

## Constraints and Farmers' Suggestions for Natural Farming Adoption in Tarai Zone of Uttar Pradesh, India

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### ABSTRACT

Despite increasing policy support for natural farming in Uttar Pradesh, limited empirical evidence is available on the constraints affecting its adoption in the Tarai zone. Therefore, the present study was undertaken to identify and analyze the major constraints faced by the respondents and to elicit suitable suggestions to improve adoption of natural farming. This study followed an ex-post facto research design, and a total of 450 respondents were selected through proportionate random sampling from four purposively selected dis-

tricts. Data were collected through personal interviews using a structured interview schedule. The constraints were analyzed using the Garrett Ranking Technique, while suggestions were prioritized using Mean Percent Score (MPS). The findings revealed that inadequate technical knowledge about natural farming practices, Lack of premium price for natural produce, Low yield in initial years and limited market opportunities were the major constraints hindering the adoption of natural farming. The results of the study also identified key suggestions such as the need for organized training programs and demonstrations; assured premium pricing, and establishment of dedicated markets for natural farming products. The study highlights the importance of integrated efforts involving capacity building, institutional support, and market development to enhance the adoption of natural farming. The findings provide useful insights for policymakers, extension agencies, and stakeholders for promoting sustainable agricultural practices in the region.

**Keywords** Natural farming, Constraints, Farmers' suggestions, Sustainable agriculture, Garret ranking technique, Mean per cent score (MPS), Tarai zone of Uttar Pradesh.

### INTRODUCTION

India has grown a lot of food grains and is now one of the top farming countries in the world. But this

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growth has also caused some big problems for the environment. The present generation is enjoying the benefits of prosperity brought by economic growth and scientific progress in agriculture, especially the Green Revolution. Current agricultural practices are causing soil erosion up to 100 times faster than natural soil formation (UNCCD 2017). About 60% of soil organic carbon has already been lost due to land degradation, and 20 million hectares of fertile land are lost annually (FAO 2015 and UNCCD 2017). Nearly 30% of India's land (97.8 million hectares) is affected by land degradation (ISRO 2021). Land degradation directly affects the well-being of more than 3.2 billion people worldwide. It threatens a potential decline of 12% in global food production. At current rates, 90% of land may be significantly impacted by 2050 (UNESCO 2024). These challenges threaten agricultural sustainability, ecosystem health and long-term food production.

Conventional farming depends a lot on synthetic chemicals and fuel. Using too much fertilizer and pesticide has polluted the environment, damaged soil and water, reduced food quality, and harmed human and animal health. This has led to the emergence of sustainable alternatives like organic farming, regenerative agriculture, and natural farming. In this context, natural farming, which promotes farming without synthetic inputs, is gaining prominence as a sustainable alternative (Palekar 2015).

Natural farming was first introduced by Japanese philosopher and Scientist Masanobu Fukuoka, while in India, agriculturist Subhash Palekar played an important role in promoting ZBNF practices across the country (Sharma *et al.* 2023). Natural farming is a chemical-free method of cultivation that uses Desi cow dung, urine, and other locally available resources instead of chemical fertilizers and pesticides. It also supports traditional farming practices and reduces farmers' dependence on outside inputs (Press Information Bureau 2024). Natural farming, popularly known as Zero Budget Natural Farming (ZBNF) in India, is an agro-ecological farming approach that emphasizes the use of locally available natural resources such as cow dung, cow urine, crop residues and biological methods for soil fertility enhancement and pest management (Kumar *et al.* 2023). This meth-

od is based on four components: Bijamrita, Jivamrita, Whapasa, and Acchadana. Among these, Bijamrita (a seed treatment) and Jivamrita (a soil inoculant) are microbial mixtures that can be prepared in less than 48 hrs. (Khadse and Rosset 2019).

