



Nurturing the Earth: Sustainable Agriculture and Ecological Wisdom through the Lens of Indian Knowledge Systems (IKS)

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Abstract

This article explores the scientific and ecological wisdom embedded in Indian Knowledge Systems (IKS) regarding agricultural practices. Historically, Indian agriculture transcended mere sustenance, embodying a profound ecological ethos grounded in principles like Prakriti and Rta. Through a thematic review of ancient texts such as the Rigveda, Krishi-Parashara, and Vrikshayurveda, this study examines traditional approaches to soil management, crop diversity, weather prediction, water conservation, and bio-integrated farming. Unlike modern industrial agriculture, which often leads to environmental degradation, IKS offers sustainable, biodiversity-based models. By challenging Eurocentric narratives of scientific agriculture, this paper highlights the empirical contributions of IKS and demonstrates its contemporary relevance for addressing global challenges such as climate change, soil degradation, and water scarcity. Ultimately, the integration of ancient agricultural wisdom with modern technology offers actionable pathways for achieving Sustainable Development Goals (SDGs).

Keywords: Agroecology, Climate Adaptation, Indian Knowledge Systems (IKS), Sustainable Agriculture, Traditional Ecological Knowledge, Vrikshayurveda.

1. Introduction

“The earth is our mother and we are her children. What we sow into her; she returns a hundredfold.”

Rigveda (circa 1500 BCE)

Agriculture is the cornerstone of Indian civilisation, deeply embedded in the Indian Knowledge System (IKS), where it transcends mere sustenance to embody a profound ecological and spiritual ethos. The *Rigveda*, dating back to 1500 BCE, references crops like barley (*yava*) and tools such as the plough (*sira*), underscoring agriculture's centrality to ancient Indian society (Griffith, 1896). This article explores the scientific wisdom of IKS agricultural practices, encompassing soil management, crop diversity, weather prediction, water conservation, and ecological balance.



These practices reflect a sophisticated understanding of environmental dynamics, offering timeless lessons for addressing modern challenges like climate change, soil degradation, and water scarcity.

Unlike industrial agriculture, which is often criticised for its environmental toll, including deforestation and groundwater depletion (Foley et al., 2011), IKS emphasises harmony with nature through philosophical principles like *Prakriti* (nature as a dynamic force) and *Rta* (cosmic order), which ensure ecological sustainability (Radhakrishnan, 1953). Texts like *Krishi-Parashara*, attributed to sage Parashara, systematise farming techniques, advocating organic manures and seasonal planting, practices now validated by modern research for enhancing soil health and crop yields (Sadhale, 1996a; Lal, 2020). For example, using cow dung as a fertiliser prefigures organic farming, which boosts soil organic carbon and microbial activity (Pretty et al., 2018).

This article challenges Eurocentric narratives attributing scientific agriculture solely to Western advancements, highlighting IKS's empirical contributions centuries earlier. By examining these practices through a contemporary lens, we reveal their relevance to global sustainability goals, such as those outlined in the United Nations' Sustainable Development Goals (SDGs) (United Nations, 2015). From ancient India's intricate water harvesting systems to the biodiversity preserved in sacred groves, IKS offers actionable solutions for modern crises. Therefore, this paper systematically reviews historical treatises and regional case studies to evaluate the enduring relevance of IKS in constructing sustainable agricultural frameworks for the 21st century.

2. Methodology

This study employs a thematic literature review and historical analysis of ancient Indian agricultural texts alongside modern agroecological research. Primary historical sources examined include the *Rigveda*, *Atharvaveda*, *Krishi-Parashara* (attributed to Sage *Parashara*), *Vrikshayurveda* (by *Surapala*), and *Brihat Samhita* (by *Varahamihira*). These treatises were systematically analysed to extract core agronomic principles related to soil management, biodiversity, pest control, and water conservation. Subsequently, these traditional frameworks were cross-referenced with contemporary empirical studies and global sustainability metrics, specifically the United Nations' Sustainable Development Goals (SDGs), to validate the scientific efficacy and modern adaptability of these historical practices.

3. The Foundations of Agricultural Wisdom in IKS

The IKS views agriculture as a sacred partnership with nature, rooted in empirical observation and philosophical depth. The *Rigveda* describes farming tools and crops, while the *Atharvaveda* includes hymns for bountiful harvests, reflecting agriculture's cultural and spiritual significance (Griffith, 1896; Whitney, 1905). The *Krishi-Parashara*, a seminal treatise, details crop selection, soil management, and seasonal timing, demonstrating a systematic approach to farming (Sadhale, 1996a). For instance, it recommends sowing rice in specific seasons based on soil and climate, a practice grounded in long-term observation.



