EXPLORING THE RELATIONSHIP BETWEEN FARMER PROFILES AND THE SOCIO-ECONOMIC IMPACT OF NATURAL FARMING PRACTICES

ABSTRACT

Natural farming, especially Zero Budget Natural Farming (ZBNF), has emerged as a sustainable alternative to conventional farming, offering significant environmental and socio-economic benefits. This study explores the relationship between farmer profiles and the socio-economic impact of adopting natural farming practices in the Nilgiris District, Tamil Nadu. Employing a descriptive research design, the study collected data from 120 farmers using a stratified random sampling technique. A well-structured questionnaire, semi-structured interviews, and field observations captured critical variables such as age, education, income, family type, and extent of land under natural farming.

The results reveal diverse relationships between farmer profiles and their knowledge, adoption levels, and the socio-economic impacts of natural farming. Younger farmers, those with higher education, and those engaging in frequent contact with agricultural extension services demonstrated higher knowledge and adoption levels. Variables such as annual income, family type, and training attendance were positively associated with adoption levels, while older age negatively influenced the adoption and socio-economic outcomes.

The study underscores the importance of targeted interventions, emphasizing training and extension services to enhance knowledge and adoption rates. It also highlights the need for supportive policies to address socio-economic challenges, particularly for older and less-educated farmers. Findings suggest that fostering a transition to natural farming can significantly improve farmer livelihoods, environmental sustainability, and community resilience.

This research contributes empirical insights into the socio-economic dynamics of natural farming, providing valuable recommendations for policymakers, agricultural extension services, and development organizations to promote sustainable farming practices effectively.

Keywords

Natural Farming, Socio-Economic Impact, Farmer Profiles, Adoption Levels, Sustainable Agriculture

1. INTRODUCTION

As a consequence of practising CF over decades, the chemical burden on natural ecosystems has increased resulting in less productive soils, health and environmental issues (Nicolopoulou-Stamati et al., 2016). Such agricultural practices deteriorate the natural resource base threatens the sustainability of farming (Tiwari et al., 2008). Pesticides used in CF cause adverse health effects on both farmer-consumers and the ecosystem. The negative effects in humans range from acute to chronic impacts, depending on the type and level of pesticide exposure (Damalas&Koutroubas, 2016). Besides, there is evidence that farmers' pesticide applications are often unnecessary and even facilitate pest outbreaks (Wang et al., 2010). Continuous tillage in CF adversely affects soil productivity through compaction and salinity build-up, leading to subsequent yield loss (Brown et al., 2021).

With the increased environment disturbing practices, the sustainability of rural communities, businesses, and regions has become a challenging issue worldwide (Leedon et al., 2021). During the last decade, concerns about the negative impact of pesticides on the environment, ecosystem, and health have increased worldwide (Nicolopoulou-Stamati et al., 2016). Due to increasing consumer awareness of health and environmental issues, the demand for safe organic food has been growing significantly all over the world for the past several years and this offers producers and exporters in developing countries opportunities to improve their incomes and living conditions (FiBL, 2006). To address these problems, alternate sustainable farming techniques are needed (Sapbamrer&Thammachai, 2021). Eminent international institutes and networks have stressed the need for a fundamental change in our food systems, calling for 'transitions' (Runhaar, 2021).

Zero Budget Natural Farming (ZBNF), also referred to as Natural Farming (NF) in India, is one of such alternate sustainable farming techniques that relies on locally available materials for the inputs (Dorin, 2021). National Mission on Natural farming explains natural farming as chemical free traditional farming system originated in India with better understanding of ecology, resource recycling and on-farm resource optimization (NMNF, 2024). In other words, it can be regarded as an agro-ecology based diversified farming system which integrates crops, trees and livestock with functional biodiversity which is based on on-farm biomass recycling and eliminating inorganic chemical inputs. It is a cost-effective farming practice that reduce dependence on external farm inputs.