Agriculture forms the foundation of Uttar Pradesh's economy, the nation's most populous state. Over 80% of its people rely directly or indirectly on farming for their livelihoods, making the state's economy deeply rooted in agriculture. In the Tarai zone, a fertile, marshy lowland strip (10-20 km wide) along the Himalayan foothills, this region serves as a vibrant transition area with diverse wildlife and nutrient-rich alluvial soils. Major agricultural hub for sugarcane, rice and wheat, supported by high rainfall (Singh and Rawat 2026). In recent years, the state has also promoted natural farming under the Bharatiya Prakritik Krishi Paddhati (BPKP) scheme; Uttar Pradesh began natural farming as "cow-based natural farming". Despite these efforts, adoption remains limited in many areas due to several practical constraints. While many studies have documented the constraints of natural farming and other sustainable agricultural practices in different parts of India, there is little empirical evidence from the Tarai agro-ecological zone of Uttar Pradesh. The Tarai zone is characterized by intensive cropping systems, favorable natural resource conditions and increasing policy emphasis on natural farming promotion. However, the factors influencing its adoption and the interventions necessary for its effective scale-up are poorly documented. Therefore, there is a need for a systematic assessment of the farmers' constraints and suggestions for developing location-specific strategies for promoting natural farming in the zone.

This study investigates the multifaceted challenges hindering the widespread adoption of natural farming practices and proposes actionable strategies to overcome them within this specific Agro-ecological region. Previous studies have also reported several constraints in the adoption of natural farming. For instance, Sharma *et al.* (2025) reported that the most important hurdles faced by farmers in natural farming adoption were intensive demand for labor for the preparation of natural inputs, followed by limited supply of skilled labor, maximum rate of wages,

limited information about the market, and the lack of specialization of markets. Natural farming is becoming an important approach to achieve sustainable agricultural development by minimizing dependence on external chemical inputs and enhancing ecological balance. But successful adoption of natural farming requires not only policy support but also access for farmers to technical knowledge, institutional services, input resources and market opportunities. Hence, it is vital to identify the specific constraints faced by the farmers to design effective interventions for wider adoption of natural farming practices.

With the above viewpoints in consideration, the present study was conducted to identify the major constraints faced by the farmers in adoption of natural farming and to document their suggestions for overcoming the constraints in the Tarai zone of Uttar Pradesh. The findings of the study are expected to provide useful insights to extension agencies, policy makers and other stakeholders involved in promoting sustainable agricultural practices in the region.

## RESEARCH METHODOLOGY

The present investigation was carried out in the Tarai zone of Uttar Pradesh, where four districts, namely Lakhimpur Kheri, Bijnor, Bahraich and Pilibhit, were selected purposively due to the relatively higher concentration of registered farmers under natural farming. The selected districts represented the major concentration of registered farmers under natural farming in the Tarai zone. Therefore, these districts were considered appropriate for obtaining reliable information regarding the constraints and suggestions associated with natural farming adoption. The study followed an ex-post facto research design to analyze the constraints and suggestions related to natural farming practices. A multistage sampling procedure was adopted for the selection of respondents. Seven blocks were purposively selected from the identified districts based on the predominance of farmers under natural farming. A list of registered farmers under natural farming was obtained from the selected blocks, and 10 per cent of the farmers were selected through a proportionate random sampling technique. To obtain the required sample size and ensure adequate representation across the study area, 47 villages

were covered from the selected blocks. Thus, a total of 450 respondents were selected for the present study.

Primary data were collected through personal interviews and a pre-tested structured interview schedule developed on the basis of review literature, expert consultation and the objectives of the study. Constraints faced by farmers were identified through open-ended responses and analyzed using the Garrett Ranking Technique to determine their relative importance, whereas suggestions provided by the respondents were analyzed using Mean Per cent Score (MPS) for prioritization.

**Garrett's ranking technique:** It is used to identify the constraints faced by the respondents in natural farming adoption. Respondents ranked 19 constraints from least severe to most severe. The assigned ranks were converted into percentage positions using Garrett's formula. The formula used to convert ranks into percentage positions is given below:

$$\text{Percent position} = \frac{100 (R_{ij} - 0.5)}{N_j}$$

Where,

$R_{ij}$  = Rank given for the  $i$ th statement by  $j$ th respondent

$N_j$  = No. of statements ranked by  $j$ th respondent

The rank given to each item was first changed into a score using the Garrett and Woodworth (1969) table. Then, the scores from all respondents for each constraint were added together and divided by the total number of respondents. After finding the average score for every constraint, they were arranged from highest to lowest. This helped identify the most serious constraints.

