



Cultivating Sustainability: Indigenous Farming Practices, Biodiversity, and Food Security in Indian Knowledge Systems

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Abstract

Indigenous farming practices in the Indian subcontinent have been an age-old form of knowledge that synthesizes knowledge about nature with traditional farming practices. These practices are grounded in the Indian Knowledge Systems (IKS) and aim at co-existing with nature in an eco-friendly manner by means of several agricultural practices such as the cultivation of several crops together, the conservation of native seeds, and the conservation of the soil in a natural manner. This research seeks to understand the impact of conventional agricultural methods on the conservation of various species and provision of nutrition for human beings despite current issues like changes in climatic conditions, soil degradation, and food shortage. The strategy employed in this research includes indigenous practices such as crop mixing and rotation, Agro-forest crops, protected forests, and native seed conservation to demonstrate the significance of indigenous agricultural practices in supporting the growth of a variety of plants, enhancing the quality of the soil, and ensuring agricultural sustainability during environmental challenges. The paper will also address the social and cultural dimensions within the context of agricultural practices such as the support for several foods and native crops. Through integrating traditional farming practices and modern sustainability initiatives in their research work, the importance of IKS for achieving global goals such as "eradicating poverty, ending hunger, take action on climate change, and protect life on land" is discussed. The need for policies for such practices and recognition within academic circles and research initiatives that focus on multiple disciplines for incorporating traditional farming practices for a "resilient and prosperous future and a secure and safe food supply" is emphasized.

Keywords: Indigenous Agriculture; Indian Knowledge Systems (IKS); Agrobiodiversity; Food Security; Traditional Farming Practices; Sustainable Agriculture; Climate Resilience; Native Seed Systems; Ecological Sustainability.

1.Introduction:

Agricultural practices in the Indian region have a rich history that ensured appropriate patterns of cultivation of land through time. The old ways are tied into something called Indian Knowledge Systems, or IKS, which covers all sorts of practical stuff passed down over time. It keeps the soil decent, helps with different plants and animals sticking around, and makes sure folks have food without ruining everything.

These traditional setups use simple tools, mix crops together, and do not rely on a ton of outside stuff like chemicals or fancy seeds [1]. On the other hand, modernized agriculture tends to favor practices such as monoculture, application of chemical fertilizers, and seed inputs from outside sources. It has caused issues like the ground getting worn out, fewer types of plants and bugs, and trouble when the weather acts up. Climate change makes it worse, especially for small farmers who cannot afford to switch things around easily. Land degradation hits them hard too[2]..

Practices like planting different crops side by side, switching what grows where each season, or even trees mixed in with fields, those have kept biodiversity going strong. Managing the forest without cutting too much, saving local seeds, all that recycles nutrients naturally and reduces pests without A mix of crops in one spot means if one fails from

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drought or flood, others might make it, lowering the overall risk [3]. Native seeds hold onto genetic variety, which could be key for whatever comes next with changing temperatures.

Food security is a big part of this, and conventional farming allows people to farm millets, lentils, vegetables, and in some cases, medicine plants that fit in well with the local cuisine [4]. It helps combat malnutrition because it promotes a healthy and diverse diet. Hunger gets addressed too, since it is about more than just filling up, but doing it sustainably. Communities share the load, passing knowledge down generations, managing resources together, that social side is important [5].

From a bigger view, these IKS ideas line up with things like the UN Sustainable Development Goals, stuff on poverty, food, climate action, protecting land life [6]. The traditional approaches construct better jobs, tougher food chains, and ways to adapt to changes in the weather. Though, it does not really get much attention in terms of policies or research, it is being overlooked [7].

This paper aims to explore how traditional approaches to farming, such as those used in IKS, help in maintaining biodiversity, providing food, and helping with modern issues such as climate change [8]. Looking at crop mixes, agroforestry, sacred groves or protected areas, seed saving, it highlights the eco benefits, nutrition side, cultural roots. The policies need to support this more, with cross field research and teamwork, for a future agriculture that includes everyone and lasts. Some people push modern tech hard, others see value in blending old and new, unable to know how that plays out yet [9].

