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Socio-economic and constraints analysis in implementation and adoption of Integrated Farming System (IFS) in Rewa division of Madhya Pradesh

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Abstract

In current study was conducted in Madhya Pradesh, with a focus on Rewa Division, particularly the districts of Rewa and Satna, to examine the socio-economic and psychological profile of respondents practicing in Integrated Farming System (IFS), and to identify the constraints and suggestions related to its adoption. A total of 320 farmers who had adopted the IFS model for at least three years were selected using random sampling method. The study employed an ex-post facto research design, and data were collected through a structured interview schedule. The study revealed that a majority of the farmers were middle-aged, male, belonged to OBC category, and had medium levels of education and farming experience. Most were marginal and small farmers living in joint families. Psychologically, farmers demonstrated medium levels of economic motivation, risk orientation, and innovativeness. Key constraints identified included lack of market facilities, inadequate government support, insufficient training, and weak resource recycling knowledge. Suggestions provided by farmers emphasized the need for increased government schemes, establishment of model units, formation of farmers' groups, regular training, and improved marketing facilities. The study underlines the importance of targeted policy support and capacity-building initiatives to strengthen the adoption of IFS in the region.

Keywords: Integrated Farming System (IFS), constraints, sustainable farming, adoption, knowledge

Introduction

Agriculture is the backbone of Indian economy but the share of agricultural GDP has fallen by 14 per cent in recent years (Gautam *et al.*, 2024) ^[6], and the average size of land holdings has shrunk by 85 per cent of the agricultural community (Joshi *et al.*, 2021) ^[10]. The Integrated Farming System (IFS) is an agricultural approach that merges various farm enterprises to support sustainable farming practices (Vyas *et al.*, 2025) ^[27]. Also referred to as the biologically integrated farming system, it addresses the rising need for increased food production while ensuring income stability and nutritional support, particularly for small and marginal farmers (Bhuiya *et al.*, 2014) ^[2]. This model incorporates resource-conserving techniques designed to deliver consistent yields and profitability, while reducing the harmful consequences of intensive agriculture and safeguarding natural ecosystems (Vyas *et al.*, 2025; Singh *et al.*, 2024) ^[28, 19]. IFS contributes to sustainable agriculture and rural growth by optimizing resource use, enhancing biodiversity, and lowering environmental damage (Bhagat *et al.*, 2024) ^[1].

Integrated Farming System approach is considered an effective means to enhance agricultural productivity and profitability, especially for small and marginal farmers. It

necessitates adequate planning and administration, good design, thorough analysis and overall implementation in order to increase agricultural farm production, profitability, and sustainability. Integrated Farming System (IFS) is a holistic agricultural approach that combines various agricultural and allied activities—such as crop cultivation, livestock rearing, aquaculture, agroforestry, and agro-processing—into a single, sustainable farming unit (Meena, 2022) ^[13]. By integrating these components, IFS aims to optimize resource use, enhance productivity, and promote environmental sustainability. Utilizes farm waste products as inputs for other components, reducing the need for external inputs and minimizing waste (Singh *et al.*, 2025) ^[20]. Provides multiple income streams, reducing financial risk and enhancing farm profitability. Promotes soil health, water conservation, and biodiversity, contributing to long-term ecological balance (Kumar *et al.*, 2025; Singh *et al.*, 2023) ^[11, 22]. Diversified systems are more adaptable to climate variability, reducing vulnerability to extreme weather events (Singh *et al.*, 2024) ^[21]. Ensures a varied diet for farming families through the production of diverse food items (Yadav *et al.*, 2023) ^[29]. “Integrated Farming System represents a sustainable and efficient approach to agriculture, especially suited for small and marginal

farmer". By integrating diverse agricultural activities, IFS enhances productivity, profitability, and environmental sustainability, contributing to the overall well-being of farming communities.