**Mean Percent Score:** It was calculated by multiplying the total obtained score by 100 and dividing by the maximum possible score:

$$\text{MPS} = \frac{\text{Total obtained score}}{\text{Maximum possible score}} \times 100$$

## RESULTS AND DISCUSSION

### Constraints faced by respondents

The adoption of natural farming is influenced by several technical, economic, institutional and resource-related factors. Knowledge of these constraints is important to develop appropriate interventions to facilitate wider uptake by farmers. The constraints perceived by the respondents have been identified and ranked using the Garrett Ranking Technique, and the results are presented in Table 1.

Table 1 indicated that the majority (82.75%) of respondents expressed the most severe constraint “Lack of technical knowledge about natural farming practices” as first ranked; This indicates that many farmers still possess inadequate knowledge regarding the preparation and application of natural inputs, nutrient management practices, pest and disease control measures, and other essential components of natural farming. The result suggests that existing extension and training efforts may not be sufficient to provide farmers with the practical skills required for successful adoption of natural farming practices.

“Lack of premium price for natural produce”

(71.24%) ranked second, indicating that farmers do not receive sufficient economic incentives for adopting natural farming. The absence of assured premium prices and organized marketing channels may discourage farmers from shifting from conventional agriculture.

“Low yield in initial years” (62.24%) ranked third, reflecting farmers’ concerns regarding income stability and production risks during the conversion period. “Lack of specialized markets for natural produce” (56.97%) ranked fourth. The absence of dedicated marketing channels limits farmers’ ability to differentiate their products and realize potential economic benefits. Inadequate market infrastructure and poor access to organized marketing systems may therefore restrict wider adoption of natural farming in the region. Similar results were also reported by Namdev *et al.* (2011), Mokhtariabkenari and Sharma (2014) and Kumar and Sharma (2021).

The data also revealed that the majority (52.76%) of respondents experienced the constraint “Difficulty in managing insect and pest damage”, ranked fifth, followed by “Difficulty in weed management under natural farming” (50.02%), ranked sixth. These findings indicate that farmers continue to face challenges

**Table 1.** The constraints faced by the respondents in adopting natural farming, n = 450.

| Sl. No. | Constraints                                                                          | Garret Mean Score | Rank  |
|---------|--------------------------------------------------------------------------------------|-------------------|-------|
| 1       | Lack of Technical knowledge about natural farming practices.                         | 82.75             | I     |
| 2       | Lack of premium price for natural produce.                                           | 71.24             | II    |
| 3       | Low yield in initial years.                                                          | 62.24             | III   |
| 4       | Lack of specialized markets for natural produce.                                     | 56.97             | IV    |
| 5       | Difficulty in managing insect and pest damage.                                       | 52.76             | V     |
| 6       | Difficulty in weed management under natural farming.                                 | 50.02             | VI    |
| 7       | Lack of extension services regarding natural farming.                                | 47.30             | VII   |
| 8       | Insufficient financial support and incentives during conversion (transition) period. | 44.37             | VIII  |
| 9       | Intensive labor requirement in preparation of natural inputs.                        | 41.81             | IX    |
| 10      | Limited availability of natural farming inputs.                                      | 38.89             | X     |
| 11      | Lack of awareness campaigns on natural farming.                                      | 36.24             | XI    |
| 12      | Lack of training facilities.                                                         | 34.10             | XII   |
| 13      | Non-availability of indigenous cows.                                                 | 31.64             | XIII  |
| 14      | Soil fertility restoration takes longer time.                                        | 29.12             | XIV   |
| 15      | Limited availability of botanical resources for formulations.                        | 26.40             | XV    |
| 16      | Shortage of skilled labor.                                                           | 24.71             | XVI   |
| 17      | Difficult to maintain indigenous cattle.                                             | 19.97             | XVII  |
| 18      | Non availability of indigenous seeds.                                                | 15.45             | XVIII |
| 19      | Limited involvement of research institutions.                                        | 08.58             | XIX   |