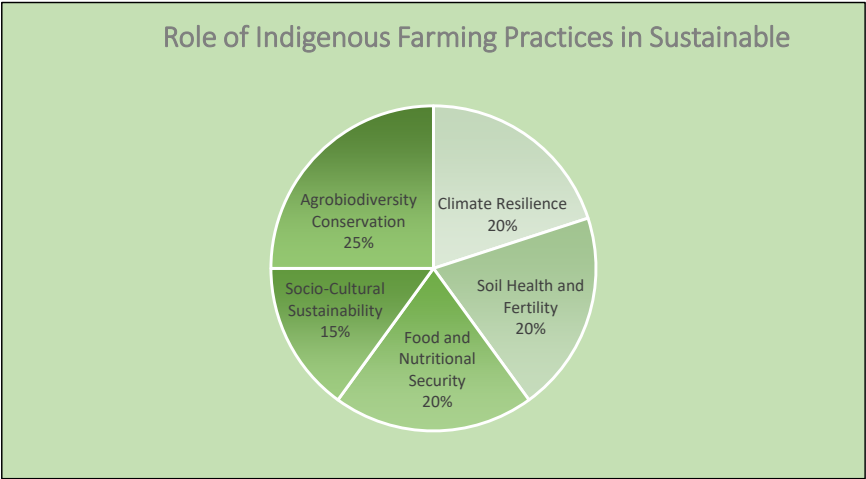


Figure 1. The Role of Indigenous Farming Practices in Sustainable Agriculture

This pie chart, it breaks down the different ways indigenous farming practices help with sustainable agriculture. The biggest slice goes to agrobiodiversity conservation at 25 percent. That means keeping a mix of crops going and protecting native seeds, which feels like a key thing for long term farming. Then there are these other parts that each take up 20 percent, like soil health and fertility, or building resilience to climate changes. Food and nutritional security fits in there too. Traditional methods seem to keep the soil good and help people get better nutrition from what they

grow. It is even across those, showing how they all tie into keeping the environment steady's cultural sustainability is 15 percent, which covers how indigenous knowledge holds onto cultural traditions and builds stronger communities. It supports those old food systems as well. Not as big as the others, but still important. All of it adds up to show how Indian Knowledge Systems give this full approach to making agriculture more resilient. Some parts overlap a bit, I guess, but overall, it makes sustainable farming look solid from traditional ways.

2.Literature Review:

1. **Mishra et al. (2025)** studied that the farmers who use natural resources for fertilizers and also blend crops but mess up the application sometimes, which results in the overuse of chemicals It is like if people get involved in learning more about this issue, this might turn the tables for the soil and make farming tougher on the problems [16].
2. **Munawar, Khalid et al. (2025)** who studied the blending of traditional with modern approaches to address the problems with the soil, save water, and increase profits. They keep stressing how government help and training would make it easier for farmers to try these mixes which protect the environment and keep food coming [10]. That part stands out because without the support, it might not stick.
3. **Chapke et al. (2025)** researched that in Odisha, the tribal population utilizes their knowledge for the sustainable and healthy cultivation of millet. These practices help the land recover from climatic problems [11]. They also state that women must be included in new ideas that help ease their workload and improve their lives. However, there is a lack of clarity on this.
4. **Berger et al. (2025)** studied the land management practices in Andhra Pradesh that promote a balance between food and nature Working with locals aligning policies and including everyone could shift how dry or wet areas handle food systems [12].
5. **Gogoi et al. (2025)** built this database on Indian food traditions with cultural bits. It can support farming and health by keeping old growing methods alive for fairer food systems that respect culture. How data like that ties into bigger things [17].
6. **A review by Trends in Food Science and Technology (2025)** discussed the indigenous knowledge protecting nature by cutting environmental damage and supporting local food. It creates strong and flexible farming systems that can adapt to changes. People may overlook how strong this makes the systems [13].
7. **Kapoor et al. (2024)** on the Ho community showed traditional farming aids environment and culture but nutrition and security are still problems. Targeted aid could fix those for tribal folks [14].
8. **Kalra et al. (2024)** reviewed biodiversity conservation through traditional knowledge in India. Many crops are vanishing so action is urgent to save them and secure food. That feels a bit alarming [15].
9. **In the study by Raveloaritiana, Wanger et al. (2024)**, diverse crops and natural methods of enhancing biodiversity and long-term profits were used [18]. Traditional stuff can last if done right.
10. **Assessing Farm Level Agricultural Sustainability in India 2025** pointed out local practices are central to sustainability. It should include traditional knowledge in a way that is equitable in the use of resources and rural food security [19].
11. **Indigenous and Local Knowledge for SDG2 in 2022** reviewed global stuff on traditional methods like natural land prep pest control and sun drying to end hunger. They ramp up production with less chemicals[20].
12. **Transforming Agriculture 2024** mixed old and modern for better soil productivity and decisions. Real time data plus traditions makes sustainable strong systems[21].
13. **Can Our Food System Withstand Climate Change 2025** warned that abandoning traditional crops and knowledge especially monocrops cuts biodiversity and worsens environment. Bringing resilient crops back to mainstream could help adapt[22].