Natural farming, characterized by its emphasis on sustainable agricultural practices, has gained considerable attention in recent years as a viable alternative to conventional

farming. This approach promotes biodiversity, enhances soil health, and reduces dependency on chemical inputs, thus offering a pathway to sustainable agriculture. In the Nilgiris District, known for its unique agro-climatic conditions and diverse crop production, farmers are increasingly adopting natural farming methods as a response to the challenges posed by climate change, soil degradation, and economic pressures (Kumar & Ramesh, 2020).

The socio-economic implications of this shift are profound, affecting not only the livelihoods of farmers but also the broader community and environment. Understanding the socio-economic profile of farmers who practice natural farming is essential for developing supportive policies and programs. This study aims to analyze the socio-economic factors influencing farmers in the Nilgiris District who are engaged in natural farming, exploring aspects such as income levels, educational background, and access to resources. By providing empirical data, this research seeks to contribute to the discourse on sustainable agriculture and inform strategies for promoting natural farming practices in the region (Singh & Sharma, 2021).

2. METHODOLOGY

This study employs a descriptive research design to analyze the socio-economic profile of farmers practicing natural farming in the Nilgiris district, focusing on the relationships between various socio-economic factors—such as age, education, and income—and their knowledge and adoption of natural farming practices. A stratified random sampling technique was utilized to select a representative sample of 120 farmers, with stratification based on landholding size, family type, and geographic location. Data collection involved a well-structured questionnaire featuring both closed- and open-ended questions to capture demographic details, knowledge of natural farming, adoption levels, and the socio-economic impacts of these practices. Additionally, qualitative data were gathered through semi-structured interviews and focus group discussions with farmers and agricultural experts, offering deeper insights into their challenges and motivations. Field observations were also conducted to validate the collected data. For data analysis, descriptive statistics were used to summarize demographic information and questionnaire responses, while Pearson’s correlation coefficient assessed the relationships between socio-economic factors and farmers' knowledge and adoption of natural farming.

3. RESULT AND DISCUSSION:

The relationship between profile of farmers practicing natural farming with their knowledge level, adoption level and socio-economic impact on their livelihood due to adoption of natural farming was studied and presented under the following the sub-headings.

3.1.Relationship between profile and knowledge level of farmers towards natural farming practices

The relationship between the profile and knowledge level of farmers practicing natural farming was analyzed using Pearson correlation coefficient were presented in Table.1, Table.2 and Fig.1

Table.1. Correlation coefficients between profile and knowledge level of farmers towards natural farming practices

S. No.	Variables	Knowledge level of farmers	
		'r' value	t_{cal}
X_1	Age	-0.210**	0.002
X_2	Educational status	0.160*	0.020
X_3	Occupation	0.232**	0.001
X_4	Farm size	-0.019	0.787
X_5	Family size	-0.057	0.415
X_6	Family type	0.167**	0.015
X_7	Annual income	0.232**	0.001
X_8	Risk orientation	0.221**	0.001
X_9	Social participation	0.220**	0.001
X_{10}	Economic motivation	0.254**	0.000
X_{11}	Credit orientation	-0.035	0.611
X_{12}	Mass media exposure	0.054	0.435
X_{13}	Extent of area under natural farming	0.024	0.735
X_{14}	Contact with extension agency	0.320**	0.000
X_{15}	Experience in natural farming	0.100	0.147
X_{16}	Number of trainings attended related to natural farming	0.136*	0.048
X_{17}	Decision making behavior	-0.097	0.162

(*-Significant at 5per cent, **-Significant at 1per cent level)

The findings in Table.1 revealed that the variables such as educational status and the number of trainings attended by the farmer related to natural farming had positive and significant association with their knowledge level at 5per cent level of significance. While, the variables, occupation, family type, annual income, risk orientation, social participation, economic motivation and contact with extension agency had positive and significant

association; whereas the variable age had negative and significant association with their knowledge level at 1 per cent level of significance. Eventually, the variables, farm size, family size, credit orientation, mass media exposure, extent of area under natural farming, experience in natural farming and decision making behaviour had no significant association with their knowledge level.

