NEPALESE JOURNAL OF AGRICULTURAL SCIENCES,
July, 2025, volume 29
e-ISSN: 2091-0428; p-ISSN 2091-041X; esjindex ID =6279
Published by HICAST, Purbanchal University, Kathmandu

REVIEW ARTICLES

Indigenous Pest Management: Scientific Validity or Folklore?

KARKI Rojan [1*], GIRI Koshila [1] & POKHREL Urmila [1]
[1]Himalayan College of Agricultural Sciences and Technology (HICAST)
***Corresponding Author's email:** karkirojan.ag@gmail.com

ABSTRACT

Traditional pest management practices, deeply rooted in Nepal's indigenous knowledge and cultural heritage, have played a significant role in the country's agricultural systems for generations. While many of these methods are based on oral traditions and anecdotal evidence, a number have been scientifically validated and align well with the principles of sustainable agriculture. This review critically explores various native pest control techniques, evaluating their effectiveness and relevance in the modern context. It underscores the potential of integrating traditional wisdom with scientific innovation to develop environmentally sound and culturally respectful pest management strategies. The findings emphasize the importance of further research and supportive policies to incorporate proven traditional methods into contemporary agricultural frameworks.

Keywords: Botanical pesticides, Ecological resilience, Folk practices, Indigenous Pest Management, Nepalese farming

NEPALESE AGRICULTURE

The past ten years have seen a number of notable changes in Nepal's agricultural industry, including the adoption of new technology, the transition from subsistence to commercial farming, and the support of government policies. Nepal's economy heavily depends on the country's agricultural sector. In 1975, agriculture constituted 65% of Nepal's GDP. As global attention transitioned from agriculture to industry, Nepal's economy saw structural changes, resulting in a diminished contribution of the agricultural sector to GDP. By 2000, the agriculture sector's proportion had diminished to roughly 40%, whilst the

NEPALESE JOURNAL OF AGRICULTURAL SCIENCES,
July, 2025, volume 29
e-ISSN: 2091-0428; p-ISSN 2091-041X; esjindex ID =6279
Published by HICAST, Purbanchal University, Kathmandu

manufacturing sector expanded from 4% in 1975 to 9% by 2000. In 2022, the agriculture industry provided 23.95% to GDP, and the manufacturing sector represented 14.3%. Preliminary data for 2023 predicts a modest increase in the agriculture sector's contribution to 24.1% (Mishra, 2023; World Bank Open Data, 2023). Approximately 75% of Nepal's population made their living from agriculture in 2000. By 2022, this percentage had dropped to 66%, with 57.3% of the population working in agriculture, according to data from the 12th census (Mishra, 2023; Nepal Statistics Office, 2025).

Nepal is a multicultural, multireligious, and multiethnic country. Its distinctive and noteworthy characteristics include diversity and pluralism. The traditional farming methods used by Nepalese farmers are one topic of continuous debate. These customs, which have been carried down through the generations, demonstrate a strong bond with biodiversity, ecological balance, and local culture. While some could claim that these approaches are unscientific and ineffective in comparison to more contemporary alternatives, others might see them as having their roots in sustainable traditions and cultural heritage. They might also be seen as creative by some, using their indigenous knowledge and inventiveness to address regional agricultural problems. The diversity of opinions on conventional techniques creates new study and exploration opportunities for the next generation of agricultural scientists and policymakers. Investigating these approaches can shed light on their environmental impact, economic viability, and potential integration with modern technologies. This combination of tradition and innovation provides a chance to create long-term agricultural systems that respect cultural heritage while increasing productivity and resilience. As Nepal's agriculture sector changes, a balanced strategy that recognizes both traditional wisdom and scientific innovation will be critical for long-term prosperity and sustainability.

INDIGENOUS/TRADITIONAL KNOWLEDGE – MYTH OR REALITY?

