haringhata (Kalyani); Haskhali, Shantipur, Ranaghat I, and Ranaghat II (Ranaghat); and Karimpur-I, Karimpur-II, Tehatta-I, and Tehatta-II (Tehatta) were considered. Ultimately, a random selection of one block per subdivision, followed by two villages per block, resulted in an eight-village sample for detailed investigation.

From each of those selected villages ten farmers were chosen using random sampling method, leading to a total of 80 respondents. The criteria for selecting farmers was that the farmers must have at least two agricultural enterprises and derive income solely from the integrated farming system at the time of investigation, dairy farming must be one of the enterprises in their integrated farming system and the respondents should have a minimum of five years of experience in farming.

For measuring the livelihood security of farmers engaged in IFS, a Livelihood Security Index (LSI) was being developed. The index was based on mainly seven components: Food Security, Economic Security, Health Security, Educational Security, Social Security, Institutional Security and Infrastructural Security (Gautam and Jha, 2022). A questionnaire containing 140 statements related to these seven indicators was sent to 70 judges. The judges were asked to mark each statement as Most Relevant, Relevant or Non-Relevant. Among them 54 judges responded and statements that received a score greater than 0.7 were selected for inclusion in the LSI. Finally, 64 items were incorporated into the index, with equal weightage assigned to all seven security components. The developed index was administered to 80 selected respondents from

different villages. Replies of the respondents were scored as '1' for positive responses and '0' for negative responses. The individual score obtained by each respondent was calculated by multiplying the weightage of the statements by the responses of the individuals ('0' or '1') for each statement. Households obtained scores below 0.67 were classified as having unsecured livelihoods.

Data Analysis

The statistical measures employed to evaluate livelihood security included several key indicators. The Censored Score involved disregarding the scores of households classified as unsecured by effectively censoring those livelihoods. The Multidimensional Headcount Ratio (H) represented the percentage of individuals within the population who achieved livelihood security. Additionally, the Intensity of Household Livelihood Security (L) indicated the proportion of the weighted score experienced by secured households across all potential dimensions of security. To calculate the Livelihood Security Index (LSI) for the respondents, the Multidimensional Headcount Ratio (H) was multiplied by the Intensity of Household Livelihood Security (L).

Multidimensional Headcount Ratio (H): The proportion of people (within a given population) who experienced livelihood security.

$$\textit{Multidimensional Headcount Ratio (H)} = \frac{\text{No.of persons having secured livelihood}}{\text{Total No.of persons}}$$

Intensity of Household livelihood security: The proportion of weighted score that the secured households experienced in a society out of all the total potential security dimensions that the society could experience.

$$\textit{Intensity of household livelihood security (L)} = \frac{\text{No.of family members} \times \text{censored score}}{\text{No.of persons having secured livelihood}}$$

Then livelihood security index (LSI) values of the respondents were calculated by multiplying Multidimensional Headcount Ratio and Intensity of Household livelihood security.

$$\textit{Livelihood Security Index} = H \times L$$

RESULTS

Overall Livelihood Security Status of the Respondents

According to Table 1, the Livelihood Security Index (LSI) for farmers engaged in Integrated Farming Systems within the study area was measured to be 0.295. This figure suggests that the livelihood security of the respondents is significantly low. It indicates that relying solely on agriculture enterprise as a family occupation does not sufficiently ensure a secure livelihood.

Table 1: Livelihood Security Index Value of the Respondents (n=80)

Indicator	Value
Multidimensional Headcount Ratio (H)	0.421
Intensity of Household Livelihood Security (L)	0.701
Livelihood Security Index (LSI)	0.295

Livelihood Security Status of Respondents Based on Various Combinations

An examination of Table 2 showed that respondents engaged in a combination of Crop, Dairy, Poultry, Fishery, and Horticulture achieved the highest Livelihood Security Index (LSI) of 0.732. Conversely, those who focused solely on Crop and Dairy recorded the lowest LSI of 0.065. The following combinations were evaluated:

Table 2: Livelihood Security Status of the Respondents for Different Combinations (n=80)

Sl. No.	Combinations	Multi-dimensional Head count Ratio (H)	Intensity of Household Livelihood Security (L)	Livelihood Security Index (HL)
1	Crop + Dairy	0.145	0.444	0.065
2	Crop + Dairy + Poultry	0.311	0.665	0.207
3	Crop + Dairy + Goatary	0.800	0.682	0.341
4	Crop + Dairy + Horticulture	0.686	0.716	0.491
5	Crop + Dairy + Fishery	1.000	0.706	0.706
6	Crop + Dairy + Poultry + Fishery + Horticulture	1.000	0.732	0.732

Livelihood Security Index for Different Community Development Blocks

Table 3 revealed that the LSI values varied across the different Community Development Blocks of district Nadia. The respondents from Black Ranaghat-II showed the highest livelihood security (LSI = 0.323), while those from Nabadwip block indicates the lowest (LSI = 0.248).