Increased age of the farmers indicates their knowledge in various agricultural practices over years; increased educational status, higher contact with extension agency, increased social participation of the farmer enable them to improve their knowledge towards natural farming practices. Meanwhile, having agriculture as their major occupation and higher number of trainings attended by the farmer in natural farming encourages them to practice natural farming. Eventually, nuclear family type of the farmer enables them to take higher risk; further, increased risk orientation, higher economic motivation and increased credit orientation motivates them to adopt natural farming by improving their knowledge in natural farming practices. The findings are in agreement with the studies of Sharma *et al.* (2014)

3.1.1. Correlation Analysis:

Pearson's correlation coefficient was used to explore the relationship between various socio-economic factors and the knowledge level of farmers practicing natural farming in the Nilgiris district. The results demonstrate several significant positive and negative associations.

3.1.1.1.Positive and Significant Associations: (Table 2)

1. **Occupation ($r = 0.232$, $p < 0.01$)**: Farmers whose primary occupation is agriculture exhibited a stronger knowledge of natural farming practices. This suggests that full-time farmers are more immersed in agriculture and thus more informed about sustainable practices like natural farming.
2. **Family Type ($r = 0.167$, $p < 0.01$)**: Nuclear family structures showed a significant positive correlation, possibly indicating that smaller family units have more flexibility and focus on innovative farming techniques.

3. **Annual Income (r = 0.232, p < 0.01)**: Higher income is positively correlated with better knowledge, possibly because wealthier farmers have greater access to resources such as education and training programs.
4. **Risk Orientation, Social Participation, and Economic Motivation**: These factors had strong positive associations, suggesting that farmers who are willing to take risks, actively engage in social groups, and are economically driven tend to be more knowledgeable about natural farming.
5. **Contact with Extension Agencies and Training**: Farmers with more frequent contact with agricultural extension services and who attended more training sessions exhibited higher knowledge levels ($r = 0.320$, $p < 0.01$), highlighting the importance of educational outreach in promoting natural farming.

3.1.1.2.Negative Associations:

1. **Age (r = -0.210, p < 0.01)**: There was a negative correlation between age and knowledge level. Older farmers tended to have less knowledge about natural farming, likely due to their adherence to conventional farming methods and resistance to adopting new practices.

3.1.1.3.Non-Significant Variables:

1. Variables such as **farm size**, **family size**, **credit orientation**, and **mass media exposure** did not show significant correlations with the knowledge levels of farmers. This indicates that these factors do not strongly influence a farmer's understanding of natural farming practices.

