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Understanding Farmers' Attitudes towards Natural Farming Adoption in Tarai Zone of Uttar Pradesh

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HIGHLIGHTS

- Annual income (r = 0.439) and achievement motivation (r = 0.413) were the strongest positive correlates of attitude towards natural farming adoption.
- Landholding, social participation, risk orientation, achievement motivation, and economic motivation were significant positive predictors.
- The regression model explained approximately 70 per cent of variation in farmer attitude (R^2 = 69.86%).

ARTICLE INFO

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ABSTRACT

Natural farming, as a chemical-free and ecologically integrated approach, is increasingly recognized as a sustainable alternative for smallholder agriculture in India. The present study was conducted during 2025–26 to assess farmers' attitudes toward natural farming and identify the socioeconomic and psychological determinants of those attitudes in the Tarai zone of Uttar Pradesh, India. An ex-post facto research design was adopted. A total of 450 respondents were selected through multi-stage stratified random sampling from four districts of the Tarai zone. Attitude was measured using a modified scale developed by Zala and Kalsariya (2022), and Pearson correlation and multiple linear regression analyses were employed to identify significant predictors. Correlation analysis revealed that landholding (r = 0.405) and annual income (r = 0.439) were significant positive correlates, while age (r = –0.331) and farming experience (r = –0.306) were significant negative correlates. Regression analysis indicated that landholding, social participation, risk orientation, achievement motivation, and economic motivation were significant positive predictors, collectively explaining 69.86 per cent of variance in attitude. The study concludes that targeted extension strategies strengthening land resource utilisation, social participation, risk-taking ability, achievement motivation, and economic motivation are essential to accelerate natural farming adoption in the region.

INTRODUCTION

Global agriculture is under mounting pressure to reconcile food production with environmental sustainability. Chemical-intensive farming systems, which dominated the post-Green Revolution era, have delivered significant productivity gains but imposed severe long-term costs on soil health, water quality, and biodiversity (Pingali, 2012; Pathak, 2023). Contemporary agricultural policy now places equal emphasis on ensuring environmental sustainability and responsibly balancing nutrient application alongside maximizing production. Against this backdrop, natural farming a chemical-free, ecologically integrated system relying on on-farm biological inputs has emerged as a credible alternative pathway for smallholder agriculture in South Asia (Bharucha et al., 2020; Kumar et al., 2025; Shanmuka et al., 2025).

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In India, natural farming has gained significant institutional momentum. The National Mission on Natural Farming (NMNF), launched in 2024, targets 7.5 lakh hectares across 15,000 clusters and aims to support one crore farmers, providing an incentive of Rs. 4,000 per acre per year for two years to encourage adoption. As of March 2025, the *Bhartiya Prakritik Krishi Paddhati* supported 28 lakh farmers practicing natural farming on 9.4 lakh hectares (GoI, 2024). Berger et al. (2025) demonstrates that Zero Budget Natural Farming delivers biodiversity and economic benefits without compromising yields, while Rasmussen et al. (2024) confirmed joint environmental and social benefits from diversified agroecological approaches.

Farmer attitude is a central psychological construct that mediates the relationship between knowledge and behavior. According to the Theory of Planned Behavior (Ajzen, 1991), attitude toward a behavior is a primary determinant of behavioral intention, which in turn drives overt action. In the agricultural context, attitude thus transforms covert behavioral intention into actual adoption decisions. Studies have shown that variables including age, family size, education, experience, landholding, extension contacts, social media use, and risk orientation significantly influence farmers' attitudes toward sustainable agricultural practice adoption (Mishra et al., 2022; Singh et al., 2024; Thangjam & Jha, 2024). In Uttar Pradesh specifically, empirical evidence confirms this attitudinal dimension: a study in Prayagraj district found that 80.00 per cent of respondents held a positive attitude toward organic farming, with inadequate marketing facilities as the dominant constraint (Mishra et al., 2022). Zero Budget Natural Farming adoption in Maharashtra identified integrated soil fertility management and integrated pest management as key adoption factors, while scarce raw materials, weed and pest management complexity, and limited knowledge of liquid fertilizers were primary constraints (Kumar et al., 2023).

The Tarai region the fertile sub-Himalayan belt of Uttar Pradesh represents a strategically significant agricultural zone where decades of chemical-intensive cultivation have compromised soil fertility and groundwater quality, yet smallholder farmers continue to rely on conventional high-input systems. The Tarai presents a distinct agro-ecological and socioeconomic context characterised by smallholder dominance, high cropping intensity, and proximity to urban markets that cannot be assumed to mirror findings from peninsular India or hill states. Region-specific evidence on farmer attitudes and their behavioral determinants toward natural farming in this zone is absent from the literature. Since attitude-behavior pathways are context-dependent, extension strategies must be calibrated to local realities (Thangjam & Jha, 2024).

