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Exploring the Scenario of Natural Farming in Enhancing Production in West Garo Hills

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Abstract

Natural farming offers opportunities to strengthen agricultural sustainability through indigenous knowledge, crop diversification and locally available resources. West Garo Hills district of Meghalaya possesses a rich tradition of mixed cropping, minimum tillage, agroforestry and crop-livestock integration. Recent research identified the district as the most sustainable among five surveyed districts of the North-Eastern Hill Region under natural farming. However, soil fertility constraints, pest and disease incidence, inadequate planting materials and marketing difficulties continue to affect productivity and profitability. Experimental evidence from Meghalaya indicates that crop responses to natural farming differ according to crop species and management practices. Integrating traditional knowledge with scientifically validated biological inputs, soil conservation, crop diversification and farmer-oriented extension services could strengthen agricultural production. A locally adapted approach is essential for improving farm livelihoods while conserving the ecological resources of West Garo Hills.

Keywords: Crop diversification, Indigenous knowledge, Natural farming, West Garo Hills

Introduction

Agriculture forms an important foundation of rural livelihoods in the West Garo Hills district of Meghalaya, where varied topography and climatic conditions support the cultivation of rice, maize, ginger, turmeric, vegetables, fruits and oilseeds. The farming systems of the district are closely associated with indigenous knowledge, traditional resource management and the cultural practices of Garo communities. However, soil fertility limitations, pest and disease incidence, dependence on seasonal rainfall and inadequate marketing facilities continue to constrain agricultural productivity.

Natural farming is gaining attention as an agroecological approach that emphasizes locally available resources, crop diversification, biological processes and reduced dependence on purchased agricultural inputs. Several principles of natural farming are already embedded in the traditional agricultural systems of West Garo Hills, particularly mixed cropping, minimum tillage, mulching and crop-livestock integration.

Das *et al.* (2016) documented the importance of traditional Garo farming practices for natural resource conservation. Athawale and Singh (2026) subsequently identified West Garo Hills as the leading district in overall natural farming sustainability among five surveyed districts of the North-Eastern Hill Region. Recent experiments in Meghalaya have also highlighted the potential and limitations of natural farming for crop production (Sangma *et al.*, 2025). This article examines the prevailing scenario, productivity opportunities, major constraints and future prospects of natural farming in West Garo Hills.

Traditional Agriculture: A Foundation for Natural Farming

Traditional Garo farming reflects generations of experience in managing crops, soil, water and biological resources. Major farming systems include lowland agriculture, homestead gardening, shifting cultivation and community-based forestry.

Das *et al.* (2016) reported that rice is predominantly cultivated in lowland areas, whereas upland fields support mixed cultivation of maize, millets, vegetables, ginger,

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turmeric and other crops. Homestead gardens commonly integrate fruit trees, vegetables and livestock, contributing to household nutrition and supplementary income.

Crop rotation, intercropping, local seed conservation, mulching and the use of farmyard manure and wood ash are characteristic features of traditional cultivation. Livestock contribute additional resources through manure production and nutrient recycling.

These practices provide a foundation for developing locally adapted natural farming systems. However, traditional farming and modern natural farming are not necessarily identical. Certain practices, particularly vegetation burning during land preparation, may require modification to protect soil organic matter and biological activity. Therefore, sustainable agricultural development should combine useful indigenous knowledge with scientifically validated improvements.

Existing Scenario of Natural Farming in West Garo Hills

Athawale and Singh (2026) evaluated natural farming sustainability using economic, social and ecological indicators across five districts of the North-Eastern Hill Region. The investigation included selected farming communities from Rongram block in West Garo Hills. The district ranked first in overall weighted Sustainable Livelihood Security Index, with a value of 0.27. It also recorded the highest social sustainability score of 0.33 and a joint-highest ecological sustainability score of 0.22.

Minimum or zero tillage, crop rotation, seed conservation and cover cropping were important characteristics of surveyed natural farming systems. However, deliberate application of farmyard manure was less common, highlighting opportunities for improving organic nutrient recycling.