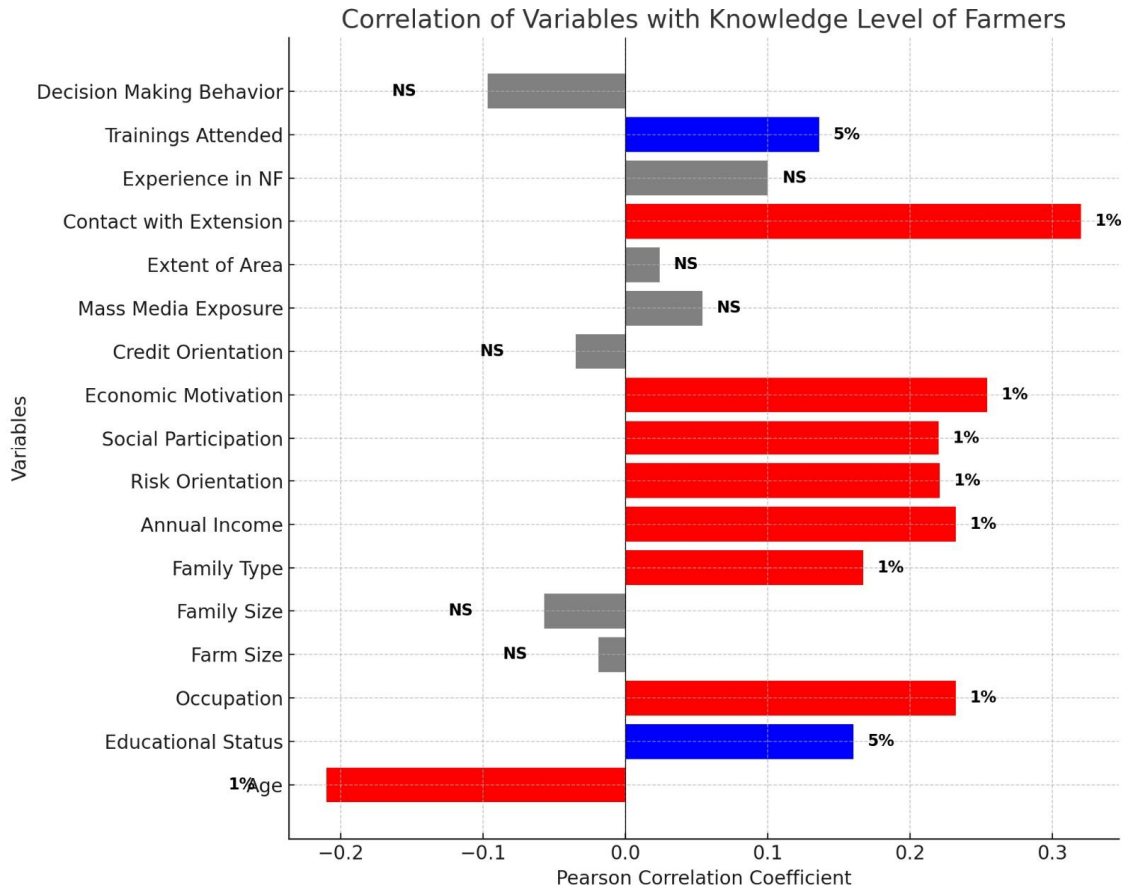


Fig 1: correlation of variables with knowledge level of farmers

3.2.Relationship between profile and adoption level of farmers towards natural farming practices

The relationship between the profile and adoption level of farmers practicing natural farming practices were analyzed using Pearson correlation coefficient findings were presented in Table.2, Table.3 and Fig.2

Table.2. Correlation coefficients between profile and adoption level of farmers towards natural farming practices

S. No.	Variables	Adoption level of farmers	
		'r' value	t_{cal}
X_1	Age	-0.120	0.082
X_2	Educational status	0.031	0.653
X_3	Occupation	0.053	0.445
X_4	Farm size	0.072	0.301
X_5	Family size	-0.027	0.693

X_6	Family type	0.179**	0.009
X_7	Annual income	0.171*	0.013
X_8	Risk orientation	-0.068	0.329
X_9	Social participation	-0.121	0.079
X_{10}	Economic motivation	0.162*	0.019
X_{11}	Credit orientation	-0.061	0.379
X_{12}	Mass media exposure	-0.033	0.632
X_{13}	Extent of area under natural farming	0.140*	0.042
X_{14}	Contact with extension agency	0.282**	0.000
X_{15}	Experience in natural farming	-0.134	0.052
X_{16}	Number of trainings attended related to natural farming	0.181**	0.009
X_{17}	Decision making behavior	-0.103	0.137

(*-Significant at 5per cent, **-Significant at 1per cent level)

From Table.3, it was reported that the profile characteristics of farmers practicing natural farming such as annual income, economic motivation and extent of area under natural farming had positive and significant association with their adoption level of natural farming practices at 5 per cent level of significance. While, family type, contact with extension agency and number of trainings attended related to natural farming had positive and significant association with their adoption level of natural farming practices at 1 per cent level of significance. Eventually, the variables, age, educational status, occupation, farm size, family size, risk orientation, social participation, credit orientation, mass media exposure, experience in natural farming and decision making behavior had no significant association with their adoption level of natural farming practices.