Indigenous knowledge reflects the knowledge and methods that communities have evolved over many generations of intimate engagement with the natural world. It offers workable answers for environmental stewardship and land management and is based on necessity, careful observation, and trial-and-error learning (Kumar et al., 2009). According to Berkes et al. (2000), this knowledge, which is frequently transmitted orally or through experience, provides important

NEPALESE JOURNAL OF AGRICULTURAL SCIENCES,
July, 2025, volume 29
e-ISSN: 2091-0428; p-ISSN 2091-041X; esjindex ID =6279
Published by HICAST, Purbanchal University, Kathmandu

insights to support contemporary science and influences decisions about the use of resources and agricultural practices.

Indigenous Technical Knowledge (ITK) is localized, traditional knowledge molded by environmental and cultural factors. Crop production, animal management, pest control, food processing, healthcare, and the preservation of natural resources are just a few of the many diverse disciplines it covers. ITK is a combination of traditional knowledge and technological adaptation (Warren et al., 1995). Indigenous Agricultural Practices (IAPs) are mainly undocumented and exist in the thoughts, languages, and experiences of various groups. The lack of systematic records makes it difficult to recognize and adapt them for larger applications, despite their promise to improve sustainable agriculture and environmental resilience (Atteh, 1989). Preserving and integrating these practices is critical for connecting traditional wisdom with scientific advances.

TRADITIONAL BELIEFS

As a nation with a strong agricultural heritage, Nepal has historically depended on traditional ideas and methods to direct farming operations. Many of these age-old methods have been handed down through the generations, frequently impacted by Nepal's close cultural and spiritual ties to China and India, its neighbors. Some of these customs have their roots in myths and rituals that still influence agricultural choices, while others are based on ecological observations and indigenous knowledge. These historic ideas continue to have cultural value and are extensively followed by farmers nationwide, even in the face of contemporary scientific discoveries.

Table 1. Techniques and the methods of their uses

Techniques	How is it used	References
Myth-Based Practices	Observing lunar phases (e.g., new moon sowing) to prevent pest attacks.	(Kumar *et al*., 2009).
Fallowing	In order to disrupt insect cycles and restore soil fertility, land should be left fallow in between planting seasons.	(Kumar *et al*., 2009).
Ritualistic Offerings	Farmers perform rituals and offerings to deities before planting or harvesting to ensure good yields.	(Singh, 2012)
Sacred Groves	Maintaining undisturbed forest patches near farms to attract beneficial insects and birds that control pests.	(Ramakrishnan, 2001)

NEPALESE JOURNAL OF AGRICULTURAL SCIENCES,
July, 2025, volume 29
e-ISSN: 2091-0428; p-ISSN 2091-041X; esjindex ID =6279
Published by HICAST, Purbanchal University, Kathmandu

Existing literature on traditional plant protection measures

Farmers' reliance on locally accessible and natural resources to protect their crops, traditional plant protection techniques have long been an essential component of Nepalese agriculture. These methods, which are based on indigenous knowledge, place an emphasis on economically and environmentally beneficial approaches to managing diseases and pests.

Table 2. Techniques and the methods of their uses

Technique	How It Is Used	References
Use of Wooden Ash	The common practice of using raw ash to control pests like aphids and stem-cutting insects involves spreading ash in powder form on pest-affected plants every 2-4 days, which also improves soil nutrient status	(Verma, 1998).
Use of Fresh Cow Urine	**Composition:** Fresh cow urine, a pest of onion, garlic, mugwort, chili, *Ageratina adenophora*, and *Adhatoda vasica* mixed with water. **Usage:** Filtered and applied to repel sap-sucking insects and disease-causing pests.	(Gahukar, 2013).
Use of Papaya Leaf Paste	**Composition:** Papaya leaf paste mixed with water. **Usage:** Filtered with a clean cloth and applied to control fungal diseases in crops	(Arvind *et al*., 2013).
Use of Mugwort (*Artemisia vulgaris*) Solution	**Composition:** 2-3 liters of water mixed with half a kilogram of dry mugwort powder. **Usage:** Protect plants from leaf-eating hairy caterpillars	(Tobyn *et al*., 2011).
Use of Chili Powder	Chilli powder can be used to control aphids and other sap-sucking insects. It is usually applied in powder form, generally on sunny days when the wind flow is stable	(Patil *et al*., 2018).
Use of Turmeric Powder Mixture	**Composition:** 1kg turmeric powder, 3-4 liters of cow urine, and 15-20 liters of soap water. **Usage:** Applied on paddy fields to control the leaf roller	(Poudel, 2020).