3. Research Methodology:

Research Design

The study was conducted using a descriptive and exploratory approach to understand the role of traditional farming methods of Indian Knowledge Systems in conserving biodiversity, ensuring food security, and developing climate resilience. A mixed approach was adopted, mainly relying on numbers, but also incorporating observations to understand the results and background of traditional farming methods.

Study Area

The study was conducted in a few rural and tribal areas of India where traditional methods of farming are adopted. The areas were selected very carefully because the rural and tribal communities of India depend on traditional methods of farming.

Size of Population

The population size consisted of small farmers, marginal farmers, and tribal farming communities who practice traditional or indigenous methods of farming. The above-mentioned communities are the primary practitioners of traditional farming methods and are very important in conserving biodiversity.

Sampling Technique and Sample Size

A multi-step method of purposive sampling was adopted in the study:

Stage 1: To locate areas where traditional methods of farming are practiced.

Stage 2: To locate villages where traditional farming methods are common.

Stage 3: To locate farming communities where indigenous methods of farming are practiced.

A total of 30 farmers were selected. The small sample size was intentional to conduct a pilot study that helped refine the measurement approach and test the research tools.

Data Collection Methods

To collect the primary data during the field visits, the following methods were used:

1. Structured questionnaire survey
2. Direct observation
3. Casual conversations with the farmers and elders

The questionnaire survey was used to interview the farmers to ensure that the responses were clear and precise, as the farmers were less educated.

Data Analysis Techniques

The collected data was coded and analyzed using SPSS.

The techniques employed in the analysis of the data were:

1. Descriptive statistics such as frequencies, percentages, averages, and standard deviations
2. Graphical methods such as bar diagrams, line charts, and pie charts
3. Comparison of various groups of farmers
4. Use of observations made in the field, which were of a qualitative nature, to support the results obtained.

The use of the two categories of data entailed recording observed and heard facts after every visit. Such recordings were analyzed for common themes such as "soil moisture maintenance," "crop death during dry seasons" and "local seed varieties." The labeling and classification of such themes were done manually. While doing so, data from structured interviews was compared with those themes. For instance, whenever all farmers said that they use mixed

crop planting technique, it was checked out in the observation and interview recording whether indeed that was practiced in their farms. This way, the combination of two methods facilitated the analysis not only counting the number of people practicing specific techniques but also understanding the reasons and problems behind the practices.

Ethical Considerations

Ethical standards were adopted in the entire study. The participants were ensured that they were free to participate in the study or leave it at any time. They were also assured of the confidentiality of the data. Hence, the study was conducted in an ethical manner. The ownership of indigenous knowledge was respected.