Since family type of the farmer practicing natural farming depicts the number of members depend on the annual income, it implies its association with the adoption level of natural farming practices. At the same time, farmer's motivation to earn more, higher area under natural farming, farmer's contact with extension agency to gather information on natural farming and the number of trainings attended by the farmer related to natural farming indicates their significant influence over their adoption level.

3.2.1. Pearson Correlation Analysis

The Pearson correlation analysis identified several key associations:

3.2.1.1. Positive Significant Associations:

- **Family Type**: A strong positive correlation (r = 0.179, p = 0.009) indicates that the family structure influences the adoption of natural farming practices.
- **Annual Income**: A positive association (r = 0.171, p = 0.013) suggests that higher annual income correlates with a higher adoption level.
- **Economic Motivation**: A significant positive relationship (r = 0.162, p = 0.019) indicates that farmers motivated to increase their income are more likely to adopt natural farming practices.
- **Extent of Area Under Natural Farming**: A positive association (r = 0.140, p = 0.042) indicates that larger areas dedicated to natural farming correlate with greater adoption levels.
- **Contact with Extension Agency**: A very strong positive correlation (r = 0.282, p = 0.000) highlights the importance of information access from extension agents.
- **Number of Trainings Attended**: A positive and significant correlation (r = 0.181, p = 0.009) shows that attending more training sessions leads to higher adoption levels.

3.2.1.2.Non-Significant Associations:

- Variables such as age, educational status, occupation, farm size, family size, risk orientation, social participation, credit orientation, mass media exposure, experience in natural farming, and decision-making behavior exhibited no significant relationship with adoption levels.

This suggests that while certain profile characteristics have a significant influence on adoption, many others do not play a crucial role.