Despite the increasing use of contemporary chemical pesticides, many of these methods—such as the application of wooden ash, cow urine, and botanical extracts—have been handed down through the centuries and are still commonly

NEPALESE JOURNAL OF AGRICULTURAL SCIENCES,
July, 2025, volume 29
e-ISSN: 2091-0428; p-ISSN 2091-041X; esjindex ID =6279
Published by HICAST, Purbanchal University, Kathmandu

used today. Some of these techniques have received scientific validation, but more study is needed to fully evaluate their potential in integrated pest management.

Table 3. Techniques and the methods of their uses

Technique	How It Is Used	Stage of Crop Development
Mixture of Kerosene and Ash	2-3 spoonful of kerosene mixed with 1 kg of raw ash; applied twice a week (morning/evening) by broadcasting.	Applied in all development stages of every type of plant.
Solution of Fresh Cow Urine, Onion, Garlic, Mugwort, Chilli, *Ageratina adenophora*, and *Adhatoda vasica*	4-5 liters of cow urine mixed with onion (5-6), garlic (100 g), mugwort, chilli, *Ageratina adenophora*, and *Adhatoda vasica*; diluted with 4-5 liters of water, filtered, and applied by foliar spray.	Used throughout the crop cycle for sap-sucking insects and disease prevention.
Peppermint, Bari, and Mugwort Solution	The mixture of peppermint, bari, and mugwort is applied by foliar spray to control hairy caterpillars.	Applied in all growth stages for caterpillar control.
Chili Powder	Applied in powder form, usually on sunny days when wind flow is stable, to control aphids.	Used during active pest infestation, particularly in the vegetative and reproductive stages.
Fresh Dung Solution	1-2 kg of fresh dung mixed with 4-5 liters of water, filtered, and applied by foliar spray.	Applied at every stage of crop development for pest repellence.
Papaya Leaf Extract	Papaya leaves are crushed into a paste, mixed with 1-2 liters of water, filtered, and applied by foliar spray.	Apply during any crop stage for fungal disease control.
Holy Basil Extract	Crushed basil leaves mixed with 2-3 liters of water, applied by foliar spray, to control leaf-eating insects in citrus fruits.	Applied particularly during fruiting stages to prevent insect damage.
Bovine Urine Solution	Mixed with water in a 2:1 ratio, applied by foliar spray to control mealybugs and sap-sucking insects. Lower concentrations are used before harvest to prevent odor.	Apply in all stages, with caution before harvest.
Mugwort Solution	2-3 liters of water mixed with 0.5 kg of mugwort, applied by foliar spray to control hairy caterpillars.	Used throughout the crop cycle for caterpillar prevention.

Source : Gyawali *et al*., (2021)

A study by Asmita Bhattarai and Narayan Datta Bastakoti on *Plant-Based Traditional Knowledge for Pest and Disease Management in Pokhara*

NEPALESE JOURNAL OF AGRICULTURAL SCIENCES,
July, 2025, volume 29
e-ISSN: 2091-0428; p-ISSN 2091-041X; esjindex ID =6279
Published by HICAST, Purbanchal University, Kathmandu

Metropolitan City Ward No. 32, Kaski, identified several indigenous techniques. These practices highlight the community's dependence on locally available plant resources and traditional wisdom for sustainable agricultural pest and disease control.

