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Rural development programs and indigenous farming knowledge: Burkina faso and Nepal in comparative perspective

Haby Ibrahim[1]

Iradukunda Sengesho Benigne2

Nizeyimana Jean Baptiste3

1. Joint PhD Researcher at Lisala University and UNCR University, Agriculture & Rural Development Department, Rural Development
2. Joint MPhil Researcher at Lisala University and UNCR University, IT Department, Film and TV Production
3. Lecturer at Lisala University, Faculty of Psychology and Education, Department of Technopedagogy

ABSTRACT

This study falls within SDG Focus Goal 2: Zero Hunger — Target 2.3: By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers; Target 2.4: Ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and

[1] Joint PhD Researcher at Lisala University and UNCR University, Agriculture & Rural Development Department, Rural Development

production, that help maintain ecosystems; Target 2.5: Maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species.

This study examines the comparative approaches to rural development programs and their integration with indigenous farming knowledge in Burkina Faso and Nepal, focusing on how each country's development initiatives engage with traditional agricultural practices, community-based knowledge systems, and culturally appropriate technologies. The research analyzes the mechanisms for preserving and revitalizing indigenous knowledge, the role of participatory approaches in development interventions, and the challenges of maintaining traditional practices in contexts of environmental change and modernization. A comparative analysis was conducted examining primary and secondary sources including peer-reviewed research, institutional project documentation, and community-based case studies covering recent developments to 2025-2026.

Burkina Faso presents a dynamic landscape where multiple initiatives are actively working to retrieve, validate, and integrate indigenous farming knowledge into contemporary agricultural development. The SUSTLIVES project, funded by the European Union and implemented by the Alliance of Bioversity International and CIAT, focuses on neglected and underutilized species (NUS)—crops such as fabirama, moringa, roselle, amaranth, and bambara groundnut that were long dismissed as "poor people's crops" but are now being recognized for their nutritional value, climate resilience, and cultural significance . Working in 21 pilot villages across Burkina Faso and Niger, the project establishes "living labs" in farmers' fields where agronomists, seed custodian farmers, and community organizations work together to assess the performance of these traditional species . Community seed banks ensure access to locally adapted varieties, strengthening food sovereignty and reducing dependence on costly hybrid seeds . The EWA-BELT project, coordinated by the ACRA Foundation, has demonstrated the effectiveness of retrieving traditional knowledge for plant protection, focusing on Cassia nigricans (locally known as "zandr kouka"), a botanical extract traditionally used for post-harvest crop protection whose knowledge had diminished over time . Through participatory research with farmers and the INERA research institute, the project reintroduced this practice, with trials showing Cassia nigricans extracts performing as effectively as synthetic pesticides in some cases, while offering a higher benefit-cost ratio due to local availability . Action research in the Dano lowlands from 2019 to 2023 explored potato cultivation as a diversification strategy, allowing 80 farmers to learn new

techniques while bringing in their own "old local know-how" including associations, bio-insecticides, and fences made from local materials . The "Plug-In Principle," articulated in a recent open access book based on extensive field research across Africa including Burkina Faso, advocates that scientific and technological advancements should enhance rather than replace existing indigenous knowledge, emerging from the recognition that development interventions often fail when they attempt replacement rather than integration .

Nepal presents a contrasting yet complementary picture where indigenous farming knowledge is deeply embedded in the cultural and spiritual practices of diverse ethnic communities, yet faces pressures from modernization, policy changes, and environmental shifts. The Kulung people, an Indigenous community in the Himalayas' Mahakulung region, maintain the tradition of "tos," a land-worshipping ritual performed three times annually at crucial points in the agricultural calendar . During these ceremonies, a shaman (nokchho) observes insects and soil conditions beneath sacred yongkholung stones to forecast the upcoming season—spiders and black ants laying white eggs signal good conditions, while termites warn of pest infestation . This practice, rooted in "centuries of lived experience and careful observation of natural patterns," demonstrates how indigenous knowledge systems integrate spiritual and practical dimensions of farming . However, knowledge transmission faces disruption due to modernization and a growing generation gap, with younger community members showing less interest in traditional rituals and elders noting that modern shamans lack the powerful insights of their predecessors . The Chepang community, one of Nepal's most marginalized indigenous nationalities, has experienced fundamental changes in their agricultural systems. Historically reliant on shifting cultivation, hunting, and gathering, the Chepangs were restricted from forest resource use following new forestry laws, forcing a transition to permanent cultivation . Research in Gorkha district reveals that while over 80% of Chepangs remain involved in agriculture, they are diversifying into cash crops and seeking off-farm employment, with rural out-migration becoming a significant factor in land use change . The SAMRIDDHI Rural Enterprises and Remittances Project, supported by IFAD, has documented how Indigenous Peoples' food systems in Nepal are embedded in traditional knowledge, cultural practices, and biodiversity, reflecting deep community understanding of local plants, seasonal calendars, and food preparation techniques . The Sloping Agriculture Land Technology (SALT) initiative in Makawanpur, working with Chepang and

Tamang communities, has transformed degraded shifting cultivation lands through agroforestry, planting over 9.2 million trees and plants including banana, pineapple, and broom grass across 2,500 hectares, benefiting more than 3,000 households while preventing an estimated 4,109 tonnes of annual soil loss .

Both countries demonstrate significant interplay between rural development programs and indigenous farming knowledge, yet with different strategic orientations and challenges. Burkina Faso's strength lies in systematic, project-based efforts to retrieve and scientifically validate traditional knowledge, integrating it with modern agricultural research through participatory approaches. Nepal's strength lies in the deep cultural embedding of agricultural knowledge within indigenous communities, though this knowledge faces pressures from policy changes, environmental shifts, and generational divides. Neither country has fully resolved the tension between preserving traditional practices and adapting to contemporary challenges, though both offer valuable models for integrating indigenous and scientific knowledge systems.

Effective integration of indigenous farming knowledge into rural development programs requires: (1) participatory approaches that center farmers and communities as knowledge holders rather than passive recipients; (2) validation of traditional practices through collaborative research; (3) supportive policy frameworks that recognize indigenous knowledge systems; (4) mechanisms for intergenerational knowledge transmission; (5) attention to the spiritual and cultural dimensions of agricultural practice; (6) adaptation of traditional knowledge to changing environmental conditions; (7) seed banks and biodiversity conservation that protect local genetic resources; and (8) economic valorization of traditional crops through value chain development.

KEYWORDS: Indigenous farming knowledge, rural development, Burkina Faso, Nepal, traditional agriculture, participatory research, food sovereignty, neglected and underutilized species, shifting cultivation, SDG 2, agroecology, knowledge integration.