METHODOLOGY

The study was conducted during 2025–26 in the Tarai agro-climatic zone of Uttar Pradesh, India, under an ex-post facto research design, which was deemed appropriate for investigating naturally prevailing conditions of farmer awareness, perception, and attitude toward natural farming without experimental manipulation of variables. The Tarai zone is characterised by rich alluvial soils, diverse cropping systems, and high dependence on agriculture for rural livelihoods. Four districts Lakhimpur Kheri, Bijnor, Bahraich, and Pilibhit were selected from the eight natural farming-practicing districts of the Tarai zone on the basis of the highest number of farmers registered under the National Mission on Natural Farming. Two districts were excluded on representativeness grounds: Shahjahanpur comprised only six per cent of its area within the Tarai zone, and Muzaffarnagar comprised only 10 per cent, making both geographically inadequate to represent Tarai-specific conditions. Seven blocks were selected from the four districts based on the highest concentration of registered natural farming practitioners. Two blocks were selected from each of the three districts with higher practitioner density Behjam and Mohammadi from Lakhimpur Kheri, Najibabad and Jalilpur from Bijnor, and Marauri and Puranpur from Pilibhit while one block, Mihinpurwa, was selected from Bahraich, which had a comparatively lower concentration of registered practitioners. From the seven selected blocks, 47 villages were selected through simple random sampling, with the number of villages allocated to each block proportional to its share of registered natural farming households, to ensure adequate spatial coverage and intra-block representativeness. A complete enumeration of registered natural farming households was conducted in each selected village, from which 10 per cent of farmers were selected proportionally by random sampling, yielding a final sample of 450 respondents. Primary data were collected through a structured and pre-tested interview schedule administered via personal interviews. Negatively worded statements in the attitude scale were reverse-scored prior to analysis. For measuring the attitude level, the modified scale developed by Zala and Kalsariya (2022) was used. Pearson product-moment correlation coefficient (r) was used to assess the direction and magnitude of association between selected independent variables and the dependent variable attitude toward natural farming. Multiple linear regression analysis was carried out to quantify the independent contribution of each socio-economic and psychological variable while holding all other predictors constant. All statistical inferences were drawn at the five per cent level of significance, and data were processed using SPSS version 25.0.

RESULTS

Statement-wise attitude of respondents towards natural farming

Table 1 presents the statement-wise distribution of respondents according to their attitude towards natural farming. Among the 19 attitude statements, the highest Weightage Mean Score (WMS) was recorded for the statement that application of crop residues and mulching improves soil aeration and water retention capacity (WMS = 4.03, Rank I), indicating near-unanimous agreement among respondents on the soil-physical benefits of natural farming practices. This was closely followed by the statement on the role of Bijamrut for seed treatment and Jivamrut as a nutrient source (WMS = 3.87, Rank II), and the belief that natural farming reduces input costs by eliminating dependence on external inputs (WMS = 3.85, Rank III). Neem leaf or neem kernel extract as an effective pest management method and natural

Table 1. Statement-wise distribution of respondents according to attitude towards natural farming

S.No.	Statements	WMS	Rank
1.	In my view, natural farming might reduce input cost because farmers do not need to take anything from outside	3.85	III
2.	I prefer natural farming because it complements other farming enterprises.	3.65	X
3.	I believe natural farming does reduce production.	3.61	XI
4.	Application of crop residues and mulching improves soil aeration and water retention capacity.	4.03	I
5.	In my opinion, irrigation requirements decrease in natural farming so water and electricity can be saved.	3.73	VII
6.	I do not believe that natural farming is the most effective solution to address global warming.	2.25	XIX
7.	I believe that farmers receive higher prices for their produce under natural farming due to access to new markets and export opportunities.	3.49	XIV
8.	Natural farming conserves beneficial soil organisms and microorganisms, thereby enhancing soil fertility.	3.73	VII
9.	I think plant grown naturally are not more tolerant to insects and disease than other farming practices	2.60	XVII
10.	I would like to advise my children to use Bijamrut for seed treatment to protect from soil-borne disease, and Jivamrut is the best source of all nutrients.	3.87	II
11.	I prefer the use of Nimastra, Brahmastra, Agniastra and Dashparni Ark for the management of sucking pests and larval infestations.	3.79	VI
12.	I think that neem leaf or neem kernel extract is an effective method for pest management.	3.83	IV
13.	Natural farming decreases the percentage of organic carbon in soil.	2.38	XVIII
14.	I believe that sustainable management and efficient utilization of natural resources can be achieved through natural farming.	3.50	XIII
15.	I am sure that natural farming reduces the incidence of non-communicable diseases.	3.19	XV
16.	I believe that one indigenous cow can support natural farming on more than five acres of land.	3.56	XII
17.	I would like that natural farming is a pain free, care free and loan free farming.	3.83	IV
18.	I think that only large landholders can successfully adopt natural farming.	2.78	XVI
19.	I don't like that natural farming increases weed infestation.	3.66	IX