Central to IKS is the philosophy of *Prakriti*, which personifies nature as a living, dynamic system, and *Rta*, the cosmic order ensuring ecological balance (Radhakrishnan, 1953). These principles guided farmers to align practices with natural cycles, avoiding overexploitation. For example, Vedic rituals like *Soma* offerings were linked to seasonal cycles, reinforcing sustainable farming practices (Macdonell, 1897). IKS's interdisciplinary approach integrated *Jyotisha* (astronomy) for monsoon predictions, botany for crop selection, and hydrology for irrigation, creating a holistic framework.

Vrikshayurveda by Surapala (circa 11th century) outlines organic manures like cow dung, green compost, and fish meal, practices now validated for enhancing soil organic carbon and microbial diversity (Sadhale, 1996b; Lal, 2020). Regional variations, such as millet cultivation in arid Rajasthan or wetland rice farming in Bengal, highlight IKS's adaptability to diverse agroecological zones. The *Arthashastra* by Kautilya emphasises state support for agriculture, including seed distribution and irrigation infrastructure, reflecting a policy-driven approach to sustainability (Shamasastri, 1915).

These methods challenge the notion that scientific agriculture emerged solely in 18th-century Europe. IKS employed experimentation, such as testing soil fertility through plant growth, centuries earlier (Sadhale, 1996b). Modern agroecology echoes IKS principles, with studies showing that diverse cropping systems improve resilience against climate variability (Pretty et al., 2018). By grounding agriculture in ecological and ethical frameworks, IKS offers a model for sustainable development, bridging ancient wisdom with contemporary challenges like food security and environmental degradation.

4. Core Tenets of IKS in Agriculture (Thematic Analysis)

4.1 Understanding Soil: The Science of Fertility

In IKS, soil was revered as a living entity, requiring careful stewardship to sustain fertility. *Vrikshayurveda* classifies soils as *jangala* (arid), *anupa* (marshy), or *sadharana* (mixed), tailoring crops like millets, rice, or pulses to specific textures, moisture levels, and nutrient profiles (Sadhale, 1996b). This classification parallels modern soil science, which analyses texture, pH, and nutrient content to optimise crop growth (Weil et al., 2016). For example, *jangala* soils were suited for drought-resistant millets, while *anupa* soils supported rice, demonstrating an empirical understanding of soil-crop compatibility.

Krishi-Parashara advocates organic manures, cow dung, green manure, and plant residues to replenish nutrients, a practice validated by research showing increased soil organic carbon and microbial activity (Sadhale, 1996a; Lal, 2020). Crop rotation with nitrogen-fixing legumes like mung bean prevented soil depletion, mirroring modern sustainable techniques that enhance soil health. Ancient farmers tested soil fertility by observing plant growth patterns, an early bioassay method described in *Vrikshayurveda* (Sadhale, 1996b). For instance, vigorous growth of specific weeds indicated fertile soil, a practice comparable to modern soil testing for nitrogen or phosphorus levels.



This empirical approach challenges Eurocentric narratives, as IKS's soil management has predated Western soil chemistry for centuries. In Rajasthan, traditional farmers continue using cow dung to restore degraded soils, aligning with global efforts to combat desertification (Lal, 2020). Modern organic farming draws on IKS, with studies showing organic inputs reduce environmental impact while boosting yields by 20–30% in some contexts (Pretty et al., 2018). For example, using vermicompost in Punjab echoes IKS practices, enhancing soil structure and water retention. By integrating IKS soil wisdom with modern microbiology, researchers can develop hybrid models to restore degraded lands, proving the enduring relevance of these ancient practices for sustainable agriculture.

4.2 Crop Management: Diversity and Resilience

IKS promoted crop diversity to ensure food security and ecological resilience, a strategy documented in the *Arthashastra*, which lists crops like rice, millets, pulses, and medicinal plants (Shamasastry, 1915). Intercropping, such as pairing legumes with cereals, enhanced pest resistance and soil fertility, a practice validated by modern agroecology (Altieri, 2018). *Krishi-Parashara* details crop rotation to prevent soil exhaustion, which increases yields in diverse systems (Sadhale, 1996a). For example, rotating rice with pulses in the Gangetic plains maintained soil nitrogen levels, reducing the need for external inputs.