IFS is the best solution for small and marginal farmers. It improves both the nutritional and economic well-being of farm households, creates more job opportunities (Vala and Chavda, 2023)^[24], and maximizes the use of farm resources, leading to higher productivity. This approach makes agricultural production sustainable, profitable (increasing returns by 3 to 6 times), and productive over the long term. Approximately 90-95 percent of nutritional needs are met through resource recycling, which reduces cultivation costs and thereby boosts profit margins (Verma *et al.*, 2025)^[26].

The Integrated Farming System combines natural resources and regulatory processes within farming operations to maximize the replacement of external inputs. This approach ensures sustainable production of high-quality food and other products using environmentally friendly technologies, maintains farm income, minimizes or eliminates agricultural pollution, and supports the diverse functions of agriculture.

Methodology

The study was conducted in Madhya Pradesh. Madhya Pradesh was divided in 10 division Jabalpur, Indore, Gwalior, Chambal, Bhopal, Ujjain, Sagar, Rewa, Narmadapuram, and Shahdol. out of which Rewa division was selected. Rewa Division have 5 districts Rewa, Satna, Sidhi, Singrauli, and Mauganj. Among the five districts Rewa and Satna Districts were selected on the basis of previous research which showing the proper implementation of Integrated Farming System model. Satna district have 8 blocks, out of 8 blocks 2 blocks, namely Maiher and Majhgawan were nominated for the research study from Satna district and there are total 10 blocks in Rewa district, out of total 10 blocks 2 blocks, namely Rewa and Jawa selected for study from Rewa district on the source of determined the adaptation of (IFS Model) by the farmers. A separate list of villages were prepare for every block with the help of block officials on the basis of higher adoption of IFS model. From every block, villages list four villages (16 villages) were selected using random number table of random sampling. List of respondents were prepared with the help of *Gram Pradhan* on the basis of Using IFS model at least last three year. 20 respondents were selected from each village. Total 320 farmers were selected for the investigation.

Ex-Post Facto Design were used for the study as the events have already occurred. Therefore, these designs were measured appropriate. The study followed an *ex-post-facto* research design, where the researcher examines existing effects and traces them back to probable causes without manipulating the independent variables (Kerlinger, 1973).

The data collection was done with the help of the pre-structured schedule. The schedule was prepared with the help of previous research and experts of the relevant area. The schedule was rigorously checked in several time by the expert to maintain the uniqueness and relevancy. Schedule was also checked with implementation in 40 non-sampled farmers of the same area. Sample survey data were tabulated and analyse in bright of objective to check the relevancy and data uses for the study. After getting the approval of the

advisor and expert based on the result of sample survey. Personal interview technique was use to collect the response of the farmers.

Data was collected, arranged and analysed according to the objective. To analyse the data Frequency, Percentage, Arithmetic mean, Standard Deviation, Chi Square test and other appropriate tools used to get the result.

Frequency and Percentage

Frequency mentions to the number of times a specific value or group appears in a data set. It is commonly used in frequency distributions to show how often each data point or range of data points occurs. Percentage is a way of stating a number as a segments a part of 100. It is often applied to comparison proportions, and is calculated by dividing the part by the whole and multiplying by 100.

$$P = (n/N) \times 100$$

Where,

n= Frequency of a particular cell

N= Total no. of respondents in that particular cell

P= Percentage

Arithmetic Mean

The arithmetic mean, commonly known as the average, is the sum of all values in a data set divided by the number of values. The formula is:

$$\bar{X} = \frac{\sum X}{N}$$

Where,

$\bar{X}$ = Average number or mean value

$\sum X$ = The total no. of the scores obtained by respondents

N = The total no. of respondents

Standard deviation

That is the statistical measure that quantifies the amount of variation or dispersion in a set of data values. A low standard deviation indicates that the data points tend to be close to the mean, while a high standard deviation indicates that the data points are spread out over a wider range of values.