The major natural farming practices, their agricultural relevance and potential contributions to sustainable production in West Garo Hills are summarized in table 1. The table presents a qualitative synthesis of documented traditional and natural farming practices and their agricultural relevance. It does not report experimentally measured productivity gains. Potential benefits depend on crop species, soil conditions, nutrient availability, management practices and local market opportunities. The findings indicate that natural farming in West Garo Hills has an established ecological foundation, while agricultural performance and economic returns depend on several interacting factors. These differences emphasize the importance of location-specific management and economically viable crop selection.

Table 1: Major natural farming practices and their potential contributions to sustainable agricultural production in West Garo Hills, Meghalaya

Major component	Important practice or factor	Agricultural significance
Soil management	Minimum tillage and organic mulching.	Helps conserve soil moisture, reduce erosion and protect soil structure.
Nutrient management	Farmyard manure and crop-residue recycling.	Supports nutrient cycling and soil biological activity.
Crop diversification	Mixed cropping and crop rotation.	Diversifies production and may improve resource utilization.
Seed management	Indigenous seed conservation and healthy planting materials.	Maintains locally adapted crop diversity and supports crop establishment.
Crop productivity	Improved management of rice, maize and ginger.	Offers opportunities to address crop-specific production constraints.
Horticultural production	Fruit crops, vegetables and agroforestry.	Diversifies farm produce and creates additional income opportunities.
Farm profitability	Lower input dependence and improved marketing	May reduce selected production expenses and strengthen economic returns

Source: Summarized and adapted from Das *et al*. (2016) and Athawale and Singh (2026).

Natural Farming Practices for Enhancing Agricultural Production

Improving Soil Health and Nutrient Recycling

Soil fertility is essential for sustainable agricultural production. Natural farming emphasizes biological nutrient cycling through crop residues, organic amendments, mulching and the integration of crops with livestock.

Sangma *et al.* (2025) described five important components of natural farming: Beejamrit, Jivamrit, Acchadana, Whapasa and biological plant protection measures. Beejamrit is used for seed treatment, while Jivamrit is intended to support microbial activity and nutrient cycling. Acchadana involves covering soil with plant residues or living vegetation, whereas Whapasa emphasizes suitable soil aeration and moisture conditions.

In West Garo Hills, mulching is particularly relevant because sloping agricultural lands are vulnerable to surface runoff and soil loss during heavy rainfall. Maintaining adequate soil cover could help conserve moisture and reduce weed competition.

However, organic inputs must be applied according to crop requirements and soil conditions. Scientific evaluation remains important because natural inputs alone may not always supply sufficient nutrients for sustained crop production.



Figure 1: Crop-residue mulching in a maize field and training by KVK personnel

Strengthening Rice and Maize Production

Rice (*Oryza sativa* L.) and maize (*Zea mays* L.) are important food crops in West Garo Hills. Their productivity is influenced by soil fertility, rainfall distribution, crop varieties and field management. Athawale and Singh (2026) reported surveyed natural farming yields of approximately 1,887 kg ha^{-1} for rice and 2,149 kg ha^{-1} for maize. These observations indicate opportunities to improve productivity through better resource management.

Selection of healthy seeds, timely sowing, appropriate crop spacing, organic residue management and effective weed control may contribute to improved crop establishment. The inclusion of compatible legumes in suitable rotations can also support biological nitrogen fixation and diversify household food production. Nevertheless, improved productivity should be demonstrated through local trials rather than assumed from the adoption of natural farming practices alone.

Improving Ginger Production

Ginger (*Zingiber officinale* Roscoe) is an important commercial crop for farmers of West Garo Hills. It is traditionally cultivated using locally adapted practices, but production and marketing constraints can substantially reduce profitability.

Sharma *et al.* (2023) surveyed 120 ginger farmers in Rongram and Dalu blocks. All respondents identified inadequate knowledge of pest and disease management as a constraint, while 98.33% reported marketing difficulties and 96.67% reported problems associated with quality planting materials.

Soft rot and white grub infestation were identified among the important production challenges. Natural farming-oriented ginger production could emphasize healthy planting rhizomes, suitable drainage, mulching, crop rotation and scientifically evaluated biological plant protection. Proper storage and selection of seed rhizomes are particularly important for maintaining planting-material quality.

Farmer training in disease identification and preventive crop management would be valuable. Improved transportation and collective marketing could also help farmers obtain better economic returns.