RÉSUMÉ (French Version)

Cette étude examine les approches comparatives des programmes de développement rural et de leur intégration avec les savoirs agricoles indigènes au Burkina Faso et au Népal, en se concentrant

sur la manière dont les initiatives de développement de chaque pays s'engagent avec les pratiques agricoles traditionnelles, les systèmes de connaissances communautaires et les technologies culturellement appropriées. La recherche analyse les mécanismes de préservation et de revitalisation des savoirs indigènes, le rôle des approches participatives dans les interventions de développement, et les défis du maintien des pratiques traditionnelles dans des contextes de changement environnemental et de modernisation. Une analyse comparative a été menée en examinant des sources primaires et secondaires, y compris la recherche évaluée par les pairs, la documentation de projets institutionnels et des études de cas communautaires couvrant les développements récents jusqu'en 2025-2026.

Le Burkina Faso présente un paysage dynamique où de multiples initiatives travaillent activement à retrouver, valider et intégrer les savoirs agricoles indigènes dans le développement agricole contemporain. Le projet SUSTLIVES, financé par l'Union européenne et mis en œuvre par l'Alliance of Bioversity International et CIAT, se concentre sur les espèces négligées et sous-utilisées—des cultures telles que le fabirama, le moringa, l'amarante, le gombo, le bambara groundnut qui ont longtemps été considérées comme des "cultures de pauvres" mais sont aujourd'hui reconnues pour leur valeur nutritionnelle, leur résilience climatique et leur signification culturelle . Travaillant dans 21 villages pilotes au Burkina Faso et au Niger, le projet établit des "laboratoires vivants" dans les champs des agriculteurs où agronomes, agriculteurs gardiens de semences et organisations communautaires travaillent ensemble pour évaluer la performance de ces espèces traditionnelles . Les banques de semences communautaires assurent l'accès aux variétés localement adaptées, renforçant la souveraineté alimentaire et réduisant la dépendance aux semences hybrides coûteuses . Le projet EWA-BELT, coordonné par la Fondation ACRA, a démontré l'efficacité de la récupération des savoirs traditionnels pour la protection des plantes, en se concentrant sur Cassia nigricans (localement connu sous le nom de "zandr kouka"), un extrait botanique traditionnellement utilisé pour la protection des récoltes après récolte, dont la connaissance s'était perdue au fil du temps . Grâce à une recherche participative avec les agriculteurs et l'INERA, le projet a réintroduit cette pratique, les essais montrant que les extraits de Cassia nigricans étaient aussi efficaces que les pesticides synthétiques dans certains cas, tout en offrant un meilleur rapport coût-bénéfice en raison de leur disponibilité locale . Une recherche-action dans les bas-fonds de Dano de 2019 à 2023 a exploré la culture de la pomme de terre comme

stratégie de diversification, permettant à 80 agriculteurs d'apprendre de nouvelles techniques tout en apportant leurs propres "savoir-faire anciens" incluant associations, bio-insecticides et clôtures en matériaux locaux . Le "Principe d'Intégration" (Plug-In Principle), articulé dans un livre en libre accès récent basé sur des recherches de terrain approfondies à travers l'Afrique incluant le Burkina Faso, préconise que les avancées scientifiques et technologiques devraient améliorer plutôt que remplacer les savoirs indigènes existants, émergeant de la reconnaissance que les interventions de développement échouent souvent lorsqu'elles tentent un remplacement plutôt qu'une intégration .

Le Népal présente un tableau contrasté mais complémentaire où les savoirs agricoles indigènes sont profondément ancrés dans les pratiques culturelles et spirituelles de diverses communautés ethniques, mais font face à des pressions de la modernisation, des changements politiques et des transformations environnementales. Le peuple Kulung, une communauté indigène de la région himalayenne du Mahakulung, maintient la tradition du "tos," un rituel d'adoration de la terre pratiqué trois fois par an aux moments cruciaux du calendrier agricole . Lors de ces cérémonies, un chaman observe les insectes et les conditions du sol sous des pierres sacrées pour prédire la saison à venir—des araignées et fourmis noires pondant des œufs blancs signalent de bonnes conditions, tandis que les termites avertissent d'une infestation de ravageurs . Cette pratique, enracinée dans des "siècles d'expérience vécue et d'observation attentive des schémas naturels," démontre comment les systèmes de savoirs indigènes intègrent les dimensions spirituelles et pratiques de l'agriculture . Cependant, la transmission des connaissances est perturbée par la modernisation et un fossé générationnel croissant, les jeunes membres de la communauté montrant moins d'intérêt pour les rituels traditionnels et les aînés notant que les chamans modernes manquent de la perspicacité de leurs prédécesseurs . La communauté Chepang, l'une des nationalités indigènes les plus marginalisées du Népal, a connu des changements fondamentaux dans ses systèmes agricoles. Historiquement dépendants de la culture sur brûlis, de la chasse et de la cueillette, les Chepangs ont été restreints dans l'utilisation des ressources forestières suite à de nouvelles lois forestières, les forçant à une transition vers la culture permanente . La recherche dans le district de Gorkha révèle que si plus de 80 % des Chepangs restent impliqués dans l'agriculture, ils se diversifient vers des cultures de rente et recherchent un emploi hors ferme, l'exode rural devenant un facteur important de changement d'utilisation des terres . Le projet SAMRIDDHI Rural Enterprises and Remittances, soutenu par le FIDA, a documenté comment les

systèmes alimentaires des Peuples Autochtones au Népal sont ancrés dans les savoirs traditionnels, les pratiques culturelles et la biodiversité, reflétant une compréhension communautaire profonde des plantes locales, des calendriers saisonniers et des techniques de préparation des aliments . L'initiative Sloping Agriculture Land Technology à Makawanpur, travaillant avec les communautés Chepang et Tamang, a transformé des terres dégradées de culture sur brûlis par l'agroforesterie, plantant plus de 9,2 millions d'arbres et de plantes incluant bananier, ananas et herbe à balai sur 2 500 hectares, bénéficiant à plus de 3 000 ménages tout en prévenant une perte annuelle estimée de 4 109 tonnes de sol .

Les deux pays démontrent une interaction significative entre les programmes de développement rural et les savoirs agricoles indigènes, mais avec des orientations stratégiques et des défis différents. La force du Burkina Faso réside dans les efforts systématiques et basés sur des projets pour retrouver et valider scientifiquement les connaissances traditionnelles, les intégrant à la recherche agricole moderne par des approches participatives. La force du Népal réside dans l'ancrage culturel profond des connaissances agricoles au sein des communautés indigènes, bien que ces connaissances soient confrontées à des pressions liées aux changements politiques, aux transformations environnementales et aux fossés générationnels. Aucun des deux pays n'a pleinement résolu la tension entre la préservation des pratiques traditionnelles et l'adaptation aux défis contemporains, bien que tous deux offrent des modèles précieux pour l'intégration des systèmes de savoirs indigènes et scientifiques.