Table 3: Livelihood Security Index for Different Community Development Blocks in the Study Area (n=80)

Sl. No.	Block	Multi-dimensional Head count Ratio (H)	Intensity of Household Livelihood Security (I)	Livelihood Security Index (HL)
1	Haringhata	0.387	0.681	0.264
2	Ranaghat -II	0.456	0.707	0.323
3	Nabadwip	0.345	0.718	0.248
4	Tehatta - I	0.505	0.595	0.306

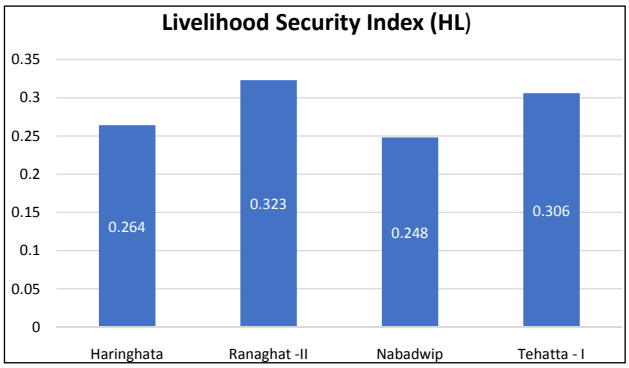

Fig. 1: Bar Diagram showing the Livelihood Security Index for Different Community Development Blocks in the Study Area (n=80)

DISCUSSION

Results from the present investigation indicated a significantly low level of livelihood security among farmers practicing IFS in different Community Development Blocks of Nadia District, with an overall LSI of 0.295. This score suggested that dependence on crop production activities alone is not enough for securing the rural livelihoods of the farmers. The analysis of enterprise combinations revealed that as the intensification and diversification increases, their livelihood security also enhances subsequently. Farmers who adopted more than one enterprise in addition to crop production venture, particularly those including fishery, obtained higher levels of security. In West Bengal, the factors influencing fish production were identified as the expansion of water areas dedicated to fish farming and the rising domestic demand for fish in the market (Dey *et al*. 2017).

The regional disparities in the community development blocks observed in LSI values highlighted the influence of local factors such as improved infrastructure facilities, market access and availability of resources on livelihood. The highest LSI in Ranaghat-II block were attributed to the innovative interventions and prevalent development activities in this area which in turn yields better result. While the lower scores in Nabadwip block indicated a requirement for focused development efforts.

Contrasting results were found by Gautam and Jha (2022) showed that majority of dairy farming households adopted integrated crop and livestock farming system, they derived income from both dairy and crop production and their overall average livelihood security index value was found to be 0.72. This may be due to mega biodiversity and vast dairy animal population in the Bundelkhand region (Rathod and Dixit, 2020).

A similar study conducted by Beeraladinni and Patil (2023) in Karnataka aimed to evaluate the agricultural sustainability status of the state for the year 2021–22 using the Sustainable Livelihood Security Index. The findings indicated a need to boost crop yields, promote dairy farming, and enhance workforce participation through training and skill development in districts with low economic efficiency.

The comparative analysis of these studies highlighted the critical role of diversification in enhancing livelihood security among farmers. Moreover, the regional disparities observed in LSI values across different studies highlight the need for context-specific interventions. Factors such as infrastructure development, access to markets and social capital should be considered when designing programs aimed at improving livelihood security. The current study's findings indicate that targeted support for resource development and training in Nadia District could facilitate the adoption of diversified farming practices, ultimately leading to improved livelihood outcomes.

To improve IFS adoption as well as addressing infrastructural disparities at the block level in Nadia District, it is essential to enhance farmer awareness through training programs and demonstration farms by highlighting the benefits of diversified farming. Access to credit, subsidies and financial services enable farmers to invest in multiple enterprises. In order to develop infrastructure such as irrigation systems, storage facilities and improved transport facilities will reduce regional disparities. Institutional support may be reinforced by expanding extension services, promoting FPOs (Farmer Producer Organizations) and collaborating with research institutions. Special attention may be given to vulnerable groups through targeted support system to foster equitable benefits. Regular monitoring using the Livelihood Security Index will help to identify the lagging areas, enabling focused interventions to enhance livelihood security effectively.

CONCLUSION

The present investigation underscores the inadequacy of agriculture as a sole livelihood strategy in Nadia District of West Bengal. In order to enhance the livelihood security, it is essential to intensify and diversify the Integrated Farming Systems that would incorporate multiple enterprises. Policymakers should aim at providing support for resource development, training and access to market facilities in order to facilitate the diversification farming practices and incorporate the additional enterprises into the farming system.

Limitations for Future Studies

The study's limitations include limited selection of socioeconomic factors influencing farmers as well as limited selection of respondents. Future studies should identify the socio-economic factors that influence the livelihood security and the potentiality for scaling innovative integrated farming models. The current study's findings, along with those from similar research, suggest that policymakers should prioritize the promotion of diversified Integrated Farming Systems that incorporate multiple enterprises. This strategy not only boosts economic stability but also strengthens food security and resilience to market fluctuations.

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