$$S.D. (\sigma) = \sqrt{\frac{\sum d^2}{n}}$$

Where,

σ = Statical standard deviation

d = Deviation of variables mean

n= Total no. of items

Chi-Square

Chi-Square was used with a .05 level of significance. The χ^2 test was first used by Karl Pearson in the year 1900. The χ^2 test is one of the simplest and most extensively non-parametric test in statistical works. The equation for Chi-Square (χ^2) is stated as follows:

$$\chi^2 = \frac{\sum (f_o - f_e)^2}{f_e}$$

Here,

f_o = In the occurrence of frequency of observed or an experimental determined fact

f_e = expected frequencies,

f_o = the occurrence of independent hypothesis

The probable frequency's E_i for circulation a given row.

$$E_i = \frac{\text{Row total} \times \text{column total}}{\text{Grand total}}$$

Row total = The sum of all observation frequency in a given row

Column total = the sum of the observed frequency in a given column

Grand total = the total no. of observations

Results and Discussion

Socio-economic data of farmers was recorded during the investigation period, and the findings are obtainable in Table 1. A majority of the farmers (60.32%) were in the middle age group (40 to 57 years), followed by 22.18% in the young age category (up to 40 years), and 17.50% in the old age category (above 57 years). This study's findings align with previous research by Mangala (2018) [12], Darandale (2010) [3], Singh *et al.* (2017) [18], Shwetha and Shivalingaih (2018) [18], Parmar (2018) [15], Ghosh *et al.* (2019a) [7], Deshmukh *et al.* (2020) [4], and Meshram *et al.* (2021) [14], all of whom observed a predominance of middle-aged farmers in their respective studies. This indicates that the farming activity is mainly carried out by middle-aged individuals who are relatively more experienced and active in farming. All of the respondents were male (100%), reflecting a complete absence of female participation in decision-making or land ownership. These results align with the result of Ghosh *et al.*, (2019b) [8]. Regarding educational status, 20.00% of the farmers were educated up to the intermediate level, followed by illiterate (16.89%), primary school (16.66%), middle school (16.56%), high school (15.23%) and college education (14.66%). This suggests a moderate literacy rate among farmers, though a significant proportion still lacked formal education. Caste-wise classification showed that 49.34% of the respondents belonged to the OBC category, 33.78% to General, 16.22% to SC, and only 0.66% to ST.

The relationships of family size, 64.06% of the farmers belonged to medium-sized families (3 to 6 members), while 22.82% had large families and 13.12% had small families. Most respondents (85.00%) lived in joint families, with only 15.00% belonging to nuclear families, suggesting a continued prevalence of traditional family structures in rural areas. In terms of housing pattern, 51.56% of the respondents reported having both kachha and pakka houses,

while 48.44% had fully pakka houses. Notably, no farmer reported living in a purely kachha house, suggesting improvements in rural housing infrastructure. Regarding farming experience, 64.37% had medium experience (24 to 37 years), 18.13% had high experience (above 37 years), and 17.50% had low experience (up to 24 years), indicating a mature farming population with adequate exposure to agricultural practices.

Analysis of landholding size showed that the majority were marginal farmers (51.89%), followed by small farmers (45.31%), while semi-medium, medium, and large landholders were very few, each accounting for less than 3% collectively. This confirms that IFS model is mainly practiced by small and marginal farmers, emphasizing the need for input-efficient and cost-effective technologies. In occupational terms, 33.44% of the farmers reported farming as their sole profession, while 27.45% were also engaged in service, 26.66% combined farming with caste-based occupations, and 12.45% supplemented their income through wage earning. In terms of annual income, 59.11% of the respondents had a medium income (₹1,50,000 to ₹3,00,000), followed by 25.00% in the low-income group (up to ₹1,50,000) and 15.89% in the high-income category (above ₹3,00,000). The same findings were supported by the findings of Darandale (2010) [3], Verma (2019) [25], Deshmukh *et al.*, (2020) [4] and Jadhav (2020) [9]. This pattern indicates a moderate earning potential through agriculture, with many farmers likely depending on additional sources of income.