L'intégration efficace des savoirs agricoles indigènes dans les programmes de développement rural nécessite : (1) des approches participatives qui placent les agriculteurs et les communautés comme détenteurs de savoirs plutôt que comme récipiendaires passifs ; (2) la validation des pratiques traditionnelles par la recherche collaborative ; (3) des cadres politiques favorables qui reconnaissent les systèmes de savoirs indigènes ; (4) des mécanismes de transmission intergénérationnelle des connaissances ; (5) une attention aux dimensions spirituelles et culturelles des pratiques agricoles ; (6) l'adaptation des connaissances traditionnelles aux conditions environnementales changeantes ; (7) des banques de semences et la conservation de la biodiversité qui protègent les ressources génétiques locales ; et (8) la valorisation économique des cultures traditionnelles par le développement de chaînes de valeur.

COMING SOON

MOTS-CLÉS : Savoirs agricoles indigènes, développement rural, Burkina Faso, Népal, agriculture traditionnelle, recherche participative, souveraineté alimentaire, espèces négligées et sous-utilisées, culture sur brûlis, ODD 2, agroécologie, intégration des connaissances.

COMING SOON

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Auteurs correspondant: *Haby Ibrahim, Iradukunda Sengesho Benigne and Nizeyimana Jean Baptiste*
Adresses électroniques: *, Ibrahim@cirep.ac.cd,benigneira0@gmail.com, nizeyimana.jb@dphu.ac.cd ,*
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1. INTRODUCTION

The relationship between rural development programs and indigenous farming knowledge stands at the intersection of agricultural innovation, cultural preservation, and food sovereignty. For centuries, farming communities across the Global South have developed sophisticated knowledge systems through intimate interaction with their environments—understanding soil types, rainfall patterns, pest cycles, and the properties of local plant varieties. Yet these knowledge systems have often been marginalized by mainstream development interventions that privilege external, scientific expertise. SDG 2 explicitly recognizes the importance of this issue through Target 2.3, which calls for doubling the productivity and incomes of small-scale food producers, "in particular women, indigenous peoples, family farmers," and Target 2.4, which calls for sustainable food production systems and resilient agricultural practices.

This study examines two countries that offer illuminating perspectives on the integration of indigenous farming knowledge into rural development: Burkina Faso and Nepal. Both nations are characterized by significant cultural diversity, challenging agro-ecological conditions, and communities whose agricultural practices have evolved over generations in response to local environments. Yet their approaches to development, the pressures facing traditional knowledge, and the strategies for knowledge integration differ in revealing ways.

Burkina Faso, a West African Sahelian nation, faces the dual challenges of climate variability and land degradation. Recent years have seen a flourishing of development initiatives explicitly designed to retrieve, validate, and integrate indigenous farming knowledge. The SUSTLIVES project focuses on neglected and underutilized species—traditional crops long dismissed as "poor people's crops"—recognizing their nutritional value, climate resilience, and cultural significance . The EWA-BELT project has successfully reintroduced the use of Cassia nigricans, a traditional

botanical pesticide whose knowledge had diminished over time . Action research in the Dano lowlands has explored how farmers can combine new techniques with their own "old local know-how" . The "Plug-In Principle," emerging from extensive African field research, articulates a theoretical framework for knowledge integration: advancements in science and technology should enhance rather than replace existing indigenous knowledge .

Nepal, a Himalayan nation with extraordinary ethnic diversity, presents a context where indigenous farming knowledge is deeply embedded in cultural and spiritual practices. The Kulung people's "tos" rituals, performed at critical points in the agricultural calendar, integrate spiritual ceremony with practical observation of insects and soil conditions to forecast growing seasons . The Chepang community, historically reliant on shifting cultivation, has faced fundamental transformations as forestry policies restricted access to traditional lands, forcing adaptation to permanent agriculture and cash crops . Development initiatives like the Sloping Agriculture Land Technology (SALT) project have worked with indigenous communities to transform degraded lands through agroforestry, planting millions of trees while engaging local knowledge and participation .

The contrast between Burkina Faso and Nepal illuminates critical questions for SDG 2 and rural development: How can development programs effectively engage with indigenous farming knowledge? What role do participatory approaches play in successful knowledge integration? How are traditional practices adapting to environmental change and policy pressures? And what can countries learn from each other's approaches to preserving and revitalizing agricultural heritage?

2. LITERATURE REVIEW

2.1 Indigenous Knowledge and Agricultural Development: Theoretical Perspectives

Indigenous knowledge systems represent cumulative bodies of knowledge, practice, and belief evolved through generations of interaction with specific environments. In agriculture, this knowledge encompasses understanding of soil types, crop varieties, pest management, water

conservation, and seasonal cycles. The relationship between indigenous knowledge and formal agricultural science has often been characterized by tension, with development interventions frequently attempting to replace rather than build upon local practices.

The "Plug-In Principle," articulated in a recent open access book based on extensive field research across Africa including Burkina Faso, offers a theoretical framework for knowledge integration. This principle emerged from the recognition that development interventions often fail when they attempt replacement rather than integration. The principle advocates that advancements in science and technology should enhance rather than replace existing indigenous knowledge, emphasizing that effective knowledge integration hinges on a deep understanding and appreciation of prevailing systems .

2.2 Burkina Faso: Retrieving, Validating, and Integrating Indigenous Knowledge

The SUSTLIVES Project and Neglected Species: The SUSTLIVES project, funded by the European Union through the DeSIRA initiative and led by the Italian Agency for Development Cooperation (AICS) and CIHEAM-Bari in partnership with the Alliance of Bioversity International and CIAT, represents one of the most comprehensive efforts to revitalize indigenous agricultural knowledge in Burkina Faso . The project focuses on neglected and underutilized species (NUS)—traditional crops including fabirama, moringa, roselle, amaranth, bambara groundnut, cassava, okra, and sweet potato that have been marginalized by mainstream agricultural development .

Key features of the project include:

Element	**Description**
Geographic Scope	21 pilot villages (11 in Burkina Faso, 10 in Niger)
Approach	"Living labs" in farmers' fields where agronomists, seed custodian farmers, and community organizations work together

Activities	Participatory assessment of NUS performance; community seed banks; value chain development
Knowledge Transmission	School gardens and educational programs engaging children
Communication	Community radio broadcasts in Mooré, Zarma, and French languages
Economic Empowerment	Startup support program for agro-entrepreneurs working with NUS

The project's emphasis on community seed banks ensures that farmers maintain access to locally adapted varieties, strengthening food sovereignty and reducing dependence on costly hybrid seeds . Participatory diagnostics identified three main bottlenecks for NUS value chains: inadequate post-harvest equipment, absence of formal quality standards, and limited access to credit . In response, the project launched a startup support program operating through local incubators at Joseph Ki-Zerbo University in Burkina Faso and Abdou Moumouni University in Niger, providing training, mentoring, and seed funding to agro-entrepreneurs .