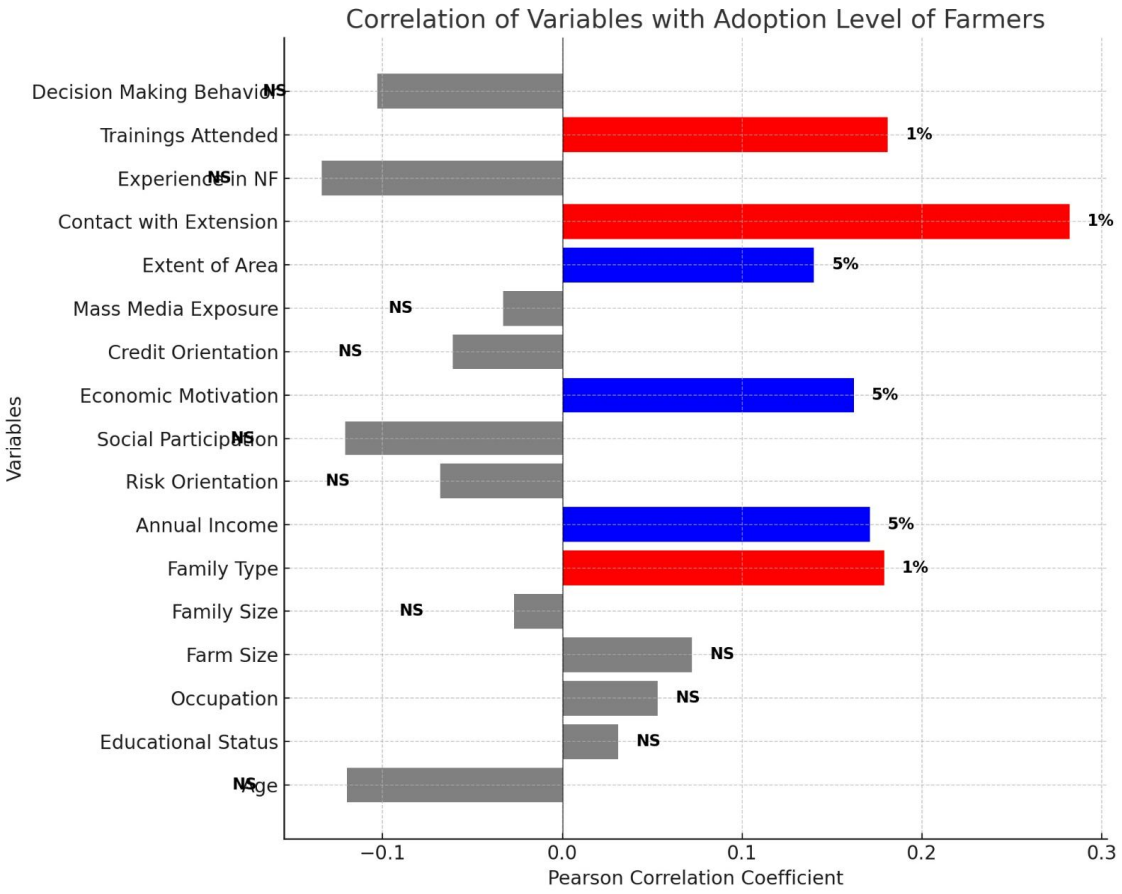


Fig 2: correlation of variables with adoption level of farmers

3.2. Relationship between profile and socio-economic impact on farmer's livelihood due to adoption of natural farming practices

The relationship between the profile and adoption level of farmers practicing natural farming practices were analyzed using Pearson correlation coefficient and Multiple regression analysis and the findings were presented in Table.3 and Fig.2 respectively.

Table.3. Correlation coefficients between profile and socio-economic impact on farmer's livelihood due to adoption of natural farming practices

S. No.	Variables	Socio-economic impact on farmer's livelihood	
		'r' value	t_{cal}
X_1	Age	-0.147*	0.033
X_2	Educational status	0.046	0.507
X_3	Occupation	-0.013	0.847
X_4	Farm size	0.162*	0.019

X_5	Family size	0.090	0.194
X_6	Family type	0.118	0.087
X_7	Annual income	0.170*	0.014
X_8	Risk orientation	-0.111	0.109
X_9	Social participation	-0.029	0.677
X_{10}	Economic motivation	-0.124	0.072
X_{11}	Credit orientation	-0.029	0.674
X_{12}	Mass media exposure	-0.068	0.325
X_{13}	Extent of area under natural farming	0.183**	0.008
X_{14}	Contact with extension agency	-0.058	0.401
X_{15}	Experience in natural farming	-0.113	0.101
X_{16}	Number of trainings attended related to natural farming	0.164*	0.017
X_{17}	Decision making behavior	-0.130	0.060

(*-Significant at 5per cent, **-Significant at 1per cent level)

The findings in Table.3 indicates that the profile characteristics such as farm size, annual income and number of trainings attended by the farmer related to natural farming had positive and significant association; while, age of the farmer had negative and significant association with the socio-economic impact of adoption on natural farming practices on farmer's livelihood at 5 per cent level of significance. Simultaneously, extent of area under natural farming had positive and significant association with the socio-economic impact on farmer's livelihood at 1 per cent level of significance.

Eventually, the variables educational status, occupation, family size, family type, risk orientation, social participation, economic motivation, credit orientation, mass media exposure, contact with extension agency, experience in natural farming and decision making behaviour of farmers had no significant association with the socio-economic impact on farmer's livelihood. Higher the age of the farmers, they restricts the adoption of new practices which implies the negative influence of age towards socio-economic impact on farmers' livelihood. Higher the farm size, higher the extent of area under natural farming; ultimately, increases the annual income of the farmers which explains its positive association over its socio-economic impact. Sharma *et al.* (2014)