Table 4. Plant species used for various pest / diseases and methods of application

Plant Used	Pest/Disease Targeted	Method of Application
Neem (*Azadirachta indica*)	Various insect pests	Leaves are boiled in water; the cooled extract is sprayed on crops.
Titepati (*Artemisia vulgaris*)	Aphids, caterpillars	The leaves are soaked in water overnight; the solution is sprayed on affected plants.
Marigold (*Tagetes erecta*)	Nematodes, aphids	Planted as a companion crop to repel pests through its root exudates and scent.
Garlic (*Allium sativum)*	Fungal infections, insects	Cloves are crushed and mixed with water; the mixture is sprayed on crops.
Chili (*Capsicum annuum*)	Insect pests	Fruits are crushed and mixed with water; the solution is applied to deter pests.
Bakaino (*Melia azedarach*)	Caterpillars, beetles	Leaves and fruits are ground into a paste, mixed with water, and sprayed on crops.
Ash	Stored grain pests	A thin layer is sprinkled over stored grains to protect against insect infestation.
Cow Urine	Fungal diseases, insects	Diluted with water and sprayed on crops as a preventive measure.
Bojo (*Acorus calamus*)	Stored grain pests	Rhizomes are powdered and mixed with stored grains to repel insects.
Khaira (*Senegalia catechu*)	Rice brown spot disease	Leaves were placed in water channels to manage the disease.

Source: Bhattarai & Bastakoti, (2023)

The study *Indigenous Technical Knowledge in Plant Disease Management* by Hari Prasanna Sahul and Rakesh Roshan Satapathy highlights various traditional plant disease management practices. Their findings reflect the strong agricultural ties between Nepal and India, showcasing how both countries share similar indigenous techniques and knowledge systems in pest and disease control.

NEPALESE JOURNAL OF AGRICULTURAL SCIENCES,
July, 2025, volume 29
e-ISSN: 2091-0428; p-ISSN 2091-041X; esjindex ID =6279
Published by HICAST, Purbanchal University, Kathmandu

CHALLENGES IN ADOPTING TRADITIONAL AGRICULTURAL PRACTICES

The adoption of traditional agricultural methods confronts numerous problems, including a lack of documentation, awareness, and proper implementation. Farmers' perspectives and the insufficient integration of ecological theories impede their effectiveness. Furthermore, poor collaboration between farmers and agricultural scientists undermines support for indigenous knowledge. Addressing these challenges is critical for long-term plant conservation while also presenting a challenge to modern solutions, as deeply ingrained cultural traditions frequently hinder adoption rates.

Table 5. Techniques and the methods of their uses

Techniques	How is it used
Ash and Liquid Waste Spraying	A little dusting of ash and spraying of liquid waste from tanned leather in tribal areas to manage bunchy top illness in chilies.
Cow Dung for Fungal Disease	Fresh cow dung is sprayed in the collar region of chili plants to treat damping-off and dieback.
Cow Dung Slurry for Seed Treatment	Fresh cow dung slurry (1 kg of cow dung in 5 L of water) is used to treat ginger and turmeric seeds for disease management and improved germination.
Organic Soil-Borne Disease Control	Farmers use sesame, mustard, and neem cake in betel vine-growing areas to manage soil-borne diseases.
Chickpea Wilt Management	Farmers mix 30 kg of chickpea seeds with 0.5 mg Heeng, 200 g salt, and 1 L of buttermilk to control wilt disease.
Cow Urine for Pulse Seeds	Pulse seeds are sprayed with cow urine to protect against soil-borne fungi and improve development.
Root and Collar Rot Control	Castor cake, Karanja cake, and neem cake are used to control root rot and collar rot caused by soil-borne pathogens.
Casuarina Leaf Extract for Infections	20 kg of *Casuarina equisetifolia* leaves are boiled, filtered, and diluted with water to treat bacterial and fungal infections.
Papaya Leaf Extract for Rice Brown Spot	A solution of 2 kg fresh papaya leaves in 3-4 L water is soaked overnight, filtered, diluted with 50-60 L water, and 250 mL soap solution added to control rice brown spot disease.
Marigold for Bacterial Infections	Marigold cultivation followed by solanaceous vegetable crops helps control bacterial infections.
Khair Leaves for Brown Spots in Rice	Placing khair (*Acacia catechu*) leaves in a water canal helps manage brown spot disease of rice.