WMS=Weightage Mean Score

farming as pain-free, care-free, and loan-free farming both scored equally (WMS = 3.83, Rank IV). Favourable attitudes were also recorded for the use of botanical formulations Nimastra, Brahmastra, Agniastra, and Dashparni Ark for the management of sucking pests and larval infestations (WMS = 3.79, Rank VI). A moderately positive attitude was noted toward natural farming's ability to reduce irrigation requirements and conserve water and electricity (WMS = 3.73, Rank VII), and its role in conserving beneficial soil organisms to enhance soil fertility (WMS = 3.73, Rank VII). Among the negatively worded statements, the belief that natural farming does not effectively address global warming received the lowest WMS (2.25, Rank XIX), indicating that most respondents disagreed with this view and recognised natural farming's relevance to climate mitigation. Similarly, the perception that crops under natural farming are not more resistant to insect pests and diseases (WMS = 2.60, Rank XVII) and the belief that natural farming decreases soil organic carbon percentage (WMS = 2.38, Rank XVIII) recorded low scores, reflecting that respondents largely rejected these unfavourable perceptions. The statement that only large landholders can successfully adopt natural farming returned a WMS of 2.78 (Rank XVI), suggesting that the majority did not view farm size as a binding constraint to adoption.

Correlation between independent variables and attitude towards natural farming

The correlation coefficients between selected independent variables and farmer attitude toward natural farming are presented in Table 2. Landholding (r = 0.405), annual income (r = 0.439), achievement motivation (r = 0.413), scientific orientation (r = 0.401), economic motivation (r = 0.374), social participation (r = 0.367), risk orientation (r = 0.315), occupation (r = 0.196), and environmental orientation (r = 0.135) showed significant positive correlation with attitude at the one per cent level of probability. Age (r = –0.331) and farming experience (r = –0.306) exhibited significant negative correlation at the one per cent level, while extension contact (r = –0.093) was negatively significant at the five per cent level. Education, family type, and training attended did not show statistically significant associations with attitude.

Table 2. Correlation coefficients between independent variables and attitude of farmers towards natural farming

S.No.	Variables	Correlation coefficient (r)
1.	Age	-0.331**
2.	Education	0.009 (NS)
3.	Farming Experience	-0.306**
4.	Family Type	-0.004 (NS)
5.	Landholding	0.405**
6.	Occupation	0.196**
7.	Annual Income	0.439**
8.	Social Participation	0.367**
9.	Training Attended	-0.018 (NS)
10.	Risk Orientation	0.315**
11.	Scientific Orientation	0.401**
12.	Achievement Motivation	0.413**
13.	Economic Motivation	0.374**
14.	Environmental Orientation	0.135**
15.	Extension Contact	-0.093*

* Significant at $p < 0.05$; ** Significant at $p < 0.01$; NS = Non-significant

Regression analysis of independent variables with attitude towards natural farming

The results of a multiple linear regression analysis examining the independent contribution of socioeconomic and psychological variables to farmers' attitudes are presented in Table 3. The overall model was statistically significant ($F(15, 434) = 71.02$, $p < 0.01$) with an R^2 value of 69.86 per cent, indicating that approximately 70 per cent of variation in farmer attitude was explained by the 15 independent variables collectively. Multicollinearity diagnostics indicated that variance inflation factor (VIF) values for all predictors were within acceptable limits (VIF < 5), confirming the stability of the regression estimates. Landholding ($b = 1.348$, $t = 4.251$, $p < 0.01$), social participation ($b = 0.797$, $t = 2.961$, $p < 0.01$), risk orientation ($b = 0.203$, $t = 3.102$, $p < 0.01$), achievement motivation ($b = 0.210$, $t = 2.748$, $p < 0.01$), and economic motivation ($b = 0.270$, $t = 3.606$, $p < 0.01$) emerged as significant positive predictors of attitude at the one per cent level of probability. Environmental orientation ($b = –0.249$, $t = –3.106$, $p < 0.01$) was a significant negative predictor. The negative regression coefficient for environmental orientation, despite its positive bivariate correlation with attitude ($r = 0.135$), is attributable to the suppression effects arising from its shared variance with other psychological predictors in the multivariate model; when other motivational variables are held constant, higher environmental orientation is associated with more critical evaluation of natural farming against absolute environmental benchmarks.