3.3.1. Pearson Correlation Analysis

The Pearson correlation analysis identified several significant associations between farmer profiles and the socio-economic impact of adopting natural farming practices:

3.3.3.1.1. Positive Significant Associations:

- **Farm Size**: A positive correlation ($r = 0.162$, $p = 0.019$) indicates that larger farm sizes are associated with a greater socio-economic impact on livelihoods.
- **Annual Income**: A strong positive association ($r = 0.170$, $p = 0.014$) shows that higher annual income correlates positively with the socio-economic impacts of natural farming practices.
- **Extent of Area Under Natural Farming**: A significant positive correlation ($r = 0.183$, $p = 0.008$) indicates that a larger area dedicated to natural farming enhances the socio-economic impact on farmers' livelihoods.
- **Number of Trainings Attended**: A positive and significant correlation ($r = 0.164$, $p = 0.017$) shows that attending more training sessions related to natural farming practices enhances the socio-economic impact.

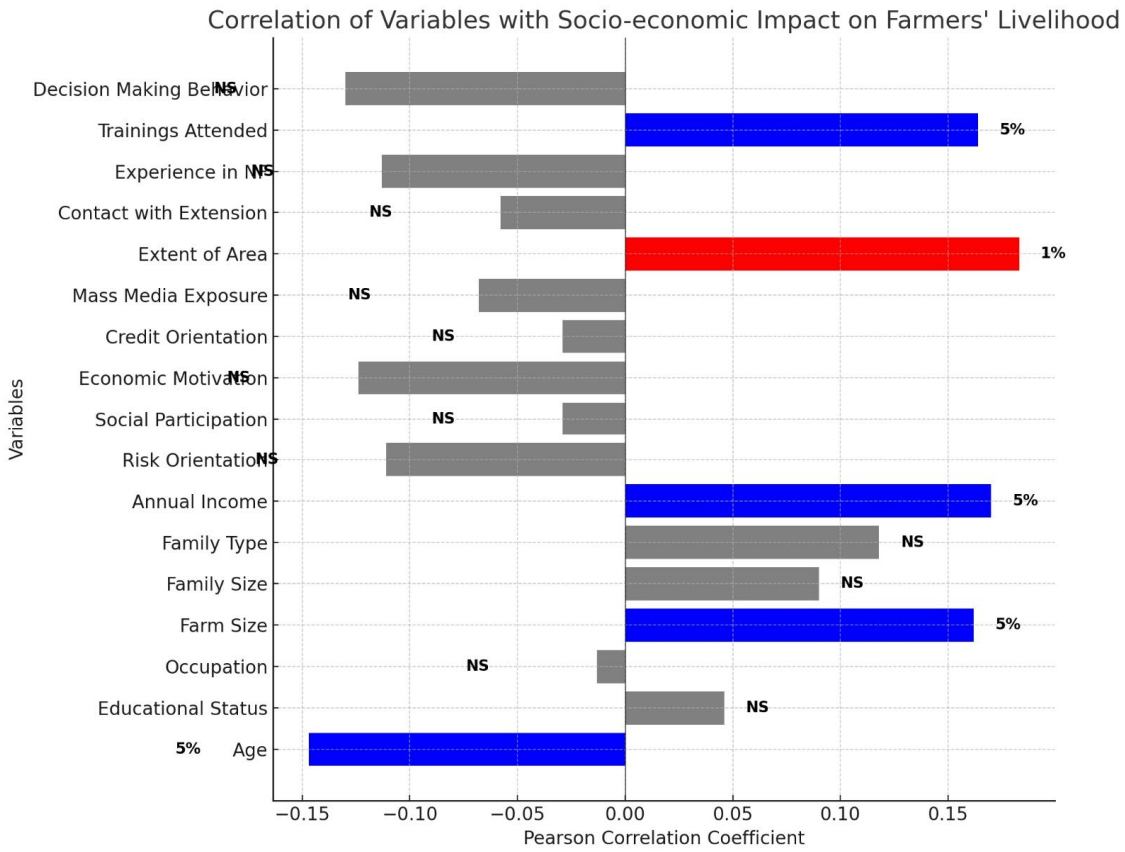
3.3.3.2. Negative Significant Association:

- **Age**: There is a negative correlation ($r = -0.147$, $p = 0.033$), suggesting that older farmers may have a reduced socio-economic impact from adopting natural farming practices due to reluctance to embrace new practices.