The EWA-BELT Project and Cassia Nigricans: The EWA-BELT project, coordinated by the ACRA Foundation, has demonstrated the effectiveness of retrieving traditional knowledge for plant protection. The project focused on Cassia nigricans, known locally as "zandr kouka" in Burkina Faso, which had traditionally been used for post-harvest crop protection . Over time, this knowledge had diminished, with many farmers no longer recognizing or using the plant .

Through interviews and collaboration with the INERA research institute, ACRA reintroduced the use of Cassia nigricans for crop protection, initially focusing on cowpea and cotton. Field trials compared Cassia nigricans with widely used Neem-based extracts and synthetic pesticides, with promising results. Cassia nigricans extracts proved as effective as Neem-based products and, in some cases, more efficient than untreated controls, with benefits particularly pronounced in pest control during the growing season .

A cost-benefit analysis conducted by Gramsci University revealed that Cassia nigricans offers a higher benefit-cost ratio (BCR) than both synthetic pesticides and Neem extracts. The ability to harvest the plant directly from the wild provides a significant economic advantage, as farmers can

produce their own pesticide without purchasing expensive chemicals . Following successful results, the local cooperative "Tegawendé" decided to incorporate the extract into their farming practices.

Action Research in Dano Lowlands: From 2019 to 2023, an action research program in the Dano lowlands explored potato cultivation as a diversification strategy for market gardening in Burkina Faso . The program, which emphasized participatory approaches, allowed 80 farmers (men and women) to learn off-season potato cultivation while bringing in their own "old local know-how" including crop associations, bio-insecticides, fences made from local materials, and livestock repellents .

Key findings included:

Finding	**Implication**
Maximum yields (15 t/ha) fell below potential (30 t/ha)	Insufficient irrigation and spacing limited productivity
Following rice yields doubled (3t/ha to 6t/ha)	Organic manure applied to potato benefited subsequent crop
Crop faces constraints including clay soils, low sump flows, late supplies	Infrastructure and support systems needed
Dependence on seed supply system and financial risks	Public investment in certified seed production and storage needed

The research concluded that diversifying market gardening with potatoes in rotation with rice could contribute to food security, employment, and income, but that this crop may be unsuitable for women, youth, and farmers without means unless supported by public investment .

2.3 Nepal: Culturally Embedded Knowledge and Adaptation Pressures

The Kulung People's Tos Rituals: The Kulung people, an Indigenous community in the Himalayas' Mahakulung region of Solukhumbu District, maintain a sophisticated agricultural

knowledge system embedded in spiritual practice. The "tos" tradition, documented by community member Nerabung Kulung through Dialogue Earth's Indigenous Voices project, involves land-worshipping rituals performed three times annually at crucial points in the agricultural calendar .

Ritual	**Timing**	**Purpose**
Yau Tos	Chaitra (March-April)	After seed sowing; prayer for rainfall and fertile land
Yenam Tos	Jestha (May-June)	Before rainy season; prayer for protection from crop destruction; introduction of koyo (restrictive period)
Tho Tos	Ashoj (September-October)	After rainy season; lifting of restrictions; celebration of harvest; largest gathering

During these ceremonies, a shaman (nokchho) observes insects and soil conditions beneath sacred yongkholung stones to forecast the upcoming season. The interpretive framework includes:

- **Spiders and black ants laying white eggs:** Good conditions for cultivation
- **Termites:** Warning of potential pest infestation
- **Wet soil:** Sign of fertility, indicating good harvest
- **Dry land:** Prediction of drought

As one local explained, "If termites are seen, it is believed that crops may suffer from pests – termites naturally destroy wood and plants, after all. If the soil is wet, it is taken as a sign of fertility, and a good harvest is expected. If the land is dry, drought is predicted. And if earthworms are seen, people say there will be more rain that year" . These observations, while not documented in science books, are "not entirely baseless—they come from centuries of lived experience and careful observation of natural patterns by our ancestors" .

However, knowledge transmission faces significant challenges. The growing generation gap, combined with lack of written documentation, has disrupted the transfer of traditional practices. Elders note that modern shamans lack the powerful insights of their predecessors, and younger community members show less interest in participating in rituals .

COMING SOON

The Chepang Community: From Shifting Cultivation to Adaptation: The Chepang people, one of Nepal's most marginalized indigenous nationalities, have experienced fundamental changes in their agricultural systems. Research by Khatri (2024) in Taklung, Gorkha, examined changing aspects of agriculture and livelihood among the Chepang community .

Key findings include:

- **Historical Practice:** For many centuries, Chepangs relied on shifting cultivation, hunting, and gathering for their livelihoods.
- **Policy Restriction:** Following new laws related to forest resource management, Chepangs were restricted from utilizing forest resources, with hunting made illegal and forest patches no longer available for cultivation .
- **Transition:** These restrictions forced a shift from shifting cultivation to permanent cultivation.
- **Current Agriculture:** Over 80% of Chepangs remain involved in agriculture, but they are diversifying into cash crops for commercial purposes.
- **Paddy Decline:** Paddy cultivation has been declining in recent years due to irrigation requirements.
- **Livelihood Diversification:** Chepangs are diversifying their livelihood strategies, with out-migration to urban areas for employment becoming significant.
- **Land Use Change:** Remote sensing data analysis revealed changes in land use patterns, driven primarily by forest policy changes and out-migration .

The research highlights the complex interplay between policy, environment, and indigenous livelihoods, demonstrating how external interventions can fundamentally transform traditional agricultural systems.

SALT Initiative and Agroforestry Transformation: The Sloping Agriculture Land Technology (SALT) initiative, implemented by MDI-Nepal with support from UNDP GEF Small Grants Programme, has worked with Chepang and Tamang communities in northwestern Makawanpur to transform degraded shifting cultivation lands . Key achievements include:

Metric	**Achievement**

COMING SOON

Households Reached	More than 3,000
Area Transformed	2,500 hectares of marginal lands
Plant Species	Over 9.2 million plants of different types
Specific Plantings	Banana (990,887), broom grass (7,090,958), pineapple (348,548), citrus (88,101)
Soil Loss Prevention	Estimated 4,109 tonnes annually
Income Generation	~US$50,000/year from sale of bananas, pineapples, broom grass, and other crops
Land Value Increase	33-66% increase in real terms

The project's focus on indigenous communities was intentional, recognizing the Chepangs and Tamangs as the "most marginalized and resource poor group in Nepal" . The initiative transformed a negative coping mechanism—the reduction of cultivation cycles from 15-20 years to just 3-4 years, which had invited serious soil erosion—into a sustainable agroforestry system . Climate resilience was demonstrated during a severe drought in 2008/09, when banana and broomgrass plantations showed no visible impact, and farmers reported enhanced resilience from diversified cropping portfolios .