Justification of Methodology

The method used is appropriate for investigating indigenous farming systems because it enables thorough documentation of traditional practices and their impact on sustainability. The limited sample size of 30 will help ensure methodological accuracy, laying a foundation for future large-scale research projects. The selection process was very well done with 30 respondents as it enabled detailed cross-checking of the responses collected during the survey since it would have been difficult to do so with a large sample size.

Limitations of the Study

The current study has several limitations. First, there is the limitation of the sample size ($n = 30$) as well as the homogeneity of the subjects in terms of being from the same geographical area, thereby limiting the generalization of the findings across all indigenous farming communities in India. Secondly, there was an element of self-reporting by the farmers in data gathering, which could lead to biases due to recall errors and social desirability of certain aspects in response to questions. Thirdly, there is the limitation inherent in the cross-sectional nature of the study whereby no determination was possible regarding the efficacy of the traditional practices over a period of time. Lastly, there was no quantification of soil quality and the biotic components in the ecosystem using empirical data.

4.Results and Discussions:

Results

4.1 Socio-Economic Profile of Respondents

The socio-economic profile of the respondents shows that indigenous farming practices are mainly carried out by small-scale farming groups.

Out of the total 30 respondents, 40% were small-scale farmers, while 30% each were marginal and tribal farmers. Most of the respondents owned small pieces of land and mainly depended on farming.

Table 1: Socio-Economic Profile of Respondents ($n = 30$)

Category of Farmers	Frequency	Percentage (%)
Small Farmers	12	40.0
Marginal Farmers	9	30.0
Tribal Farmers	9	30.0
Total	30	100.0

This shows that they mainly depend on farming methods that require minimal external support and mainly depend on traditional knowledge.

Discussion:

The study is relevant in the sense that small-scale and tribal farmers are mainly considered the backbone of indigenous farming knowledge.

The fact that they continue using traditional methods shows that they are economically challenged and have a strong affinity towards Indian Knowledge Systems (IKS).

4.2 Adoption of Indigenous Farming Practices

The analysis shows that a high number of respondents adopted indigenous farming practices

The most used method was mixed cropping, with 83.3% of the total respondents, followed by organic manuring with 80%, and crop rotation with 73.3%. About 66.7% of the total respondents used native seed varieties, and 60% used agroforestry.

Discussion:

The use of mixed cropping and organic manuring is quite high, indicating the high level of concern for the environment among the indigenous farming community.

These practices are helpful for maintaining biodiversity on the farm and are less likely to lead to crop failure.

The low use of agroforestry is due to the lack of land and the time required for the results to be obtained.

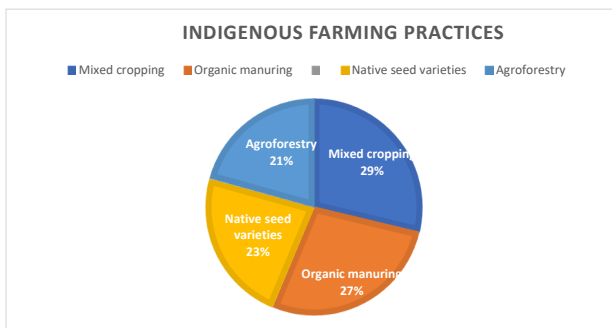


Figure 2: Adoption of Indigenous Farming Practices

4.3 Indigenous Practices and Biodiversity Conservation

The native farmers claim that conventional agricultural practices ensure diversity and are environmentally friendly.

The most used practices in growing diverse crops without the risk of pests and diseases via chemicals is mixed cropping and crop rotation.

Discussion:

The findings of the study are consistent with the biodiversity-conservation-through-better-agriculture theory.

Indigenous Knowledge Systems use the time-tested techniques of growing crops to develop robust systems of agriculture and utilize the resources available in the environment in a sustainable manner.

4.4 Perceived Sustainability Outcomes

The perceived sustainability outcomes were assessed on a five-point scale.