Cultivating finger millet (*ragi*) in South India exemplifies IKS's ecological insight. *Ragi* thrives in low-fertility soils, requires minimal water, and resists pests, making it ideal for drought-prone Karnataka. Its cultural significance, used in rituals and traditional diets, underscores IKS's integration of agriculture with community life. Similarly, sorghum (*jowar*) in Maharashtra supported resilience in semi-arid regions, a practice revived today to combat climate variability. Modern studies confirm that diverse cropping systems enhance resilience against pests and climate shifts, with yields up to 40% higher than monocultures in some cases (Pretty et al., 2018). IKS's emphasis on indigenous varieties preserved genetic diversity, reducing reliance on external seeds. This contrasts with modern monocultures, vulnerable to pests like the fall armyworm (Altieri, 2018). Farmers can address food security and environmental challenges by reviving traditional crops and intercropping, leveraging IKS's time-tested wisdom for sustainable agriculture.

4.3 Weather Wisdom: Predictive Knowledge and Adaptation

IKS farmers used *Jyotisha* to predict monsoons, relying on lunar cycles (*nakshatras*) and constellations to determine planting schedules (Sadhale, 1996b). The *Brihat Samhita* by Varahamihira details meteorological observations, such as cloud formations, wind patterns, and animal behaviours, to forecast rain (Varahamihira, 1884). For example, the appearance of specific clouds (*megha*) indicated imminent rainfall, guiding sowing decisions. Farmers also observed natural indicators, like bird migrations or flowering of certain trees, to anticipate weather changes, a practice rooted in centuries of observation.

The *nakshatra* system linked constellations like *Rohini* to monsoon onset, enabling precise planting. In Tamil Nadu, farmers still use such indicators to complement modern meteorological



data. These methods align with modern climate models, integrating traditional knowledge for accuracy, particularly in predicting erratic monsoons (IPCC, 2021). For instance, traditional farmers in Andhra Pradesh delayed sowing during weak monsoons, a strategy relevant to today's climate variability. *Brihat Samhita* also describes drought mitigation, such as planting hardy crops, which parallels modern climate-adaptive agriculture (Varahamihira, 1884).

Integrating IKS weather wisdom with modern forecasting can enhance agricultural resilience, especially in climate-vulnerable regions like South Asia. Digital tools mapping traditional indicators, such as India's IKS database, make this knowledge accessible to modern farmers. This synergy underscores IKS's relevance for adaptive, sustainable farming practices.

4.4 Water Conservation: Ingenious Irrigation Systems

IKS developed sophisticated irrigation systems to address water scarcity, including stepwells (*vavs*), tanks (*tadagas*), and canals, as detailed in *Brihat Samhita* (Varahamihira, 1884). Stepwells in Gujarat, with intricate designs, ensured water access in arid regions, reflecting engineering precision. *Johads* and *kundas* in Rajasthan facilitated groundwater recharge, akin to modern watershed management (Agarwal & Narain, 2003). These systems were community-managed, ensuring equitable distribution, a model relevant for participatory resource management today.

The *johad* system, small earthen check dams, captured rainwater, recharged aquifers, and enabled year-round farming. Tarun Bharat Sangh's revival of *johads* in Rajasthan's Alwar district restored rivers like the Arvari, transforming barren lands into fertile fields (Agarwal & Narain, 2003). This aligns with modern rainwater harvesting, which mitigates groundwater depletion in India, where overexploitation is critical (Rodell et al., 2009). Ancient tanks in South India, like those in Tamil Nadu, stored monsoon water, supporting multi-season cropping (Agarwal & Narain, 2003). These systems optimised water use, contrasting with modern irrigation's inefficiencies.

IKS's focus on sustainable water management offers scalable solutions for water-stressed regions. For example, modern drip irrigation mirrors IKS's efficient water delivery, reducing waste (Postel, 2000). By reviving community-based systems like *johads*, policymakers can address water scarcity while fostering local governance, aligning with global sustainability goals (United Nations, 2015).