SAMRIDDHI Project and Indigenous Food Systems: The SAMRIDDHI Rural Enterprises and Remittances Project, supported by IFAD, has documented how Indigenous Peoples' food systems in Nepal are embedded in traditional knowledge, cultural practices, and biodiversity . Key insights include:

- Indigenous food systems reflect deep community knowledge of local plants, traditional agricultural practices, seasonal calendars, and food preparation and preservation techniques .
- These systems are integrated with the cultural and spiritual practices of diverse indigenous communities .
- Lessons learned from the project provide practical insights for optimizing future investments in Indigenous Peoples' food systems .

2.4 Comparative Dimensions: Knowledge Integration and Development Approaches

The comparison between Burkina Faso and Nepal illuminates several critical dimensions of rural development and indigenous knowledge:

Knowledge Integration Philosophy: Burkina Faso's approach, exemplified by the "Plug-In Principle," emphasizes systematic retrieval, validation, and integration of indigenous knowledge through participatory research . Nepal's approach, while also participatory, often works within existing cultural frameworks where knowledge is already embedded but faces pressures.

Project Types: Burkina Faso features targeted, externally funded projects focused on specific knowledge elements (neglected species, botanical pesticides) . Nepal features both targeted interventions (SALT) and documentation of existing practices (tos rituals, SAMRIDDHI).

Knowledge Threats: In Burkina Faso, knowledge loss is often due to agricultural modernization and neglect of traditional crops . In Nepal, knowledge threats include policy restrictions (forest laws), generational divides, and out-migration .

Validation Methods: Burkina Faso projects emphasize scientific validation of traditional practices through controlled trials and economic analysis . Nepal projects emphasize documentation of existing practices and community-based adaptation.

Economic Integration: Both countries recognize the importance of economic valorization—Burkina Faso through startup support and value chain development ; Nepal through cash crop integration and market access .

3. RESEARCH QUESTIONS

This study addresses the following research questions:

1. What are the key characteristics of rural development programs in Burkina Faso that engage with indigenous farming knowledge, and how do they retrieve, validate, and integrate traditional practices?
2. What are the key characteristics of indigenous farming knowledge systems in Nepal, and how are they being preserved, transformed, or threatened by development interventions and policy changes?
3. How do the two countries compare in terms of approaches to knowledge integration, participatory methodologies, and responses to knowledge loss?

4. METHODOLOGY

This study employs a comparative analysis methodology to examine rural development programs and indigenous farming knowledge in Burkina Faso and Nepal. The research design integrates secondary analysis of peer-reviewed research, institutional project documentation, community-based case studies, and policy documents to develop comprehensive understanding of knowledge systems, development interventions, and integration approaches in both countries.

Research Design: The comparative approach is appropriate for examining how different cultural contexts, policy environments, and development histories shape the relationship between indigenous knowledge and rural development. Burkina Faso and Nepal were selected as cases that offer complementary insights: both have rich indigenous agricultural knowledge facing pressures, yet their development approaches and knowledge integration strategies differ.

Data Sources: Primary and secondary sources analyzed include:

- Open access book on integrating indigenous and scientific knowledge in Africa, introducing the "Plug-In Principle"
- SUSTLIVES project documentation from Alliance Bioversity International - CIAT
- EWA-BELT project documentation on Cassia nigricans retrieval in Burkina Faso
- Community-based documentation of Kulung people's tos rituals
- Research on Chepang community agricultural transformation in Nepal
- SALT initiative documentation from Equator Initiative

COMING SOON

- SAMRIDDHI project lessons learned from IFAD/European Commission
- Action research on potato diversification in Dano lowlands, Burkina Faso

Analytical Framework: The comparative framework examines five dimensions:

1. **Knowledge Systems:** Characteristics of indigenous farming knowledge and transmission mechanisms
2. **Development Interventions:** Types of programs, methodologies, and integration approaches
3. **Pressures on Knowledge:** Modernization, policy changes, environmental shifts, generational divides
4. **Validation and Valorization:** Methods for validating traditional knowledge and creating economic value
5. **Outcomes and Sustainability:** Impacts on food security, livelihoods, and knowledge preservation

Time Period: The analysis focuses on recent developments (2021-2026), capturing contemporary projects and current research.

5. RESULTS

5.1 Burkina Faso: Systematic Retrieval and Participatory Validation

The "Plug-In Principle" Framework: The open access book "Integrating Indigenous and Scientific Knowledge for Sustainable Food Systems in Africa" presents a novel approach to food security research based on extensive field research across multiple African countries including Burkina Faso . The "Plug-In Principle" emerged from recognizing that development interventions often fail when they attempt to replace rather than integrate existing indigenous knowledge. The principle advocates that advancements in science and technology should enhance rather than replace prevailing systems, emphasizing that effective knowledge integration hinges on deep understanding and appreciation of local practices .

COMING SOON

SUSTLIVES: Revitalizing Neglected Species: The SUSTLIVES project has made significant progress in revitalizing traditional crops across 21 pilot villages . Key outcomes include:

Outcome	**Description**
Participatory Assessment	Farmers, agronomists, and community organizations collaboratively assess traditional crop performance
Community Seed Banks	Local varieties conserved and made accessible, reducing dependence on hybrid seeds
Value Chain Development	Mapping of production, storage, processing, and distribution systems
Entrepreneur Support	Startup program providing training, mentoring, and seed funding for agro-enterprises
School Engagement	Educational programs connecting children with local food heritage
Policy Influence	Working Group on African Opportunity Crops under African Seed and Biotechnology Platform

Participatory diagnostics identified three main bottlenecks for traditional crop value chains: inadequate post-harvest equipment, absence of formal quality standards, and limited access to credit . The startup support program, operating through local incubators at universities, has enabled successful enterprises including moringa cubes in Niger and sweet potato chips in Burkina Faso .

EWA-BELT: Cassia Nigricans Rediscovery: The EWA-BELT project's work on Cassia nigricans demonstrates the effectiveness of retrieving lost traditional knowledge . Key findings include:

- Cassia nigricans extracts proved as effective as Neem-based products and, in some cases, more efficient than synthetic pesticides
- Benefit-cost ratio higher than both synthetic pesticides and Neem extracts due to local availability
- Farmers can harvest from the wild, producing their own pesticide without purchasing expensive chemicals

- Following successful trials, local cooperative "Tegawendé" adopted the practice and expanded to other crops including maize
- Community-based research ensures solutions adaptable to local conditions

Dano Lowlands Action Research: The potato diversification research in Dano from 2019-2023 demonstrated the value of participatory approaches that allow farmers to integrate their own knowledge . Key findings include:

- Farmers brought in "old local know-how" including crop associations, bio-insecticides, local material fences, and livestock repellents
- While potato yields (15 t/ha) fell below potential (30 t/ha), subsequent rice yields doubled (3t/ha to 6t/ha)
- Organic manure applied to potato benefited the following crop, reducing symptoms of iron toxicity
- Crop diversification contributes to food security, employment, and income in dry season
- However, dependence on seed supply systems and financial risks make the crop unsuitable for women, youth, and farmers without means unless supported by public investment