From the findings, farmers strongly agree that indigenous farming practices have positive outcomes. Crop diversity had the highest average (4.43), followed by food security (4.33) and soil fertility (4.27). Climate resilience also had a high average of 4.10, implying that traditional practices are adaptable to changing weather conditions.

Discussion:

From the findings, it is evident that farmers perceive that indigenous farming practices are linked to all the sustainability outcomes, implying that the practices are comprehensive and address the different dimensions of sustainability, ecological, economic, and social sustainability.

The strong association with food security is an indication of how IKS can contribute to the maintenance of a rich diet, particularly during unpredictable weather.

4.5 Indigenous Farming and Climate Resilience

From the findings, farmers claimed that traditional practices, such as organic manuring, agroforestry, and crop diversification, are essential in maintaining moisture levels and reducing the need to acquire resources from outside the farm.

From the findings, it is evident that the traditional practices are essential, especially during unpredictable rain and climate change.

5. Conclusion:

This study reveals the importance of traditional farming practices using Indian Knowledge Systems (IKS) in conserving biodiversity, ensuring food security, and adapting to climate change. This study, with data collected from 30 farmers who were selected with great care, proves that traditional farming practices such as growing multiple crops, crop rotation, organic manuring, and using local seeds are still practiced by farmers. The farmers believe that traditional farming practices have strong positive aspects both for the environment and for themselves.

The importance of the recognition of traditional knowledge in the formulation of farming policies is also highlighted in the study. Implications of Findings for Policy and Practice beyond Academia: The implications of the research findings extend beyond academic discourse[23].

Firstly, the Indian state and national governments' policies must explicitly consider the value of traditional agriculture that indigenous tribes employ in crafting their climate Adaptation strategies. Contemporary schemes like the National Mission for Sustainable Agriculture (NMSA) focus on soil quality and water conservation but fall short of taking into account practices such as inter-cropping, local seed cultivation, and agro-forestry, which are widely practiced among indigenous communities. Encouragement of these practices through incorporation into farming assistance and insurance schemes may promote agriculture that preserves biodiversity.

Secondly, on an international level, the practices of Indigenous farming can be seen to meet several United Nations Sustainable Development Goals, such as the eradication of poverty, hunger, mitigation of climate change, and terrestrial ecosystem conservation. Unlike technological agriculture that requires significant investments, traditional Indigenous agriculture uses minimal external inputs and is applied in developing countries. In this sense, international bodies, such as the Food and Agriculture Organization and International Fund for Agricultural Development, must give priority to documentation and promotion of these traditional practices, using participatory research methodologies rather than externally devised interventions.

Thirdly, agricultural advice must integrate Indigenous farmer elders as equal teachers to contemporary certified agronomists. While modern agronomy relies primarily on certified agronomists, the accumulated traditional knowledge in multispecies farming and soil moisture management demonstrates remarkable efficiency. Demonstration fields contrasting traditional agricultural techniques with contemporary can be useful in this process.

Despite the sample size being small, the research suggests a replicable methodology for larger-scale studies across a variety of agricultural contexts. Importantly, the results confirm that Indian Knowledge Systems are not outdated traditions but dynamic and effective tools of sustainable development. Better support through policies, record-keeping, and local support services could make these farming communities more sustainable. Although the research had a limited sample size, it is a good foundation for further research in other farming areas. The research has shown that Indian Knowledge Systems are not outdated but useful ways of farming that could be of great help in the current context.