4.5 Ecological Balance and Natural Pest Control

IKS employed natural pest control, using neem, ash, and companion planting, as outlined in *Vrikshayurveda* (Sadhale, 1996b). For example, planting marigolds with vegetables deterred nematodes, a practice validated by modern agroecology (Altieri, 2018). Sacred groves (*devrais*), found across India, preserved biodiversity, protecting ecosystems under the ethical principle of *Ahimsa* (non-violence) (Gadgil & Vartak, 1976). These groves, revered as sacred, maintained genetic diversity, supporting pollinators and soil health.

Traditional seed banks preserved indigenous varieties, ensuring resilience against environmental shocks. The *Navdanyam* movement in India continues this practice, safeguarding over 5000 crop



varieties (Shiva, 1997). IKS's holistic approach integrated agriculture with ecological and spiritual values, contrasting with modern industrial farming's reliance on synthetic pesticides, which harm biodiversity (Altieri, 2018). For instance, neem-based pest control is non-toxic and biodegradable, offering a sustainable alternative to chemical pesticides (Sadhale, 1996b).

Modern agroecology draws on IKS principles, with studies showing that biodiverse systems enhance ecosystem services like pollination and soil fertility (Pretty et al., 2018). By reviving sacred groves and natural pest management, farmers can address habitat loss and pesticide overuse, aligning with global conservation goals (United Nations, 2015).

Ancient Indian agriculture emphasised eco-friendly pest control techniques, relying on botanical, mineral, and organic formulations to manage pests without harming soil, water, or biodiversity. This approach stemmed from a deep understanding of the agro-ecosystem and reflects early principles of Integrated Pest Management (IPM).

Texts like the Vrikshayurveda and Krishi-Parashara use ash, cow urine, garlic, neem oil, turmeric, and other plant-based substances as repellents and insecticides (Sadhale, 1996a). For example, neem (*Azadirachta indica*) was widely used for its insecticidal and antifungal properties, especially in grain storage and foliar applications. Scientific research has since validated neem's azadirachtin compound, which inhibits insect feeding and reproduction (Isman, 2006).

Fermented concoctions using cow dung and buttermilk were applied to deter fungal infections on crops such as turmeric and banana. The strategic use of intercropping and companion planting, such as marigolds with vegetables, also helped repel pests by disrupting insect life cycles (Nene, 2007).

Unlike modern chemical pesticides that lead to resistance, soil degradation, and water contamination, these techniques safeguarded crop health and minimised ecological disruption. Several of these methods are being revived under organic farming and sustainable agriculture initiatives, reaffirming the scientific validity of India's traditional pest management systems.

4.6 Role of Animals and Bio-integrated Farming

In traditional Indian agriculture, animals were not merely auxiliary tools but integral components of a bio-integrated farming system that combined livestock, crops, and ecological processes into a unified whole. The role of animals such as cows, oxen, buffaloes, goats, and poultry extended far beyond labour; they provided nutrients, pest control, traction power, and biocultural resilience. This model aligns closely with the principles of circular farming systems, which are gaining renewed relevance in sustainable agriculture today (Nene, 2007).

The cow, in particular, occupied a central place in the Indian agricultural economy. Its by-products, dung and urine, were used extensively for fertilising fields, maintaining soil microbial health, and even pest control. Cow dung was valued as a source of organic manure and a bio-energy material for cooking and heating. Research confirms that regular use of cow dung compost improves soil aeration, water retention, and microbial biomass, enhancing long-term soil fertility (Subba Rao, 2001). Similarly, cow urine was applied as a foliar spray or soil drench to stimulate plant growth and manage fungal infections, functioning much like modern-day biostimulants.



A prominent example of integrated livestock-based agriculture is the use of Panchagavya, a fermented mixture of five cow-derived substances: dung, urine, milk, curd, and ghee. This concoction, often enriched with sugarcane juice, banana, and coconut water, was traditionally applied to crops to boost immunity, growth, and yield. Modern scientific evaluations have verified that Panchagavya contains beneficial microorganisms, growth-promoting hormones, and nutrients, making it a potent biostimulant with a minimal ecological footprint (Natarajan, 2002). Beyond cows, oxen served as primary draft animals for ploughing, transport, and threshing. Their contributions were pivotal in regions where mechanical alternatives were inaccessible. Importantly, traditional practices ensured that animals were not overburdened; agrarian ethics embedded in Dharmasastra texts emphasised compassion and rotational use to prevent animal fatigue.