5.2 Nepal: Culturally Embedded Knowledge and Adaptation Pressures

Kulung People's Tos Rituals: The tos tradition of the Kulung people represents a sophisticated integration of spiritual practice and agricultural observation . Key features include:

Element	**Description**
Timing	Three annual rituals aligned with agricultural calendar
Leadership	Shaman (nokchho) conducts observations and provides forecasts
Method	Observation of insects and soil conditions beneath sacred yongkholung stones
Indicators	Spiders/ants with eggs (good), termites (pest warning), wet soil (fertility), dry land (drought)

Community Rules	Prohibition on farm work during tos and following day; fines for non-attendance
Knowledge Base	Rooted in "centuries of lived experience and careful observation of natural patterns"

The tradition faces significant challenges: "due to modernisation and a growing generation gap, the transfer of knowledge has been disrupted. The lack of written documentation poses an even bigger challenge" . Elders note that modern shamans lack the powerful insights of their predecessors, and younger community members show less interest in participating in rituals .

Chepang Community Transformation: Research on the Chepang community in Gorkha district reveals fundamental changes in agricultural systems . Key findings include:

Finding	**Description**
Historical Practice	Shifting cultivation, hunting, and gathering for centuries
Policy Trigger	New forest laws restricted forest resource use, banned hunting, prohibited cultivation on forest patches
Agricultural Transition	Forced shift from shifting to permanent cultivation
Current Involvement	Over 80% still involved in agriculture
Crop Changes	Paddy declining due to irrigation requirements; diversification into cash crops
Livelihood Diversification	Out-migration for employment becoming significant
Land Use Change	Remote sensing data confirms changes driven by policy and migration

The research highlights the profound impacts of policy interventions on indigenous livelihoods, demonstrating how well-intentioned conservation measures can disrupt traditional agricultural systems without providing viable alternatives.

SALT Initiative: Agroforestry Transformation: The Sloping Agriculture Land Technology initiative in Makawanpur demonstrates successful engagement with indigenous communities to transform degraded lands . Key outcomes include:

- More than 3,000 households benefited across 12 districts
- Over 9.2 million plants established on 2,500 hectares of marginal lands
- Estimated 4,109 tonnes of annual soil loss prevented
- Income generation from banana, pineapple, broom grass, and other crops
- Land values increased 33-66% in real terms
- Women's participation strong, with 47% share in local community organizations
- Indigenous and Dalit communities represent 84% of participants (Tamang, Chepang, and others)

The project demonstrated climate resilience during the severe drought of 2008/09, when banana and broomgrass plantations showed no visible impact and farmers reported enhanced resilience from diversified cropping portfolios .

5.3 Comparative Analysis

Table 1: Comparative Summary—Burkina Faso and Nepal

Dimension	**Burkina Faso**	**Nepal**
Knowledge Integration Philosophy	"Plug-In Principle" – science should enhance rather than replace indigenous knowledge	Knowledge deeply culturally embedded; facing adaptation pressures
Key Projects/Initiatives	SUSTLIVES (neglected species), EWA-BELT (Cassia nigricans), Dano action research	SALT (agroforestry), SAMRIDDHI, community documentation of tos rituals
Knowledge Threats	Agricultural modernization, neglect of traditional crops	Policy restrictions (forest laws), generational divide, out-migration
Validation Methods	Scientific trials, cost-benefit analysis, participatory research	Community documentation, observational records, adaptation monitoring

Economic Integration	Startup support, value chain development, entrepreneur incubation	Cash crop integration, market access, income diversification
Community Engagement	"Living labs," seed custodian farmers, local cooperatives	Indigenous community organizations, shamans, traditional governance
Gender Dimensions	Women's participation in farming; attention to women entrepreneurs	Women's active involvement in SALT (47% community organization share)
Climate Adaptation	Drought-tolerant traditional species; diversified cropping	Drought-resilient species (banana, broomgrass); diversified portfolios
Key Strengths	Systematic retrieval and validation; scientific integration	Deep cultural embedding; community-based documentation
Key Challenges	Ensuring economic viability for poorest farmers; seed system dependence	Knowledge transmission disruption; policy-induced transformation

Key Differences:

1. **Knowledge Integration Approach:** Burkina Faso employs systematic, project-based retrieval and validation of indigenous knowledge through participatory research with scientific partners . Nepal's approach emphasizes documentation of existing culturally embedded practices and adaptation to pressures .
2. **Knowledge Threats:** In Burkina Faso, knowledge loss stems primarily from agricultural modernization and neglect of traditional crops . In Nepal, threats include explicit policy restrictions (forest laws), generational divides, and out-migration .
3. **Validation Methods:** Burkina Faso emphasizes scientific validation through controlled trials and economic analysis . Nepal emphasizes community-based documentation and observation of adaptation .

4. **Economic Integration:** Burkina Faso has developed sophisticated value chain approaches including startup support and entrepreneur incubation . Nepal's economic integration focuses on cash crop diversification and market access .
5. **Project Types:** Burkina Faso features externally funded, targeted research-development projects . Nepal features a mix of externally funded initiatives and community-led documentation .

Key Similarities:

1. **Recognition of Indigenous Knowledge Value:** Both countries demonstrate growing recognition that indigenous farming knowledge contributes to food security, climate resilience, and sustainable agriculture.
2. **Participatory Approaches:** Both employ participatory methodologies that center farmers and communities as knowledge holders rather than passive recipients.
3. **Climate Adaptation Focus:** Both recognize traditional species and practices as sources of climate resilience—drought-tolerant crops in Burkina Faso, drought-resilient banana and broomgrass in Nepal.
4. **Gender Dimensions:** Both acknowledge women's centrality in agriculture and traditional knowledge systems, with explicit attention to women's participation in projects.
5. **Economic Valorization:** Both recognize that preserving traditional knowledge requires creating economic value through market integration and value chain development.
6. **Challenges of Knowledge Transmission:** Both face challenges in transmitting knowledge to younger generations, whether through modernization in Burkina Faso or generational divides in Nepal.

6. DISCUSSION OF RESULTS

6.1 The "Plug-In Principle" as Guiding Framework

Burkina Faso's experience offers a powerful conceptual framework for integrating indigenous and scientific knowledge. The "Plug-In Principle"—advocating that scientific advancements should enhance rather than replace existing indigenous knowledge—emerged from recognizing the

failures of replacement-oriented development interventions . This principle has profound implications for rural development policy globally.

The SUSTLIVES project exemplifies this approach by treating traditional crops not as relics to be preserved but as resources to be developed through scientific partnership. The "living labs" methodology, where agronomists and farmers work together in real farming conditions, ensures that scientific knowledge plugs into existing practice rather than overriding it. The community seed banks ensure that farmers maintain control over genetic resources while benefiting from improved varieties.

