

Conceptualising Indigenous Knowledge and Traditional Practices for Agricultural Bioresources Utilisation: Towards Achievement of SDGs 2, 13 and 15

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ABSTRACT

Indigenous knowledge has been described in ontological and epistemological terms, but it has rarely been conceptualised against the utilisation of agricultural bioresources in Nigeria. This study documents how indigenous knowledge and traditional practices are used, and how they contribute to Sustainable Development Goals 2, 13 and 15. A mixed-method design combined a survey of 155 farmers, 20 interviews with elders and knowledge custodians, and two focus-group discussions in four farming communities. Quantitative data were analysed in SPSS 25. Qualitative data were analysed thematically and triangulated. Indigenous names and elder classification remain central to how communities conceptualise crops and animals (cluster mean about 3.97). Intercropping, mulching, seed preservation and soil-fertility practices were strongly endorsed. The same practices were linked by respondents to food availability, climate coping and habitat protection, with item means from 3.91 to 4.11. The paper joins Ecological Systems Theory, Indigenous Innovation Theory and the Sustainable Livelihood Framework to survey and oral evidence, rather than offering a descriptive inventory alone. Agricultural and climate policy should treat indigenous knowledge as a complement to scientific practice, document it before generational loss, and build university–community partnerships around hybrid extension.

Keywords: agriculture, epistemology, indigenous knowledge, biodiversity, bioresources, oral tradition, SDGs

1. Introduction

Climate disruption of biodiversity and agroecology has renewed attention to epistemologies rooted in traditional practice (Ijatuyi et al., 2025; Ogar, Pecl, & Mustonen, 2020). Agriculture is one of the fields in which that knowledge is required (Chomboko et al., 2025). Food shortages linked to the limits of some modern methods, and to climate stress, have shifted attention toward land conservation practices developed in place (Amoak, Luginaah, & McBean, 2022). In much of sub-Saharan Africa, rural communities have used indigenous knowledge to manage soil, biodiversity and food supply. The knowledge is informal, tested by trial, and held largely in oral teaching (Ouma, 2022; Faye, 2020). It is also part of spiritual and cultural identity (Zainuddin & Islam, 2025).

Indigenous knowledge of bioresources covers utilisation, conservation and innovation in crops, livestock, medicinal plants, aquatic and forest products, and soil and water systems that have coevolved with local ecosystems (Parvin & Begum, 2025). Examples include the use of animal dung and crop residues for household energy in northern Ghana and Nigeria's Middle Belt, and the conversion of millet chaff and cassava peels into briquettes in East Africa. Such practices lower pressure on forests and complement, rather than replace, modern technique (Adefia et al., 2024). Nigerian studies of these practices have often been descriptive. This paper conceptualises their interface with Goals 2, 13 and 15.

The purpose is to document how indigenous knowledge and traditional practices are adopted in the utilisation of agricultural bioresources, and how they contribute to food security and biodiversity conservation. Four questions guide the study. How do communities conceptualise and categorise agricultural bioresources within cosmological and epistemological frameworks? How do indigenous systems contribute to sustainable utilisation? How do they contribute to

food security and biodiversity under Goal 2? To what extent can they contribute to Goals 13 and 15?

2. Literature and theoretical framework

Indigenous knowledge is treated in the literature as dynamic bodies of practice, innovation and belief developed through observation of a local ecosystem (Ijatuyi et al., 2025; Zainuddin & Islam, 2025). It is experience-based and locality-specific. In agriculture it covers seed selection, intercropping, pest control, soil and water management, agroforestry and ritual-ecological calendars (Jessen et al., 2022). Recycling of residues, manure and organic waste into energy, fertiliser and feed is part of the same repertoire (Gamage et al., 2023). Traditional practice is the customary technique through which that knowledge is applied: seed selection, mixed farming, organic manure, land rotation and rotational grazing.

Three frameworks organise the analysis. Social-ecological systems theory, developed from Bronfenbrenner (1979) and extended to human–environment feedback, explains how micro and macro settings shape resource use (Partelow, 2018; Wang et al., 2025). Indigenous Innovation Theory, associated with Anil Gupta, treats grassroots innovation as the creative application of undocumented local wisdom: traditional varieties, natural pest control, water harvesting and biodiversity farming. The Sustainable Livelihood Framework, associated with Chambers, Scoones and Ashley, treats human, natural, social, physical and financial assets, and the vulnerability context, as the setting of livelihood choice (Morse, 2025). Together they predict that indigenous practice supports Goal 2 through diversified production, Goal 13 through adaptive calendars, and Goal 15 through governed bioresource management.