Source : Sahu & Satapathy, (2021)

NEPALESE JOURNAL OF AGRICULTURAL SCIENCES,
July, 2025, volume 29
e-ISSN: 2091-0428; p-ISSN 2091-041X; esjindex ID =6279
Published by HICAST, Purbanchal University, Kathmandu

Validating traditional agricultural practices: a collaborative approach

A multidimensional, multi-stakeholder approach is required to validate, adopt, safeguard, certify, and advance traditional agricultural techniques. A solid beginning point could be the next Census 2031/32, which will include questions to systematically document indigenous knowledge. The focus of subsequent research should be on incorporating ancient farming approaches into modern plant disease management. Field demonstrations with farmers can highlight practical applications while ensuring that scientifically established procedures are promoted. Ineffective practices should be publicized via media campaigns, conferences, and house visits. Cultural and social sensitivities must be considered throughout the process. Although time-consuming, this technique promotes research, teaching, and extension, which contributes to agricultural development.

LEVERAGING MULTI-STAKEHOLDER COLLABORATION FOR INDIGENOUS AGRICULTURAL INNOVATIONS

The usage of 'jholmal,' a locally made bio-fertilizer and bio-pesticide, is one example of how cooperative efforts among various stakeholders have aided in the development and implementation of indigenous agricultural practices in Nepal. Jholmal is a traditional, home-made liquid bio-fertilizer and insecticide manufactured by combining water, locally accessible botanical plants with repellent qualities, farmyard manure (FYM), and animal urine in certain amounts. In agricultural settings, cow urine and certain botanicals have long been used to control pests and diseases.(Jandaik *et al*., 2015). Building on this traditional knowledge, CEAPRED and ICIMOD refined the practice by developing three distinct jholmal formulations—Jholmal-1, Jholmal-2, and Jholmal-3. This innovation integrates traditional practices with scientific research, leading to improved crop yields and reduced pest infestations. Field trials demonstrated that applying jholmal resulted in a significant increase in bitter gourd yields—30.5% and 31.1% at foothill sites and 26.6% and 28.7% at hilltop sites over two consecutive years—while also decreasing fruit infestations (Bhusal *et al.,* 2022). Such initiatives highlight the effectiveness of ecosystem-based adaptation measures that utilize local resources and knowledge, offering simple, affordable, and climate-friendly solutions to enhance agroecosystem health and build resilience among smallholder farmers (Bhusal *et al.,* 2022).

NEPALESE JOURNAL OF AGRICULTURAL SCIENCES,
July, 2025, volume 29
e-ISSN: 2091-0428; p-ISSN 2091-041X; esjindex ID =6279
Published by HICAST, Purbanchal University, Kathmandu

REFERENCES

Atteh, O.D. (1989). *Indigenous local knowledge as key to local-level development*. [No publisher available].

Berkes, F., Colding, J. and Folke, C. (2000). Rediscovery of traditional ecological knowledge as adaptive management. *Ecological Applications*, **10**(5), pp.1251-1262.

Bhattarai, A. and Bastakoti, N.D. (2025). Study on plant-based traditional knowledge for pest and disease management of crop plants in Pokhara Metropolitan City Ward No.32, Kaski. *Herbal and Medicinal PlantsBiodiversityStudies*,**5**(1). Availableat:https://www.nepjol.info/index.php/hebids/article/view/59586/445007.