The Cassia nigricans work demonstrates the principle in action: rather than promoting synthetic pesticides, researchers retrieved traditional knowledge, validated it through trials, and supported farmers to produce their own botanical extracts. The higher benefit-cost ratio reflects the economic logic of building on local resources rather than replacing them with expensive external inputs.

Nepal's experience, while not explicitly framed by the "Plug-In Principle," offers complementary insights. The SALT initiative's success with Chepang and Tamang communities came not from imposing external technologies but from engaging communities in transforming their own degraded lands through agroforestry systems that built on traditional knowledge of local species .

6.2 Policy as Driver of Knowledge Transformation

Nepal's experience powerfully illustrates how policy interventions can fundamentally transform indigenous agricultural systems, often with unintended consequences. The Chepang community's forced transition from shifting cultivation to permanent agriculture following new forest laws demonstrates that policies designed for conservation can disrupt livelihoods without providing alternatives . The reduction of cultivation cycles from 15-20 years to 3-4 years, which invited serious soil erosion, was not a choice but a response to restricted land access.

This finding has important implications for SDG 2 and rural development policy. Policies affecting indigenous communities must be developed with deep understanding of existing agricultural systems and must include provisions for supporting transition. The SALT initiative succeeded

precisely because it provided a positive alternative to the negative coping mechanisms that had emerged under policy pressure.

Burkina Faso's policy environment appears less directly restrictive, though the project documentation suggests that traditional crops were marginalized by mainstream agricultural policies favoring modern varieties and inputs. The SUSTLIVES project's engagement with the African Seed and Biotechnology Platform represents an effort to influence policy at regional level .

6.3 The Spiritual Dimension of Agricultural Knowledge

The Kulung people's tos rituals offer a powerful reminder that indigenous agricultural knowledge is often inseparable from spiritual and cultural practice. The observation of insects beneath sacred stones, the timing of rituals according to the agricultural calendar, the prohibitions on farm work during ceremonial periods—these practices integrate practical observation with spiritual meaning.

For the Kulung, the shaman's forecast is not merely technical advice but guidance embedded in relationship with ancestors and land. As elder Sambarman Okhati explained, "Tos is performed in celebration and gratitude for the new crops in a field, and to seek the same generous cultivation for the future. We also pray to our ancestors to ask for their support to fend off drought, heavy rainfall, landslides and pest infestation in our crops" .

This spiritual dimension presents both opportunities and challenges for development interventions. Programs that ignore or dismiss spiritual practices risk alienating communities and undermining the very knowledge systems they seek to engage. Yet integrating spiritual dimensions into formal development frameworks requires sensitivity and respect that may be difficult to achieve.

6.4 Economic Valorization as Preservation Strategy

Both countries demonstrate that preserving traditional knowledge requires creating economic value. The SUSTLIVES project's startup support program, incubated at universities and providing seed funding to agro-entrepreneurs, represents a sophisticated approach to economic valorization

. Enterprises like moringa cubes and sweet potato chips create market demand for traditional crops, generating income that incentivizes continued cultivation.

The SALT initiative's transformation of degraded lands into productive agroforestry systems demonstrates similar logic. By generating income from banana, pineapple, and broom grass sales (approximately US$50,000 annually) and increasing land values 33-66%, the project created economic incentives for sustainable land management .

However, both contexts also reveal the limits of market-based approaches. The Dano research found that potato cultivation, while promising, was "ultimately unsuitable for women, young people and farmers without means, even if it is of great interest to them" . Without public investment in seed systems and storage, the economic benefits of diversification may not reach the most vulnerable.

6.5 Intergenerational Knowledge Transmission

Both countries face challenges in transmitting agricultural knowledge to younger generations, though the dynamics differ. In Burkina Faso, modernization and the association of traditional crops with poverty have led younger farmers to prefer modern varieties . The SUSTLIVES project's school garden initiatives and educational programs represent deliberate efforts to reconnect children with local food heritage .

In Nepal, the Kulung community's experience reveals a more complex dynamic. Younger community members show less interest in participating in tos rituals, and elders note that modern shamans lack the powerful insights of their predecessors . The lack of written documentation compounds the challenge, as oral transmission becomes less reliable with each generation.

The SALT initiative's success in engaging youth through income generation suggests that economic opportunities can attract younger generations back to agriculture. As one account noted, "The youths have begun farming banana, broomgrass, fodders, asparagus utilizing their bare waste lands, involving in marketing of products earning good income margin from its sale in the highway, and are leading a dignified life" .

6.6 Implications for SDG 2

The findings have important implications for achieving SDG 2 targets:

Target 2.3 (Double productivity and incomes of small-scale food producers): Both countries demonstrate that engaging indigenous knowledge can enhance productivity and incomes. Burkina Faso's validation of Cassia nigricans offers cost-effective pest management . Nepal's SALT initiative generated significant income from diversified agroforestry . However, ensuring benefits reach the most vulnerable—women, youth, and farmers without means—requires targeted support.

Target 2.4 (Sustainable food production and resilient agriculture): Indigenous knowledge systems embody principles of sustainability and resilience developed over generations. Burkina Faso's traditional species are drought-tolerant and climate-adapted . Nepal's diversified cropping portfolios provided resilience during severe drought . Building on these systems rather than replacing them enhances sustainability.

Target 2.5 (Maintain genetic diversity of seeds and plants): Community seed banks in Burkina Faso and the preservation of diverse local varieties in Nepal's indigenous food systems directly contribute to genetic diversity conservation. The "Plug-In Principle" ensures that scientific breeding enhances rather than replaces local genetic resources.

Target 2.1 (End hunger and ensure access to food): The revitalization of neglected and underutilized species contributes to dietary diversity and food security. Traditional crops like moringa, amaranth, and bambara groundnut are nutrient-dense and culturally appropriate .

Target 2.2 (End malnutrition): Indigenous food systems often include nutrient-rich traditional varieties that address micronutrient deficiencies. SUSTLIVES emphasizes the nutritional value of traditional crops .

7. CONCLUSION

This comparative analysis of rural development programs and indigenous farming knowledge in Burkina Faso and Nepal reveals profound insights into how different societies are navigating the

relationship between tradition and innovation in agriculture. The two countries, with their distinct cultural contexts, development histories, and knowledge systems, each illuminate critical dimensions of integrating indigenous and scientific knowledge for sustainable food systems.

Burkina Faso's experience demonstrates the power of systematic, project-based approaches to retrieving, validating, and integrating indigenous knowledge. The "Plug-In Principle"—advocating that scientific advancements should enhance rather than replace existing knowledge—provides a conceptual framework with relevance far beyond West Africa . The SUSTLIVES project has revitalized neglected and underutilized species across 21 pilot villages, establishing "living labs" where farmers and scientists work together, creating community seed banks, developing value chains, and supporting agro-entrepreneurs . The EWA-BELT project successfully retrieved traditional knowledge of Cassia nigricans for plant protection, demonstrating through rigorous trials that botanical extracts can match synthetic pesticide effectiveness while offering higher benefit-cost ratios . Action research in the Dano lowlands showed how participatory approaches allow farmers to bring their "old local know-how" into new crop diversification strategies . These initiatives collectively demonstrate that indigenous knowledge is not a relic to be preserved but a resource to be developed through respectful partnership.