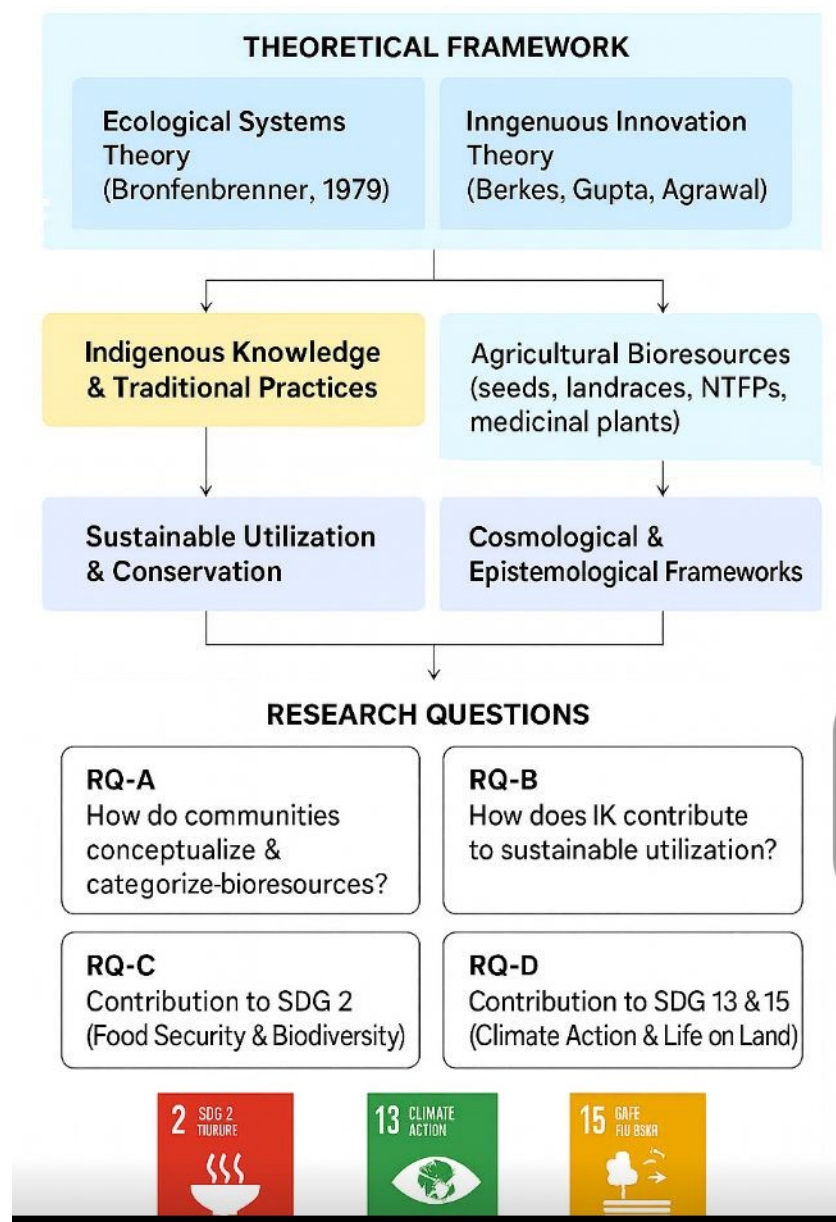


Figure 1. Linking theories, constructs and research questions.