With regard to social participation, 63.67% of farmers were members of one organization, 17.78% had membership in two organizations, while 17.88% reported no participation. Only 0.67% were associated with more than two organizations. These findings align with the findings of Prasad, 2019 Sivaraj *et al.*, (2017) [23], Singh *et al.*, (2017) [18], Verma (2019) [25], Deshmukh *et al.*, (2020) [4] and Jadhav (2020) [9]. This implies a moderate level of community engagement, with potential for improving linkages through cooperatives and farmer producer organizations.

Psychological attributes of the respondents revealed that 48.76% had medium economic motivation, 31.87% had high economic motivation, and 19.37% had low motivation. The result was in accordance with Shankaraiah and Swamy (2012) [17]. In terms of risk orientation, a dominant 90.32% of the farmers were found to have medium risk orientation, with only 6.87% showing low and 2.81% high risk-taking ability. The results were in accordance with the findings Govind *et al.* (2018). Most farmers (74.68%) also fell under the medium innovativeness category, followed by low (18.76%) and high (6.56%). This result matches up with the results of Fogya (2020) [5]. These findings suggest that while farmers are moderately motivated and somewhat open to innovation, they are also cautious and require confidence-building and assurance before adopting new technologies.

Table 1: Distribution of farmers According to their Socio-economic and Psychological profile.

Sr. No.	Particulars	Categories	Percentage
1.	Ages	Young (up to 40)	22.18
		Middle (40 to 57)	60.32
		Old (above 57)	17.50
2.	Gender	Male	100.00
		Female	0.00
3.	Education	Illiterate	16.89
		Primary school	16.66
		Middle school	16.56
		High school	15.23
		Intermediate	20.00
		College education	14.66
4.	Caste	General	33.78
		OBC	49.34
		SC	16.22
		ST	0.66
5.	Size of Family	Small (Up to 3 members)	13.12
		Medium (3 to 6 members)	64.06
		Large (above 6 members)	22.82
6.	Type of family	Nuclear	15.00
		Joint	85.00
7.	Housing Pattern	Kachha	0.00
		Pakka	48.44
		Both	51.56
8.	Farming Experience	Low (up to 24)	17.50
		Medium (24 to 37)	64.37
		High (above 37)	18.13
9.	Size of Land holding	Marginal (below 1 ha.)	51.89
		Small (1 to 2 ha.)	45.31
		Semi-medium (2 to 4 ha.)	2.22
		Medium (4 to 10 ha.)	0.33
		Large (10 ha. and above)	0.33
10.	Occupation	Farming & Caste occupation	26.66
		Farming & Wage earning	12.45
		Farming as sole profession	33.44
		Farming & Service	27.45
11.	Annual Income	Low income (up to 150000)	25.00
		Medium income (150000 to 300000)	59.11
		High income (above 300000)	15.89
12.	Social participation	No member of any organization	17.88
		Membership of one organization	63.67
		Membership of two organizations	17.78
		Membership of more than two organizations	0.67
13.	Economic motivation	Low (up to 15)	19.37
		Medium (15 to 17)	48.76
		High (above 17)	31.87
14.	Risk orientation	Low (up to 14)	6.87
		Medium (14 to 16)	90.32
		High (above 16)	2.81
15.	Innovativeness	Low (up to 4)	18.76
		Medium (4 to 7)	74.68
		High (above 7)	6.56

Table 3: Distribution of farmers according to constraints faced by the farmers in adoption of integrated farming system (IFS).