Nepal's experience reveals the deep cultural embedding of agricultural knowledge within indigenous communities and the profound impacts of policy interventions on traditional systems. The Kulung people's tos rituals integrate spiritual practice with practical observation, using sacred stones and insect indicators to forecast growing seasons—knowledge rooted in "centuries of lived experience and careful observation of natural patterns" . Yet this knowledge transmission faces disruption from modernization and generational divides, with younger community members showing less interest in traditional practices . The Chepang community's forced transition from shifting cultivation following forest policy changes demonstrates how well-intentioned conservation measures can disrupt livelihoods without providing alternatives . The SALT initiative's success in transforming degraded lands through agroforestry, planting over 9.2 million plants across 2,500 hectares and benefiting more than 3,000 households, shows that positive alternatives are possible when communities are engaged as partners rather than subjects .

Several cross-cutting insights emerge from this comparison:

First, indigenous knowledge is not static tradition but dynamic resource. Both countries demonstrate that traditional practices can be adapted to contemporary challenges—climate change, market integration, policy shifts—when communities are supported to innovate.

Second, participatory approaches are essential for effective integration. Whether Burkina Faso's "living labs" or Nepal's community-based SALT implementation, programs that treat farmers as knowledge holders rather than passive recipients achieve better outcomes.

Third, policy matters profoundly. Nepal's experience shows how policies can disrupt traditional systems, while Burkina Faso's engagement with regional policy platforms demonstrates efforts to create supportive frameworks.

Fourth, economic valorization supports knowledge preservation. Creating market value for traditional crops and practices provides incentives for continued cultivation and transmission.

Fifth, intergenerational transmission requires deliberate effort. Both countries face challenges in passing knowledge to younger generations, requiring educational initiatives, economic opportunities, and cultural recognition.

Sixth, spiritual and cultural dimensions cannot be ignored. The Kulung people's tos rituals remind us that agriculture is never merely technical but always embedded in relationships with land, ancestors, and community.

Seventh, scientific validation can strengthen indigenous knowledge. Burkina Faso's approach of validating traditional practices through controlled trials and economic analysis demonstrates that science and tradition need not be opposed.

For Burkina Faso, priorities emerging from this analysis include:

1. Scale successful approaches from pilot villages to broader geographic coverage, building on SUSTLIVES and EWA-BELT methodologies.

2. Strengthen seed systems and storage infrastructure to ensure that the benefits of diversification reach women, youth, and farmers without means.
3. Continue policy engagement through platforms like the African Seed and Biotechnology Platform to create supportive frameworks for traditional crops.
4. Expand school garden and educational initiatives to reconnect younger generations with local food heritage.
5. Document and disseminate the "Plug-In Principle" as a framework for knowledge integration in development interventions.

For Nepal, priorities include:

1. Address the generational knowledge transmission gap through documentation of practices like tos rituals, combining community-based recording with support for intergenerational learning.
2. Build on SALT's success by scaling agroforestry approaches to additional districts and communities facing similar challenges.
3. Engage with forestry and land use policy to ensure that conservation measures include provisions for supporting indigenous livelihoods.
4. Support livelihood diversification that creates economic opportunities for youth, reducing out-migration while maintaining agricultural knowledge.
5. Strengthen community seed banks and local variety conservation to maintain genetic diversity.

For the international community, the lessons are clear: indigenous farming knowledge is essential for achieving SDG 2 targets on sustainable agriculture, food security, and genetic diversity. The "Plug-In Principle" offers a framework for integration that respects local knowledge while leveraging scientific advances. Burkina Faso's systematic validation and Nepal's culturally embedded practices both offer valuable models for different contexts.

The ultimate measure of success for SDG 2 is not whether countries adopt particular technologies but whether farming communities can sustain their livelihoods, whether food systems are resilient in the face of climate change, and whether agricultural biodiversity is preserved for future generations. Burkina Faso and Nepal, in their different ways, are both working toward these goals.

8. LIMITS OF THE STUDY

This study has several limitations that should be acknowledged. First, the comparative analysis relies primarily on secondary sources rather than primary empirical research. Direct observation of farming practices in both countries, interviews with farmers, project staff, and community elders, and participatory research would provide valuable additional perspectives and ground-truth the findings from published literature. Second, data availability and comparability vary significantly between countries. Burkina Faso benefits from extensive project documentation through international development partners, while Nepal's documentation includes both project reports and valuable community-based documentation through initiatives like Dialogue Earth's Indigenous Voices project. Third, the study focuses on successful projects and documented practices, which may not represent the full range of experiences with indigenous knowledge in either country. Fourth, the voice of farmers themselves is mediated through project reports and documentation rather than captured directly. Future research should prioritize participatory methodologies that center farmer perspectives. Fifth, the study does not comprehensively address the political economy dimensions—the interests, power relations, and structural forces that shape knowledge integration and development interventions in both countries. Understanding why certain policies were adopted or why some communities benefit while others do not requires deeper political economy analysis. Sixth, the transferability analysis is necessarily speculative. While principles can be identified, actual transfer of integration approaches depends on countless contextual factors including cultural values, institutional capacities, and political dynamics that cannot be fully anticipated. Despite these limitations, the comparative analysis provides valuable insights into rural development programs and indigenous farming knowledge, with implications for both countries and for broader efforts to achieve SDG 2.

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10. AUTHOR CONTRIBUTIONS

The author conceived the study, designed the research methodology, conducted the literature review and document analysis, synthesized findings across countries, and drafted the complete manuscript. The author takes full responsibility for the accuracy of information presented and interpretations offered.

11. COMPETING INTERESTS

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential competing interest. No funding was received from organizations with interests in rural development, indigenous knowledge, or related sectors.

12. AUTHORS' CONTRIBUTIONS

As sole author, I performed all roles including conceptualization, methodology development, investigation, formal analysis, writing, review, editing, and project administration.

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14. DATA AVAILABILITY

All sources analyzed in this study are publicly available documents, including open access books, institutional project documentation, academic research, and community-based reporting. Primary sources are cited in the bibliography and accessible through the referenced publications and organizations.

15. DISCLAIMER

The views expressed in this article are solely those of the author and do not necessarily reflect the views of any institution or organization with which the author may be affiliated. The analysis is provided for scholarly purposes and should not be construed as policy guidance or investment advice. Rural development programs, indigenous knowledge systems, and agricultural practices are subject to change, and readers should consult current sources for specific information about Burkina Faso, Nepal, and indigenous farming knowledge.

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