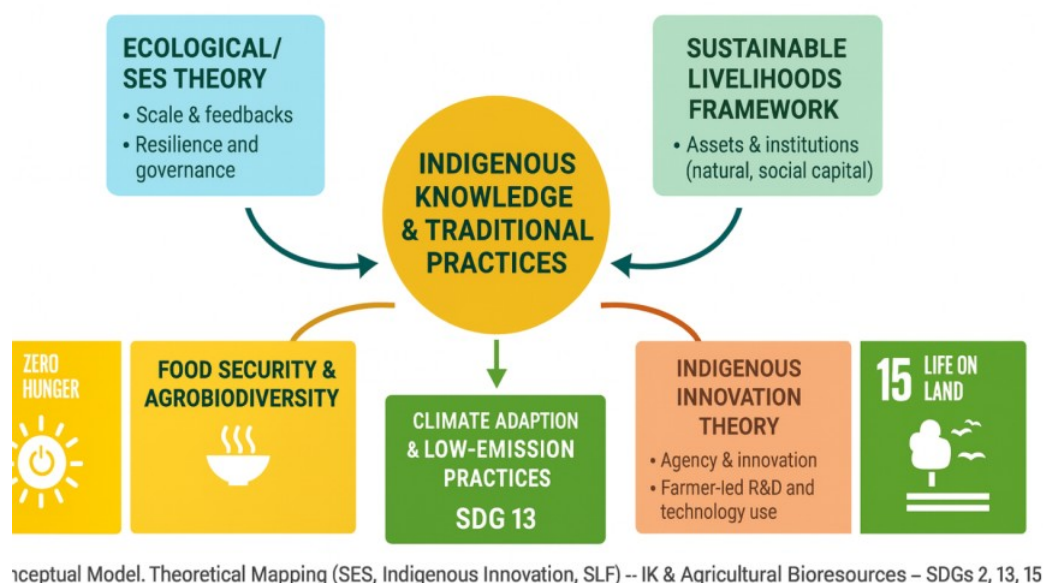


Figure 2. Integrated model of indigenous knowledge and pathways to SDGs 2, 13 and 15.

Figure 1 places Ecological Systems Theory, Indigenous Innovation Theory and the Sustainable Livelihood Framework above the constructs of indigenous knowledge, traditional practice and agricultural bioresources, and links them to the research questions. Figure 2 places intergenerational learning, ecological literacy and adaptive management at the hub, with pathways to Zero Hunger, Climate Action and Life on Land.

3. Method

A mixed-method design was used because the practices are context-specific. Four farming communities in the South-South were selected for ecological variation (dryland, forest-savanna and humid settings) and cultural diversity. Indigenous farmers and elders or custodians formed the population. Snowball and purposive sampling produced 20 elder and mixed-farmer interviews and 12 participants in two focus groups. Systematic selection from cooperatives produced 155 survey respondents. The questionnaire had a demographic section and Likert items from 1 (strongly disagree) to 5 (strongly agree). Survey data were analysed with descriptive statistics in SPSS 25. Interviews and groups were analysed thematically (Braun & Clarke, 2006) and triangulated with the survey.

4. Results

4.1 Cosmological and epistemological classification

Table 1. Conceptualisation of agricultural bioresources (n = 155)

Statement	M	SD
Indigenous names and categories are still widely used for crops and animals	4.04	1.18
Cultural beliefs influence how agricultural resources are used	3.91	1.24
Elders classify plants and animals by farming, healing and spiritual use, and pass this on orally	4.11	1.27

Rituals, taboos and customs guide responsible use of agricultural resources	3.82	1.35
Cluster mean	3.97	1.26

Note. Scale: 1 = strongly disagree to 5 = strongly agree.

All four items sat above 3.50. Elders' role in classification and oral transmission was the highest ($M = 4.11$). Indigenous names were close behind ($M = 4.04$). Rituals and taboos were lower but still agreed ($M = 3.82$). The cluster mean of 3.97 indicates moderate to high agreement that classification is cosmological as well as agronomic.