Table 3. Multiple linear regression analysis of factors influencing farmers' attitude toward natural farming

S.No.	Variables	Regression Coefficient (bi)	SE of bi	t-value
1.	Age	-0.116	0.094	-1.243
2.	Education	0.010	0.163	0.063
3.	Farming Experience	0.071	0.095	0.749
4.	Family Type	0.632	0.460	1.374
5.	Landholding	1.348	0.317	4.251**
6.	Occupation	0.251	0.310	0.808
7.	Annual Income	-0.404	0.268	-1.511
8.	Social Participation	0.797	0.269	2.961**
9.	Training Attended	0.141	0.237	0.596
10.	Risk Orientation	0.203	0.065	3.102**
11.	Scientific Orientation	0.111	0.084	1.314
12.	Achievement Motivation	0.210	0.076	2.748**
13.	Economic Motivation	0.270	0.075	3.606**
14.	Environmental Orientation	-0.249	0.080	-3.106**
15.	Extension Contact	0.021	0.023	0.917

* $p < 0.05$; ** $p < 0.01$

Note: The overall model was significant ($F = 71.02$, $p < 0.01$, $R^2 = 0.6986$). Variance Inflation Factor (VIF) values for all predictors were below 5.0, indicating absence of serious multicollinearity.

DISCUSSION

The favourable attitude of respondents toward natural farming across soil health, economic, and pest management dimensions is consistent with Kumari et al. (2022), who documented positive attitudinal orientation toward farm-prepared biological inputs among smallholders exposed to Zero Budget Natural Farming training. The strong endorsement of crop residue application and mulching reflects farmers' direct experience of moisture conservation benefits in semi-arid conditions. Positive attitudes toward on-farm biological inputs and botanical formulations indicate effective extension outreach (Slathia et al., 2020; Jatav, 2024). The rejection of negative perceptions regarding soil organic carbon and farm size constraints suggests an informed respondent profile. Residual uncertainty over productivity during the transitional phase, however, remains a concern warranting evidence-based field demonstration, as noted by Eyhorn et al. (2019).

The positive bivariate correlations of annual income and landholding with attitude suggest that farmers possessing greater economic resources tend to hold more favorable attitudes toward natural farming. However, in the multivariate regression model, annual income did not emerge as a significant predictor, indicating that its influence may operate indirectly through other socioeconomic and motivational factors. In contrast, landholding remained a significant positive predictor, highlighting the importance of farm resource endowment in shaping attitudes toward natural farming. Achievement motivation emerged as a significant predictor, indicating that farmers with stronger aspirations for success and innovation are more likely to develop favorable attitudes toward natural farming. Although scientific orientation showed a significant positive correlation with attitude, its effect was not statistically significant in the regression model, suggesting overlap with other psychological variables included in the analysis. The positive attitude toward indigenous inputs Bijamrut, Jivamrut, Nimastra, and neem extracts corroborates the findings of Singh and Patel (2021) and reflects the effectiveness of KVK-led training in building familiarity with on-farm input preparation.

The significant negative correlations of age and farming experience with attitude are consistent with the innovation diffusion literature, whereby older and more experienced farmers exhibit greater habit persistence in conventional high-input systems (Thangjam & Jha, 2024). The negative association of extension contact with attitude may reflect the historical orientation of extension services toward conventional input-intensive agriculture, which may have reinforced conventional farming norms. The non-significant association of education with attitude likely reflects the narrow educational range within the sample. The negative regression coefficient of environmental orientation ($b = –0.249$) despite its positive bivariate correlation reflects a suppression effect in the multivariate context, as explained in the results section above.

CONCLUSION

The study establishes that farmers in the Tarai region of Uttar Pradesh hold a predominantly moderate attitude toward natural farming, shaped primarily by economic capacity, psychological motivation, and social engagement rather than by formal education or extension contact alone. Landholding, achievement motivation, economic motivation, risk orientation, and social participation are the most consistent enablers of positive attitude, while older age, longer conventional farming experience, and residual uncertainty about productivity during the transitional phase are the primary

attitudinal barriers. The regression model explains approximately 70 per cent of attitudinal variation, confirming that a combination of economic empowerment and psychological strengthening is necessary for attitude change. Extension programmes targeting the Tarai region must integrate income-support mechanisms, peer-learning platforms, and long-duration demonstration plots to convert moderate attitudinal endorsement into sustained natural farming adoption.

DECLARATIONS

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Authors' contributions: Conceptualization of research (YK, NRM, RKD); Designing of the experiments (YK, NRM, RKD); Contribution of experimental materials (YK, NRM, RKD, RS); Execution of field survey and data collection (YK, PK); Analysis of data and interpretation (YK, KS); Preparation of manuscript (KS, YK).

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