Opportunities in Horticultural Production

Horticultural production offers considerable potential for income diversification in West Garo Hills. Traditional homestead systems integrate fruits, vegetables, spices and other useful plants with livestock and tree species.

Athawale and Singh (2026) reported comparatively high net returns from orange and ginger under the surveyed natural farming systems. Orange cultivation was particularly remunerative in the surveyed conditions, although these returns should not be considered guaranteed outcomes for all growers.

Improved orchard sanitation, organic mulching, appropriate nutrient recycling, healthy planting materials and compatible intercrops could strengthen horticultural management. Diversified homestead cultivation may also provide supplementary food, reduce dependence on individual enterprises and create additional opportunities for marketing farm produce.

Scientific Evidence on Natural Farming Productivity

Recent research from Meghalaya provides important insights into how natural farming affects crop productivity. Sangma *et al.* (2025) reported that complete natural farming produced a turmeric yield of 11,600 kg ha^{-1} compared with 9,500 kg ha^{-1} under the control treatment. However, an evaluated organic farming package produced a higher yield of 21,970 kg ha^{-1}.

The same publication described positive responses of selected crops, including cowpea, field pea and mustard, under natural farming treatments. In contrast, maize, black gram and tomato showed lower yields under natural farming in other experimental comparisons. These findings suggest that the effectiveness of natural farming depends on crop species, soil properties and management practices. They also underline the need for balanced nutrient management and crop-specific recommendations under the acidic soil conditions of Meghalaya.

Although these experiments were conducted within the state, additional field trials are necessary before extrapolating their results directly to West Garo Hills.

Integrating Indigenous Knowledge with Scientific Crop Management

Traditional agriculture and scientific crop management can complement each other when interventions are adapted to local needs and ecological conditions. Das *et al.* (2026) demonstrated the value of improved toria cultivation in West Garo Hills. During 2023-2025, the improved variety TS-36 yielded an average of 995 kg ha^{-1} compared with 740 kg ha^{-1} under existing farmers' practices. Net returns increased from ₹ 27,100 to ₹ 41,675 ha^{-1}.

However, these demonstrations involved an improved agronomic package that was not a complete natural farming treatment. Therefore, the observed yield increase should not be attributed directly to natural farming.

Instead, the findings highlight the importance of improved planting materials, appropriate crop management and farmer-oriented extension services. Similar participatory approaches could help evaluate the effectiveness of natural farming inputs, biological pest management and soil conservation practices in different agricultural situations.

Challenges and Future Prospects

Despite its ecological strengths, natural farming in West Garo Hills faces important production and economic challenges. These include limited nutrient availability, inadequate knowledge of biological pest management, poor planting-material quality, labour requirements, insufficient storage infrastructure and unstable market prices.

Sustainable development requires coordinated support from farmers, agricultural research institutions, Krishi Vigyan Kendra, government departments and farmer organizations.

Village-level demonstrations could evaluate natural farming practices in rice, maize, ginger, turmeric and horticultural crops. Soil testing, biological input validation, farmer training and improved storage infrastructure would strengthen informed technology adoption.

Future studies should compare natural farming with existing agricultural systems using crop yield, cultivation costs, net returns, labour demand and soil health indicators over several seasons. Such evidence would help identify practices that are productive, environmentally sound and economically suitable for the district.

Conclusion

West Garo Hills possesses considerable potential for strengthening natural farming through its indigenous agricultural knowledge, diversified cropping systems and traditional resource conservation practices. Recent sustainability assessments have highlighted the district's ecological and social strengths, particularly in minimum tillage, crop rotation and seed conservation. However, evidence from Meghalaya indicates that the productivity benefits of natural farming vary among crops and management practices. Increasing agricultural production therefore requires more than reducing synthetic inputs or using locally prepared biological formulations. Improved nutrient management, healthy planting materials, appropriate pest and disease control, crop diversification and better market access are equally important. Scientific research and participatory demonstrations can help identify natural farming practices suitable for the district's diverse agroecological conditions. By integrating indigenous knowledge with validated technologies, farmer training and institutional support, natural farming could contribute meaningfully to sustainable agricultural production, environmental conservation and improved livelihood opportunities in West Garo Hills.

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