References

1. Chakraborty, S., Banerjee, D.: Indigenous knowledge systems and soil health management. *Indian Journal of Agroecology* 7(3), 114–128 (2025).
2. Devi, L., Singh, K.: Agrobiodiversity loss and the role of native millet varieties in food security. *Indian Journal of Agricultural Biodiversity* 8(3), 210–225 (2025).
3. Gupta, A.K., Sharma, P.: Biodiversity conservation and traditional agriculture in South Asia. *Journal of Rural Studies* 62, 78–95 (2025).
4. Iyer, S., Menon, A.: Agroforestry practices and ecological sustainability in Indian drylands. *Eco-Agriculture Review* 8(2), 43–59 (2025).
5. Patil, R., Deshmukh, S.: Traditional cropping systems and climate resilience among tribal farmers in central India. *Indian Journal of Indigenous Knowledge* 21(1), 55–70 (2025).
6. Rao, V., Srinivas, K.: Role of native seed systems in sustainable agriculture and food security. *Journal of Agrarian Change* 15(2), 132–150 (2025).
7. Sen, S., Ghosh, A.: Community-based conservation and food sovereignty in Eastern India. *Sustainability in Practice* 12(4), 66–82 (2025).

8. Tripathi, S., Rao, P.: Policy gaps in mainstreaming indigenous farming knowledge: A case study of central Indian tribal belts. *Agricultural Policy Review* 19(1), 33–50 (2025).
9. Singh, V.K., Sukumaran, S.: Climate resilient agriculture for environmental sustainability. *Indian Farming* 75(12), 4–8 (2025).
10. Munawar, M., Khalid, A., Rahman, S.: Integrating traditional and modern agricultural practices for sustainable soil and water management. *Journal of Sustainable Agriculture Systems* 18(2), 122–139 (2025).
11. Chapke, R., Das, P., Mohanty, S.: Indigenous millet cultivation practices among tribal communities in Odisha: Implications for climate resilience. *Journal of Ethnobiology and Rural Development* 14(1), 67–84 (2025).
12. Berger, T., Reddy, K., Srinivasulu, M.: Participatory land management and food–nature balance in Andhra Pradesh. *Land Use Policy* 138, 106782 (2025).
13. Trends in Food Science & Technology: Indigenous knowledge systems and sustainable food production: A review. *Trends in Food Science & Technology* 148, 75–89 (2025).
14. Kapoor, R., Soren, H., Lakra, P.: Traditional farming, nutrition security, and environmental sustainability among the Ho community of India. *Journal of Tribal Studies* 16(2), 145–163 (2024).
15. H. Sharma, D. Singh, and G. Chauhan, "Intelligent Modeling Embracing Diversity for Promoting Regional Languages in New Education Policy," in 2025 International Conference on Computational Engineering, Sensing Technology and Management (ICCETM), 2025, pp. xx–xx, doi: 10.1109/ICCETM66557.2025.11557923.
16. Kalra, N., Sharma, V., Singh, R.: Traditional ecological knowledge and biodiversity conservation in India: A review. *Environmental Sustainability Review* 11(4), 201–219 (2024).
17. Mishra, A., Ratha, D.: Indigenous farming practices and sustainability outcomes in India. *Journal of Sustainable Rural Development* 19(3), 201–218 (2023).
18. Gogoi, M., Baruah, D., Sharma, A.: Preserving indigenous food traditions through digital documentation and cultural databases. *Food Heritage and Sustainability Journal* 7(1), 55–71 (2025).
19. Raveloaritiana, E., Wanger, T.C., Rakotoarisoa, J.: Biodiversity-friendly farming systems and long-term agricultural sustainability. *Agriculture, Ecosystems and Environment* 362, 108857 (2024).
20. Assessing Farm-Level Agricultural Sustainability in India: Traditional practices and resource efficiency. *Indian Journal of Agricultural Economics* 80(1), 44–61 (2025).
21. Indigenous and Local Knowledge for SDG 2: Pathways toward sustainable food systems and zero hunger. *United Nations Sustainable Development Report Series*, New York (2022).
22. Transforming Agriculture through Traditional Knowledge and Digital Innovation. *FAO Agricultural Transformation Report*. Food and Agriculture Organization of the United Nations, Rome (2024).
23. Can Our Food System Withstand Climate Change? Traditional Crops and Agricultural Resilience. *Global Food Security* 40, 100845 (2025).
24. Cleveland, D.A., Soleri, D., Smith, S.E.: Do folk crop varieties have a role in sustainable agriculture? *Bio Science* 44(11), 740–751 (2016).

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