Goats and sheep, on the other hand, played dual roles by offering manure and grazing services. Grazing managed undergrowth and weed control while their droppings enriched fallow fields. Poultry provided eggs, meat, and pest regulation, particularly against insects and weeds. The holistic use of these animals created closed-loop systems, minimising waste and external inputs. Such bio-integrated farming systems enhanced resilience to climate shocks, nutritional security, and economic diversification, especially for smallholder farmers. Unlike monoculture-dependent industrial farming, Indian mixed-farming approaches prioritised interdependence between flora, fauna, and humans, echoing principles now recognised under agroecology and regenerative agriculture (Pretty, 2008).

4.7 Regional Diversity and Applied Case Studies

In Tamil Nadu, traditional rice farming incorporates System of Rice Intensification (SRI) principles, traceable to IKS, using minimal water and organic inputs to boost yields by 20–50% (Uphoff, 2011). SRI's emphasis on spacing and organic manures echoes Krishi-Parashara's recommendations (Sadhale, 1996a). In Rajasthan, Tarun Bharat Sangh's revival of johads restored water tables, enabling sustainable farming in 1000 villages (Agarwal & Narain, 2003). In Maharashtra, traditional sorghum (jowar) farming leverages drought-resistant varieties, reflecting IKS's adaptability to arid conditions. These case studies demonstrate IKS's practical relevance, bridging ancient wisdom with modern sustainability needs.

India's vast geographical and ecological diversity has fostered region-specific agricultural practices tailored to distinct climatic, soil, and cultural conditions. This regionalisation of agricultural knowledge underscores the adaptive ingenuity of Indian farmers, who developed indigenous farming systems suited to their immediate environments, many of which remain relevant for sustainable agriculture today.

In South India, particularly in Tamil Nadu, tank irrigation systems (eri) use dates back to the Chola and Pallava periods. These man-made water bodies collected and stored monsoon rains, enabling multiple cropping seasons and sustaining rice cultivation in semi-arid regions (Mosse, 1999). Ancient texts and temple inscriptions describe a sophisticated community-led



maintenance system, including silt removal and equitable water distribution, principles now echoed in participatory water governance models.

Farmers cultivated drought-resistant millets like jowar and bajra in Maharashtra and Deccan Plateau regions, utilising contour bunding and in-situ moisture conservation techniques to manage erratic rainfall. These soil and water management strategies were guided by observations of slope, runoff, and seasonal variation (Gadgil & Guha, 1992). The region's traditional knowledge of soil types (black cotton soil or regur) enabled precise crop selection.

The Kashmir Valley, characterised by cold climates and terraced landscapes, developed expertise in horticulture, particularly the cultivation of saffron, apples, almonds, and apricots. Using raised beds, mulching, and canopy management helped extend growing seasons and protect crops from frost (Kaul, 2000). The Rajatarangini chronicles record royal patronage of orchard development, indicating a long-standing institutional interest in agrobiodiversity.

In Bengal's deltaic plains, where high rainfall and frequent flooding posed challenges, farmers integrated jute-rice rotations and floating vegetable gardens (dhap farming) on bamboo rafts layered with composted water hyacinth and soil. This method ensured year-round food production while preventing soil erosion and eutrophication, an early form of climate-resilient agriculture.

The North-Eastern hill states practised shifting cultivation (jhum), where land was cyclically cleared, cultivated, and left fallow to regenerate. While often critiqued, jhum farming involves a deep ecological understanding of soil fertility cycles, tree succession, and biodiversity conservation. Cropping was interspersed with fallow periods of 10–15 years, preserving forest biomass and enhancing long-term sustainability (Ramakrishnan, 1992).

These regional practices were deeply interwoven with local belief systems, festivals, and community institutions, making them more than technical solutions; they were cultural systems of land care. The rich diversity of these approaches forms a living heritage that supports modern strategies for agroecology, biocultural conservation, and climate adaptation. Recognising and reviving these locally adapted knowledge systems is essential for historical continuity and for formulating context-specific sustainable agricultural policies in a climate-vulnerable world.

5. Discussion: Integrating IKS into Modern Sustainability Frameworks

IKS practices like drought-resistant crops and water harvesting address climate change, complementing modern breeding and irrigation technologies (IPCC, 2021). For example, reviving millet can enhance nutritional security while reducing water use. Digital platforms, like India's IKS database, map traditional knowledge, making it accessible to farmers and researchers. Policymakers can integrate IKS into agricultural curricula and national sustainability frameworks, fostering innovation (Pretty et al., 2018). For instance, India's National Mission for Sustainable Agriculture can incorporate IKS principles to promote organic farming and water conservation, aligning with global SDGs (United Nations, 2015). This synergy ensures IKS's relevance for addressing modern agricultural challenges.