Bhusal, K. & Udas, E. (2020) *Jholmal: A nature-based solution for mountain farming systems*. Kathmandu, Nepal: ICIMOD.

Bhusal, K., Udas, E., & Bhatta, L. D. (2022). Ecosystem-based adaptation for increased agricultural productivity by smallholder farmers in Nepal. *PLOS ONE*, 17(6), e0269586. https://doi.org/10.1371/journal.pone.0269586

Castagnetti, F., Bhatta, J. and Greene, A. (2021). An offering of grain: The agricultural and spiritual cycle of a food system in the Kailash Sacred Landscape, Darchula, Far Western Nepal. *Frontiers in Sustainable Food Systems*, **5**. doi: https://doi.org/10.3389/fsufs.2021.646719.

Gyawali, P., Khanal, S. and Joshi, J. (2021). Crop protection practices in traditional agriculture in mid-hills of Western Nepal: A case of Palpa and Gulmi District. *International Journal of Applied Sciences and Biotechnology*, **9**(2), pp.138-151. doi:https://doi.org/10.3126/ijasbt.v9i2.36305.

Haverkort, B. (1995). Agricultural development with a focus on local resources: ILEIA's view on indigenous knowledge. In: D.M. Warren, L.J. Slikkerveer and D. Brokensha, eds. *The Cultural Dimensions of Development: Indigenous Knowledge Systems*. London: Intermediate Technology Publications Ltd., pp.454–457.

Jandaik, S., Sharma, D. & Kumar, V. (2015). Effect of cow urine on growth and yield of tomato. *Asian Journal of Agricultural Research*, 9(1), pp. 38–46.

Kala, C.P. (2011). Traditional ecological knowledge, sacred groves and conservation of biodiversity in the Pachmarhi Biosphere Reserve of India. *Journal of Environmental Protection*, **2**(7), pp.963-972. doi: https://doi.org/10.4236/jep.2011.27111.

Kumar, G., Chhetry, N. and Belbahri, L. (2009). Indigenous pest and disease management practices in traditional farming systems in northeast India: A review. *Journal of Plant Breeding and Crop Science*, **1**(3),pp.2838. Availableat:https://academicjournals.org/article/article1381225427_Chhetry%20and%20Betbahri.pdf.

Mishra, K. (2023). Impediments in the agriculture sector of Nepal. *Nepal Economic Forum*, Available at: https://nepaleconomicforum.org/impediments-in-the-agriculture-sector-of-nepal/.

Ramakrishnan, P.S. (1998). Conserving the sacred for biodiversity: The conceptual framework. In: P.S. Ramakrishnan, K.G. Saxena and U.M. Chandrashekara, eds. *Conserving the Sacred for Biodiversity Management*. New Delhi: Oxford and IBH Publishing Co., pp.3-16.

NEPALESE JOURNAL OF AGRICULTURAL SCIENCES,
July, 2025, volume 29
e-ISSN: 2091-0428; p-ISSN 2091-041X; esjindex ID =6279
Published by HICAST, Purbanchal University, Kathmandu

Sahu, H.P. and Satapathy, R.R. (2021). Indigenous technical knowledge in plant disease management. *Asian Journal of Agricultural Extension, Economics & Sociology*, **39**(10), pp.54-62. doi:https://doi.org/10.9734/ajaees/2021/v39i1030704.

Smith, L.T. (1999). *Decolonising methodologies: Research and indigenous peoples*. London: Zed Books and University of Otago Press.

Thagunna, S.S. and Ghimire, P. (2023). Literature review on traditional plant protection measures in Nepal. *AgricultureExtensioninDevelopingCountries*,**1**(2),pp.99101. doi:https://doi.org/10.26480/aedc.02.2023.99.101.

WorldBank(2023).*WorldBankOpenData*.Availableat:https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?contextual=default&end=2023&locations=NP&start=1975&view=chart