Sl. No.	Statement	Mean score	Rank
1.	Poor knowledge on resources recycling in IFS	0.46	5 th
2.	Poor knowledge of suitable cropping pattern system in IFS and their Interaction	0.61	8 th
3.	Lack of knowledge on latest technologies of IFS	0.99	9 th
4.	Lack of knowledge on uses of ICT tools in Farming	0.86	10 th
5.	Lack on training on skill work performance	1.00	3 rd
6.	No proper planning in selection of various farm enterprises units	0.65	4 th
7.	Insufficient waged labour	0.42	6 th
8.	Lack of government support and incentives for establishment of IFS unit	1.00	2 nd
9.	Lack of market facilities to sell their products	1.00	1 st
10.	Price Fluctuation	1.00	7 th

The table 3 show the various challenges faced by farmers in implementing the Integrated Farming System (IFS) model, ranked in descending order of significance. The most pressing issue, ranked 1st, is the lack of market facilities to sell IFS products, which significantly hinders farmers' ability to generate income. The second most important issue, ranked 2nd, is the lack of government support and incentives for establishing IFS units. Following this, farmers face challenges related to the planning and selection of various farm enterprises, ranked 4th, along with poor

knowledge in resources recycling (5th) and the need for more training in skill performance (3rd). Issues such as insufficient waged labor (6th), price fluctuations (7th), and poor knowledge about suitable cropping patterns and their interactions (8th) further compound the difficulties in IFS. The least concerning, though still significant, is the lack of knowledge about the latest IFS technologies (9th) and the use of ICT tools in farming (10th), both ranked at the bottom.

Table 3: Distribution of farmers according to suggestion provide by the farmers in adoption of integrated farming system (IFS).

SI. No.	Suggestions	Mean score	Rank
1	Government scheme should be increased for IFS	3.50	1 st
2	Provide timely input subsidy`	3.26	7 th
3	Provide financial support to farmers	2.80	11 th
4	Arrange regular training to the famers	3.12	4 th
5	Need exposure visit to new technology	2.33	14 th
6	Provide critical inputs based on location specific requirement	3.25	5 th
7	Make availability of improve breed of livestock	2.27	15 th
8	Model units should be established in every block	3.28	3 rd
9	Establish direct marketing facility	3.10	8 th
10	Encourage farmers club and producer's commodity group	3.33	2 nd
11.	Remove middle man in the marketing of agriculture produce	2.99	10 rd
12	Use ICT tools (Tv, radio, smart phones etc.) in TOT of IFS	2.56	12 th
13	Improve the transportation facilities	2.36	13 th
14	Loan with low interest rate should be made easily available for both horticultural and agricultural crops	3.16	6 th
15	Improved low-cost technology should be developed which can be easily utilized by small farmers	3.00	9 th

The table 4 show ranks various suggestions for improving Integrated Farming Systems (IFS), The most critical suggestion, ranked 1st, is the need to increase government schemes for IFS, which would provide substantial support for its growth. Following this, the second most important recommendation (ranked 2nd) is encouraging farmers' clubs and producer commodity groups to enhance collective efforts. Establishing model units in every block (3rd) and arranging regular training for farmers (4th) are also key suggestions. Critical inputs should be provided based on location-specific requirements (5th), and offering low-interest loans for both horticultural and agricultural crops (6th) is seen as an essential support measure. Other suggestions, such as providing timely input subsidies (7th) and establishing direct marketing facilities (8th), also rank highly. The development of improved low-cost technologies (9th) and removing middlemen from the agricultural marketing process (10th) are also prioritized. Suggestions toward financial support (11th), using ICT tools in training (12th), improving transportation (13th), and providing exposure visits to new technologies (14th) are ranked lower but remain significant. Lastly, ensuring the availability of improved livestock breeds (15th) is considered less urgent but still important for long-term improvement.