The traditional agricultural systems of ancient India offer timeless insights into building sustainable, resilient, and equitable food systems. These systems, grounded in centuries of empirical knowledge and ecological wisdom, embody principles that modern sustainability science seeks to reclaim. From soil health and biodiversity to water conservation and ethical stewardship of nature, Indian agricultural traditions reflect an advanced understanding of long-term ecological balance (Nene, 2007).

One of the most critical lessons lies in soil-centric agriculture. Ancient Indian farmers prioritised soil fertility through organic amendments like green manures, compost, cow dung, and ash, which enriched microbial activity and retained moisture without synthetic inputs (Sadhale, 1996a). These practices align with today's push for regenerative agriculture, which emphasises restoring soil health to enhance productivity and carbon sequestration (Lal, 2020).

A second significant contribution is the concept of agrobiodiversity. Indigenous Indian farming embraced polyculture, mixed cropping, and crop rotations to manage pests, maintain fertility, and minimise risk. This biodiversity was a natural insurance policy against crop failure, reducing the need for pesticides and synthetic fertilisers (Altieri, 1999). In a time when modern agriculture suffers from monoculture-induced vulnerability and ecological degradation, traditional Indian methods offer a biodiversity-based model for food security and resilience.

Water conservation technologies such as tank irrigation, rainwater harvesting, and contour bunding highlight India's early mastery of climate-responsive infrastructure. These techniques reduced runoff, improved groundwater recharge, and supported agriculture even in arid regions (Mosse, 1999). Today, as the world faces water scarcity and climate instability, reviving such decentralised and community-managed water systems offers a cost-effective and sustainable alternative to capital-intensive irrigation.

Moreover, the integration of livestock, forests, and farming demonstrates a holistic view of land use. Bio-integrated farming, using cow-based preparations like Panchagavya and livestock manure, exemplifies closed-loop systems now promoted in circular economy models (Pretty, 2008). These systems minimise waste, enhance nutrient cycling, and reduce dependence on external inputs.

The ethical dimension of Indian agricultural traditions also provides valuable guidance. Rooted in dharma, farming was viewed as a moral duty involving reverence for soil, water, animals, and trees. This worldview resonates with the Earth stewardship ethic advocated in global sustainability discourses, including the UN's Sustainable Development Goals (SDGs). To translate these lessons into action, scholars and institutions increasingly advocate for integrating Indigenous Knowledge Systems (IKS) into education, research, and policy-making. The Indian Council of Agricultural Research (ICAR) and the Ministry of AYUSH are leading initiatives to document, validate, and revive traditional agricultural practices for contemporary relevance (ICAR, 2021).

While the integration of IKS offers profound ecological benefits, it is essential to acknowledge certain limitations. Some traditional practices, such as intricate manual water harvesting or bio-



integrated farming, are highly labor-intensive and may face challenges in scalability within modern, mechanized agricultural economies. Furthermore, there is a risk of romanticizing historical systems without critically evaluating their socio-economic contexts, such as historical labor structures. Therefore, the goal is not a wholesale regression to past methods, but rather a critical, context-specific synthesis of ancient ecological wisdom with modern technological efficiency.

6. Conclusion

IKS's agricultural wisdom, rooted in ecological harmony, offers solutions for modern challenges like soil degradation, water scarcity, and climate variability. Practices like organic manuring, crop diversity, and water harvesting demonstrate scientific foresight, validated by modern research (Lal, 2020; Pretty et al., 2018). From johads restoring groundwater to sacred groves preserving biodiversity, IKS provides actionable models for sustainability. Farmers, researchers, and policymakers can build a resilient future by reviving these practices and integrating ancient wisdom with modern technology. Digital tools and educational reforms can amplify IKS's impact, ensuring accessibility. This paper aligns with the broader mission to showcase IKS as a living knowledge system, inspiring innovation and sustainability worldwide while honouring India's scientific legacy. Future empirical studies should focus on quantifying the exact carbon sequestration potential and economic scalability of specific IKS interventions, such as *Panchagavya* application or localized Johad restoration, across diverse agroecological zones.

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