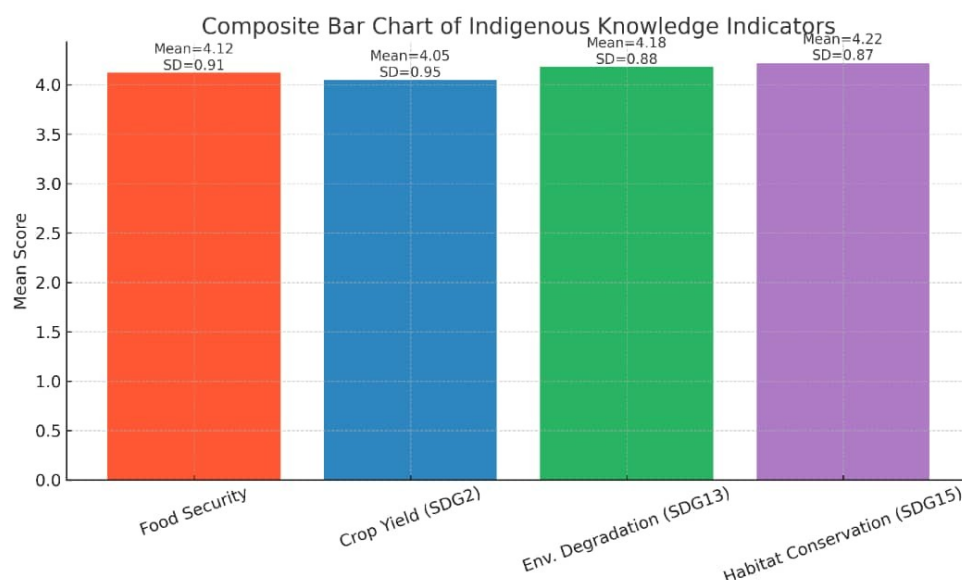


Figure 3. Mean scores for indigenous classification of agricultural bioresources.

4.2 Sustainable utilisation

Table 2. Indigenous practices and sustainable utilisation of bioresources

Statement	M	SD
I use intercropping, mulching or shifting cultivation	4.03	1.20
Indigenous knowledge helps me manage soil fertility without external inputs	4.00	1.29
Traditional practices help maintain agricultural diversity on the farm	3.91	1.24
Indigenous seed-preservation methods are still practised and support bioresource use	4.00	1.29
Cluster mean	3.99	1.26

Note. $n = 155$.

Respondents agreed that intercropping, mulching and shifting cultivation remain in use, and that indigenous knowledge supports soil fertility without external inputs. Seed preservation was endorsed at the same level as soil management ($M = 4.00$).

4.3 Food security, climate and biodiversity

Table 3. Practices linked to food security and biodiversity (SDG 2)

Statement	M	SD
Indigenous practices help increase or stabilise food production	4.03	1.20
Traditional knowledge improves household food availability through the year	4.10	1.25
Agroforestry and mixed cropping increase biodiversity on my farm	4.00	1.29
Indigenous weather forecasting improves timing of planting and harvest	4.00	1.29
Cluster mean	4.03	1.26

Note. $n = 155$. Source data corrected for typographical standard deviations.

Table 4. Practices linked to climate action and life on land (SDGs 13 and 15)

Statement	M	SD
Indigenous farming practices help me cope with drought or irregular rainfall	4.11	1.27
Traditional methods reduce soil erosion and land degradation	4.03	1.20
Cultural norms support forest and land protection	3.99	1.24
Traditional ecological knowledge contributes to conservation of species and habitats	4.11	1.27
Cluster mean	4.06	1.25

Note. $n = 155$.

Food-availability knowledge had the highest mean in the Goal 2 cluster ($M = 4.10$). Coping with irregular rainfall and conservation of species and habitats led the Goal 13 and 15 cluster (both $M = 4.11$). Cultural norms on forest protection were slightly lower ($M = 3.99$) but still indicated agreement.

4.4 Qualitative themes

Six themes emerged from interviews and groups. On ontology, plants, seeds and animals were classified by use and by spiritual significance. An elder said that crops have guiding spirits and are part of identity, not only food. Another described bioresources as gifts of the creator, classified by general and spiritual usefulness. On stewardship, participants described intercropping, mulching, seed smoking, clay pots and ash preservation. One farmer called intercropping an insurance policy against ecological shock, and still used ash, pepper and palm-wine extract to preserve seed.

On innovation, farmers selected resilient varieties, adapted storage, and integrated medicinal plants as pesticide substitutes. Youth involvement in agro-herbal practice was described as innovation rather than fossilised tradition. On livelihood, crop diversity, mixed cropping and staggered planting were treated as a buffer. A woman seed keeper said that when maize pests strike, the household relies on garden egg, cocoyam and okra. On conservation, taboo restrictions and sacred forests were said to protect rare plants and to limit erosion. On climate,

participants used bird migration, flowering of trees such as ukpa, wind, earthworms and termites as signals of rain and soil fertility. Some feared that those indicators are harder to transmit to the next generation.