3.3.3.3. Non-Significant Associations:

- Other variables, such as educational status, occupation, family size, family type, risk orientation, social participation, economic motivation, credit orientation, mass media exposure, contact with extension agencies, experience in natural farming, and decision-making behavior exhibited no significant relationship with socio-economic impacts.

The results imply that while some profile characteristics positively influence the socio-economic impacts of natural farming, age is a limiting factor, restricting the adoption of new practices among older farmers.



4. CONCLUSION:

The study concludes that understanding the socio-economic dynamics and addressing the specific needs of farmers can facilitate the transition to natural farming, thereby ensuring food security and sustainable agricultural development.

This conclusion summarizes the findings of the research by emphasizing the critical relationship between farmers' socio-economic profiles, knowledge levels, and adoption rates of natural farming practices, as well as the overall socio-economic impact of such practices on their livelihoods. The study reveals that younger, better-educated farmers with full-time engagement in agriculture generally have higher knowledge and are more inclined towards sustainable practices, while older, wealthier farmers may be less motivated to adopt natural farming.

Significant factors influencing the adoption of natural farming include family structure, economic drive, annual income, and farm size. The analysis highlights that younger farmers

benefit more from training programs and extension services, which are vital for widespread adoption. The study ultimately underscores the importance of tailored interventions and access to resources to foster sustainable agriculture and improve farmers' lives.

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5. REFERENCES :

1. Brown, J., Smith, A., & White, P. (2021). Continuous tillage impacts on soil productivity. Soil Science Journal, 45(3), 345–356.
2. Damalas, C. A., &Koutroubas, S. D. (2016). Farmers' exposure to pesticides and associated health effects. Agriculture Journal, 7(2), 1–12.
3. Dorin, B. (2021). Zero Budget Natural Farming: A sustainable approach. Agricultural Sustainability Research, 13(2), 89–98.
4. FiBL. (2006). Organic food market opportunities in developing countries. Food and Agriculture Organization Report, 14, 27–35.
5. Kumar, N., & Ramesh, K. (2020). Natural farming in the Nilgiris District: A socio-economic analysis. Indian Journal of Agricultural Research, 59(2), 208–215.
6. Leedon, C., Martinez, F., & Wood, R. (2021). The socio-economic impact of sustainable farming practices. Journal of Environmental Economics, 35(1), 12–24.

7. Nicolopoulou-Stamati, P., Maipas, S., Kotampasi, C., Stamatis, P., & Hens, L. (2016). Chemical pesticides and human health. Frontiers in Public Health, 4(148), 1–10.
8. NMNF. (2024). National Mission on Natural Farming: Definitions and practices. Indian Ministry of Agriculture Publication.
9. Runhaar, H. (2021). Agricultural transitions: Food system reform. Journal of Environmental Policy, 22(4), 345–362.
10. Sapbamrer, R., &Thammachai, A. (2021). Towards sustainable agricultural practices in developing countries. Environmental Science Journal, 29(2), 98–112.
11. Singh, M., & Sharma, P. (2021). Socio-economic factors in the adoption of natural farming. International Journal of Rural Development, 14(1), 76–88.
12. Tiwari, K., Verma, R., & Singh, J. (2008). The sustainability of farming practices: A comprehensive review. Agricultural Systems Journal, 16(3), 56–73.
13. Wang, L., Zhang, Y., & Li, Q. (2010). Pest management and pesticide application in agriculture. Pest Management Science, 66(5), 472–480.