Conclusion

The study concludes that (IFS) model in the Rewa and Satna districts of Madhya Pradesh is predominantly practiced by marginal and smallholder farmers who exhibit moderate levels of education, experience, and psychological readiness. While the IFS model offers a sustainable and diversified approach to farming, its effective implementation is hindered by systemic challenges, particularly inadequate market access, insufficient official

sustenance, and lack of technical knowledge. The analysis of farmers' constraints highlights the need for infrastructural development, increased government engagement, and knowledge dissemination. Farmers' suggestions further reinforce the demand for supportive policies, financial assistance, regular training, and grassroots-level interventions such as farmers' clubs and model IFS units. Strengthening these areas can lead to wider and more effective adoption of IFS, ultimately improving farm income, resource utilization, and rural livelihoods in the region. The findings serve as a valuable reference for policymakers, extension agencies, and researchers aiming to enhance the implementation and impact of IFS models in similar agro-ecological zones.

References

1. Bhagat R, Walia SS, Sharma K, Singh R, Singh G, Hossain A. The integrated farming system is an environmentally friendly and cost-effective approach to the sustainability of agri-food systems in the modern era of the changing climate: A comprehensive review. *Food Energy Secur.* 2024;13(1):e534.
2. Bhuiya MSU, Karim MM, Hossain SMA. Study on integrated farming systems model development. *J Bangladesh Agric Univ.* 2014;12(2):325-36.
3. Darandale AD. Attitude of tribal farmers towards organic farming practices in maize crop [Master's thesis]. Anand: Anand Agricultural University; 2010. <http://krishikosh.egranth.ac.in/handle/1/5810024106>
4. Deshmukh JM, Dhawale SP, Kanade SV. Relationship between profile of the farmers and their attitude towards sustainable agricultural practices. *Curr J Appl Sci Technol.* 2020;39(6):101-6.
5. Fogya RC. Awareness and acceptability of bio-