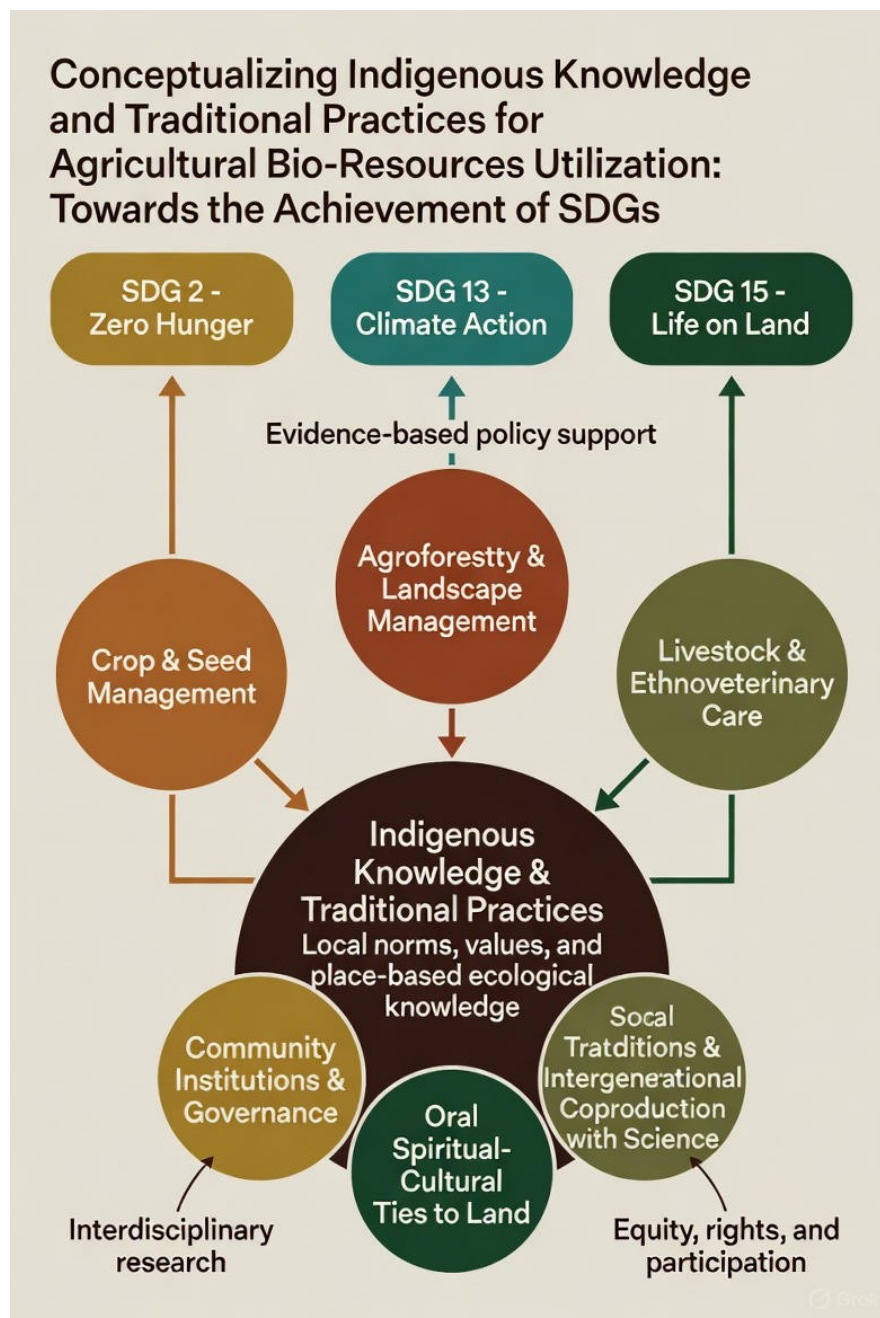


Figure 4. Pathways from indigenous knowledge systems to SDGs 2, 13 and 15.