in replacing conventional chemical-based crop protection measures with ecological alternatives. Limited knowledge of biological pest management practices and insufficient availability of effective natural formulations may contribute to these concerns. “Lack of extension services regarding natural farming” (47.30%), ranked seventh, highlighting the need for stronger advisory support systems. “Insufficient financial support and incentives during conversion (transition) period” (44.37%), with eighth rank, suggesting that farmers require economic assistance to compensate for the risks associated with the conversion process. “Intensive labor requirement in preparation of natural inputs” (41.81%) and “Limited availability of natural farming inputs” (38.89%) ranked ninth and tenth, respectively. These constraints indicate that the labor-intensive nature of natural farming and difficulties in accessing essential inputs may reduce its attractiveness, particularly among farmers facing labor shortages or resource limitations. The findings were also reported by Rao *et al.* (2021) and Saradhi *et al.* (2021).

Other constraints such as “Lack of awareness campaigns on natural farming” (36.24%), “Lack of training facilities” (34.10%), “Non-availability of indigenous cows” (31.64%), “Soil fertility restoration takes longer time” (29.12%), “Limited availability of botanical resources for formulations” (26.40%) were perceived as moderate important constraints. Although these factors were assigned lower ranks, they may collectively influence farmers’ willingness to adopt natural farming practices. Similar observations were also made by Balla and Goswami (2022) and Hariraj *et al.* (2025)

The least important constraints faced by the respondents were; “Shortage of skilled labor” (24.71%), “Difficult to maintain indigenous cattle” (19.97%), “Non availability of indigenous seeds” (15.45%), “Limited involvement of research institutions” (08.58%) Despite their relatively lower ranking, these issues should not be overlooked, as their cumulative effect may influence the long-term sustainability and scaling-up of natural farming initiatives. Similar observations were made by Sharma *et al.* (2025).

Overall, the findings suggest that technical,

economic and institutional constraints still hinder the adoption of natural farming in the Tarai zone of Uttar Pradesh. Addressing these constraints through capacity building programs, strengthened extension services, improved market infrastructure and supportive policy interventions may significantly improve the adoption and sustainability of natural farming practices in the region.

### Suggestions to overcome the constraints

Respondents were asked to identify the measures to overcome constraints associated with adoption of natural farming. The suggestions were ranked according to Mean Per cent Score (MPS) and the results are presented in Table 2.

Table 2 reveals that the respondents were asked to provide suggestions for improving the adoption behavior of natural farming practices. A majority of the respondents (88.22%) suggested that “Provision of organized, regular training program and demonstrations on natural farming for farmers” ranked at first place was common suggestion. This is indicative of the high demand from farmers for practical knowledge and skill-based learning opportunities. Since the lack of technical knowledge was the most critical constraint found to be there, the respondents emphasized the need for systematic training programs, field demonstrations and on-ground learning experiences to improve their understanding and confidence in adopting natural farming practices.

“The Government should ensure premium price and adequate market support for natural farming produce” (85.11%) ranked second ; this indicates economic incentives were seen as one of the main drivers for natural farming adoption by farmers. Natural farming has environmental benefits, but farmers may be reluctant to switch from conventional agriculture to natural farming without guaranteed premium prices and assured market channels. This underscores the need for enhancing market linkages, certification systems and consumer awareness of naturally produced commodities.