- fertilizers by the farmers in Jabalpur district of Madhya Pradesh [MSc (Agri.) thesis]. Jabalpur: Jawaharlal Nehru Krishi Vishwa Vidyalaya; 2020.
6. Gautam VC, Kushwaha GS, Singh A, Singh S, Singh A, Maurya TS. The influence of emotional intelligence on leadership styles in agriculture students. *Int J Agric Ext Soc Dev*. 2024;7(11):341-4.
 7. Ghosh MK, Islam MT, Islam MM, Arif T, Haidar MA. Socio-economic status of vegetable farmers in Char region of Chapainawabganj. *Acad J EXIM Bank Agric Univ Bangladesh*. 2019.
 8. Ghosh MK, Mehedi HS, Ara N, Zahara FT, Nur SB, Mahamudul H. Farmer's attitude towards organic farming: a case study in Chapainawabganj District. *Asian J Adv Agric Res*. 2019;10(2):1-7. <https://www.researchgate.net/publication/334214018>
 9. Jadhav HS. Perception of farmers about zero budget natural farming [Master's thesis]. Parbhani: Vasantrao Naik Marathwada Krishi Vidyapeeth; 2020. <https://krishikosh.egranth.ac.in/handle/1/5810160154>
 10. Joshi A, Das S, Vaseem M. An analysis of challenges of the agriculture economy in India. *South Asian J Mark Manag Res*. 2021;11(10):27-34.
 11. Kumar S, Singh R, Ansari MA, Ravisankar N. Integrated farming systems for higher sustainable natural resources in intensive systems. In: *Advances in Agri-Food Systems: Volume II*. Singapore: Springer Nature; 2025. p. 155-68.
 12. Mangala B. Impact of integrated farming system on socio-economic status of BAIF beneficiary farmers [Master's thesis]. Dharwad: Univ Agric Sci; 2008. <http://krishikosh.egranth.ac.in/handle/1/82307>
 13. Meena LR. Integrated farming system models development for small and marginal households for sustainable production and livelihood improvement in India: an overview. *Medicon Agric Environ Sci*. 2022;3:5-18.
 14. Meshram M, Khare NK, Singh SRK. Analyzing farmers' perception towards integrated farming in Madhya Pradesh. *Pharma Innov J*. 2021;10(3, Suppl):90-2. <https://www.thepharmajournal.com/archives/2021/vol10issue3S/PartB/S-10-1-52-453.pdf>
 15. Parmar H. Awareness and perception of integrated farming system by farmers in Shajapur District, Madhya Pradesh [Master's thesis]. Gwalior: Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya; 2018. <http://krishikosh.egranth.ac.in/handle/1/5810082149>
 16. Shankaraiah N, Swamy BKN. Attitude of farmers and scientists towards dissemination of technologies through mobile (MMS). *Trop Agric Res*. 2012;24(1):31-41.
 17. Shwetha NV, Shivalingaih YN. Personal & socio-psychological characteristics of farmers in association with performance of different farming systems in Chickaballapur, Karnataka. *Int J Curr Microbiol Appl Sci*. 2018;7(3):787-93. <https://doi.org/10.20546/ijcmas.2018.703.092>
 18. Singh R, Riar TS, Gill JS. Integrated farming system and socio-economic characteristics of Punjab Agricultural University awardee farmers. *Asian J Agric Ext Econ Sociol*. 2017;16(3):1-5. <https://www.researchgate.net/publication/316358781>
 19. Singh S, Sharma P, Bharti AK, Vyas D, Yadav R. Constraints faced by farmers in information seeking in Bundelkhand region of Uttar Pradesh. *Asian J Agric Ext Econ Sociol*. 2024;42(5):380-5.
 20. Singh S, Sharma P, Chauhan JK, Tripathi S, Noopur K. Exploring farmers' attitudes towards dairy farming in Bundelkhand region of Uttar Pradesh. *Indian Res J Ext Educ*. 2025;25(2&3):69-75.
 21. Singh S, Yadav RN, Singh LB, Singh DK, Singh VK, Singh A. Repression factors and coping strategies to foster adoption of sustainable sorghum production technologies in Bundelkhand region of Uttar Pradesh. *Indian Res J Ext Educ*. 2024;25(1):65-73.
 22. Singh S, Yadav RN, Tripathi AK, Kumar M, Kumar M, Yadav S, *et al*. Current status and promotional strategies of millets: a review. *Int J Environ Climate Change*. 2023;13(9):3088-95.
 23. Sivaraj P, Philip H, Geethalakshmi V. Climate change impact on socio-economic status and communication pattern of paddy farmers of Tamil Nadu, India. *Int J Curr Microbiol Appl Sci*. 2017;6(6):550-7. <https://www.researchgate.net/publication/317597345>
 24. Vala YB, Chavda MH. Integrated farming system: a dynamic approach toward increasing the income of small and marginal farmers. In: *Advances in Water Management Under Climate Change*. CRC Press; 2023. p. 123-40.
 25. Verma D. Attitude of farmers towards organic farming in Jabalpur district of Madhya Pradesh [Master's thesis]. Jabalpur: Jawaharlal Nehru Krishi Vishwa Vidyalaya; 2019. <https://krishikosh.egranth.ac.in/handle/1/5810154776>
 26. Verma DK, Gautam A, Panwar AS, Tiwari P, Kakraliya AL, Singh S. Climate resilient dairy farming: prospect and future aspect. *J Exp Agric Int*. 2025;47(2):83-94.
 27. Vyas D, Bharti AK, Mishra A, Singh S, Singh S. Adoption level of farmers towards organic farming practices in Jhansi, Uttar Pradesh, India. *J Sci Res Rep*. 2025;31(5):416-22.
 28. Vyas D, Bharti AK, Singh HC, Gupta PK, Singh S. A study on farmers' knowledge of organic farming practices in Jhansi district of Uttar Pradesh, India. *J Sci Res Rep*. 2025;31(4):297-305.
 29. Yadav R, Singh LB, Patel A, Kumar M, Kumar M, Pandey MK, *et al*. A review on yield gap analysis of millets in India. *Int J Plant Soil Sci*. 2023;35(18):1800-4.