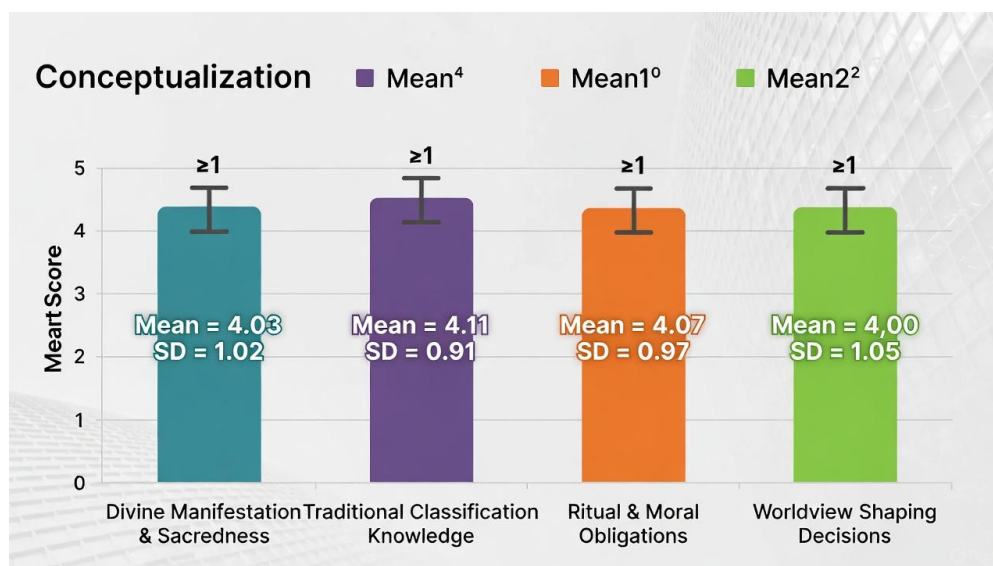


Figure 5. Field setting for indigenous crop and tree management in a study community.

The field photograph illustrates the setting in which classification is not abstract. Crops, trees and built homesteads share one compound. Elders who name a tree as sacred, and farmers who intercrop beneath it, are describing the same plot. That is why a mean on a Likert item and a quotation about chi can be read together. Both refer to a practice of keeping certain plants in the production system rather than clearing them as obstacles.

5. Discussion

Triangulation shows that the practices play a role in food security, climate adaptation and biodiversity conservation. Agreement on seed preservation, intercropping and taboo-based conservation matches scholarship that treats indigenous knowledge as intergenerational and place-based, spanning crop management, biodiversity and soil stewardship (Adefia et al., 2024; Dorji et al., 2024). The food-security findings also align with calls to include diverse producers and local methods in strategies to end hunger (Adeyemo & Adeagbo, 2024; Ijatuyi et al., 2025).

Goal 13 is visible in phonological indicators and in low-input responses such as mulching and organic soil management, which elders use to time planting and allocate labour (Zougmore, Segnon, & Thornton, 2023). Goal 15 is visible in sacred groves and species taboos, a community-driven form of in-situ conservation rather than an institutional reserve (Gandile, Tessema, & Nake, 2017). The three theories hold together in the data. Social-ecological feedback appears in the moral rules against destructive use. Innovation theory appears in variety selection and youth agro-herbal practice. The livelihood framework appears in women's seed custodianship and in the crop mix that buffers pest shock.

The study does not claim that indigenous practice can replace improved seed, veterinary service or meteorological forecasts. Item standard deviations above 1.1 show disagreement inside the sample. The design is cross-sectional, the communities are few, and oral accounts were not verified against measured yield or forest cover. Those limits qualify the means. They do not remove the consistent pattern across survey items and six qualitative themes.

6. Conclusion and recommendations

Indigenous names, elder classification and oral transmission remain the framework through which the studied communities conceptualise agricultural bioresources. Intercropping,

mulching, shifting cultivation, soil-fertility management and seed preservation are the main techniques of utilisation. The same repertoire supports household food availability, coping with irregular rainfall, and protection of species and habitats, and so speaks to Goals 2, 13 and 15. Policy should integrate this knowledge rather than treat it as an alternative to science.

Governments should write indigenous knowledge into agricultural and climate policy. Extension should use hybrid models that join local practice with climate-smart technique. Documentation is urgent where urbanisation and generational change are thinning oral transmission. Universities should partner with communities to validate and mainstream innovations. Later work should be longitudinal, and should map contributions to related goals beyond the three examined here.

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