“Establishment of dedicated markets for natural farming products” (82.66%) ranked third. Special-

**Table 2.** Recommendations for overcoming the constraints. MPS = Mean Percent Score. (n=450)

| Sl. No. | Suggestions                                                                                                           | MPS   | Rank |
|---------|-----------------------------------------------------------------------------------------------------------------------|-------|------|
| 1       | Provision of organized, regular training programmes and demonstrations on natural farming for farmers.                | 88.22 | I    |
| 2       | Enhancing the involvement of research institutions in the promotion of natural farming                                | 51.55 | XII  |
| 3       | Providing guidance on effective pest and disease management using natural inputs                                      | 78.88 | IV   |
| 4       | The Government should ensure premium price and adequate market support for natural farming produce                    | 85.11 | II   |
| 5       | Provision of financial assistance, subsidies and incentives during initial years of transition.                       | 76.00 | V    |
| 6       | Establishment of dedicated markets for natural farming products                                                       | 82.66 | III  |
| 7       | Strengthening extension services to provide timely technical guidance by Scientists and experts about natural farming | 74.00 | VI   |
| 8       | Promoting indigenous cattle rearing through Government schemes                                                        | 57.11 | X    |
| 9       | Conducting awareness campaigns to promote the benefits of natural farming                                             | 70.44 | VII  |
| 10      | Improving the availability of natural farming inputs at local level                                                   | 68.00 | VIII |
| 11      | Promoting plantation of botanical resources required for preparation natural formulations                             | 64.88 | IX   |
| 12      | Strengthening farmers confidence through dissemination of success stories and best practices                          | 48.66 | XIII |
| 13      | Enhancing farmers engagement with progressive farmers model practitioners                                             | 55.11 | XI   |

ised marketing platforms can help farmers get better prices, increase visibility of their products and reduce marketing uncertainties. Dedicated markets may also allow interaction between producers and consumers directly, which may increase trust and improve market efficiency.

“Providing guidance on effective pest and disease management using natural inputs” (78.88%) ranked fourth. Strengthening advisory services and promoting location-specific pest management strategies can therefore play a significant role in improving farmers’ confidence and adoption behavior. “Provision of financial assistance, subsidies and incentives during initial years of transition” (76.00%) ranked fifth. Therefore, respondents emphasized the need for financial support mechanisms to reduce economic risks and encourage wider adoption of natural farming practices. “Strengthening extension services to provide timely technical guidance by scientists and experts about natural farming” (74.00%) ranked sixth, and “Conducting awareness campaigns to promote the benefits of natural farming” (70.44%) ranked seventh, respectively. These suggestions highlight the need for stronger institutional support to address technical and financial challenges faced by farmers. Similar finding reported by Arif *et al.* (2024) and Sharma *et al.* (2025).

Other suggestions reported by the respondents in-

cluded “Improving the availability of natural farming inputs at local level” (68.00), “Promoting plantation of botanical resources required for preparation natural formulations” (64.88), “Improving the availability of natural farming inputs at local level” (57.11), “Enhancing farmers engagement with progressive farmers model practitioners” (55.11), “Enhancing the involvement of research institutions in the promotion of natural farming” (51.55). These measures may contribute to strengthening the institutional and resource base required for successful implementation of natural farming practices.

The least important suggestion is “Strengthening farmers confidence through dissemination of success stories and best practices” (48.66%). Although ranked lower than other suggestions, sharing success stories can still serve as an effective motivational tool for encouraging adoption by reducing uncertainty and demonstrating the practical feasibility of natural farming. The findings were also reported by Rao *et al.* (2021) and Sharma *et al.* (2025).

The overall suggestions of the respondents explored that capacity building, market development, financial assistance and institutional support are important needs for the promotion of natural farming in the Tarai zone of Uttar Pradesh. The results stress the need for a concerted effort of extension agen-

cies, research institutions, policymakers and market stakeholders to create a conducive ecosystem for the adoption of sustainable natural farming.

## CONCLUSION

The study concluded that the adoption of natural farming in the Tarai zone of Uttar Pradesh is inhibited by a combination of technical, economic and institutional factors. The major constraints faced by the farmers were inadequate technical knowledge, lack of premium prices, low yields during the transition period and limited market opportunities. The results indicate that improving farmers' access to training, strengthening extension support systems, developing dedicated markets and providing adequate incentives during the transition period are essential to promote natural farming. The study emphasizes the need for concerted efforts of extension agencies, research institutions and policymakers to create an enabling environment for wider adoption of natural farming. Such constraints can be addressed through appropriate interventions and can contribute significantly to sustainable agricultural development in the region.

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