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Local actors' perceptions and adaptation strategies in response to agricultural policies on neglected and underutilized species in Benin

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Agricultural systems in sub-Saharan Africa continue to face mounting pressures from food insecurity, climate variability, and the erosion of agro-biodiversity. In Benin, neglected and underutilized species (NUS)—including fonio, Bambara groundnut, sesame, and sweet potato—offer significant nutritional, cultural, and ecological benefits, yet they remain largely absent from national agricultural policy priorities. This study examines how actors in the Atacora region engage with this policy gap by analyzing the diversity of NUS cultivated, the institutional treatment of these species, and the ways producers and organizations perceive and adapt to weak policy support. Using an actor-oriented approach and a mixed-methods design, the research combines a review of major agricultural policy instruments with empirical data from 60 semi-structured interviews involving farmers, cooperatives, NGOs, development projects, research institutions, and public agencies. Results show that NUS are sustained primarily through grassroots and NGO-led initiatives, while state institutions contribute little beyond broad diversification rhetoric. Producers' perceptions of agricultural policies are predominantly uninformed or negative, and organizational actors highlight significant gaps in institutional visibility, program design, and extension support. In response, actors mobilize a combination of endogenous strategies—such as seed exchange networks, collective labor, and local processing—and exogenous measures including training, equipment provision, and certification. The study demonstrates that NUS valorization in Benin emerges from hybrid governance arrangements shaped by policy neglect and strong local agency. It further shows the value of an actor-oriented lens for understanding how agricultural policies are interpreted and transformed within local food systems.

KEYWORDS

actor-oriented approach, agricultural governance, Benin, local adaptation, neglected and underutilized species

1 Introduction

Agricultural systems in sub-Saharan Africa continue to confront persistent and interrelated challenges, including chronic food insecurity, the growing impacts of climate variability, and the degradation of local agroecosystems (Chivenge et al., 2015; FAO, 2021). These pressures are compounded by a dominant reliance on a small number of staple crops, even though a much broader array of plant species contributes to rural livelihoods, cultural heritage, and ecological stability. Among these, neglected and underutilized species (NUS) hold particular significance. Species such as fonio (*Digitaria exilis*), Bambara groundnut (*Vigna subterranea*), sesame (*Sesamum indicum*), and sweet potato (*Ipomoea batatas*) are deeply embedded in local food systems, traditional knowledge, and agroecological practices. They are valued for their nutritional richness, resilience to marginal soil and rainfall conditions, and ability to support local food security where dominant crops often struggle (Dansi et al., 2012; El Bilali et al., 2024; Hughes and Ebert, 2013; Mabhaudhi et al., 2019).

In Benin, these species continue to play a vital role in rural livelihoods, particularly in regions where challenging environmental conditions make NUS not only culturally important but also agronomically strategic. This is especially evident in the Atacora region, where mountainous terrain, soil degradation, and rainfall variability shape agricultural choices and reinforce the relevance of species such as fonio and Bambara groundnut. Yet despite their ecological and livelihood contributions, NUS remain marginal within national agricultural priorities. Policy frameworks continue to favor a narrow set of value chains—primarily cotton, maize, rice, cashew, and pineapple—reflecting broader economic orientations and long-standing institutional preferences (Hounkpatin and Moumouni-Moussa, 2023; Padulosi et al., 2019). National strategies that reference diversification or sustainability tend to do so in broad terms, without concrete support measures or programmatic investments directed toward NUS. This structural neglect has created an institutional landscape in which the development of NUS relies heavily on the initiatives of farmers, cooperatives, NGOs, and development projects, while public agricultural extension and research systems intervene only marginally. Experiences from the Micro-Veg project in Benin further demonstrate how coordinated actor mobilization can strengthen the development of neglected crop sectors in contexts where state support remains limited (Adechian et al., 2019). Through training, local experimentation, and collective organization, the project succeeded in enhancing the visibility and market value of indigenous leafy vegetables, illustrating how bottom-up initiatives can compensate for institutional shortcomings (Adechian et al., 2019). This dynamic mirrors the situation observed for NUS in the Atacora region, where local actors play a central role in sustaining production and innovation despite limited policy engagement.

Understanding how NUS continue to thrive in such an environment requires an analytical perspective that places actors—rather than policies—at the center of inquiry. The Actor-Oriented Approach (AOA), as articulated by Long (1994, 2003), provides a theoretical lens through which to examine how different stakeholders interpret policies, mobilize resources, and negotiate constraints within their daily realities. Rather than viewing policy processes as linear or deterministic, the AOA conceptualizes development as a dynamic and interactive process driven by the strategies, interpretations, and negotiations of multiple actors. This approach has been used to demonstrate how farmers, producer organizations, NGOs, and local administrations reconfigure interventions based on their interests, experiences, and institutional environments (Cleaver and Whaley, 2018; Moumouni, 2013; Nederlof and Dangbégnon, 2007). It thus offers a robust framework for examining how the marginal status of NUS within policy frameworks translates into differentiated perceptions and adaptation practices among actors on the ground.

In this context, the present study explores how actors in the Atacora region of Benin engage with the limited institutional recognition of NUS and how this environment shapes their strategies for sustaining or expanding NUS production, processing, and marketing. The analysis focuses on identifying the range of actors involved in the valorization of NUS and understanding their respective contributions to production systems, value-chain development, and knowledge transmission. It also examines the diversity and spatial distribution of the NUS cultivated in the region, shedding light on their ecological, cultural, and economic roles. In addition, the study investigates how agricultural policies are interpreted by actors at different institutional levels and how these perceptions reflect broader structural asymmetries in access to information, decision-making, and resources. Finally, the research analyzes the adaptation strategies developed to compensate for gaps in public support, highlighting both endogenous initiatives emerging from farmers and cooperatives and exogenous interventions led by NGOs, research institutions, and development programs.

By articulating these dimensions within an actor-oriented perspective, the study contributes to ongoing debates on the governance of underutilized crops and the capacity of local actors to innovate in the face of institutional neglect. It also provides insights into how policy environments, local agency, and resource mobilization interact to shape the future of NUS within sustainable food systems. More broadly, the study underscores the need to better integrate NUS into agricultural strategies in order to enhance resilience, promote agro-biodiversity, and support food and nutrition security in regions vulnerable to climatic and socioeconomic pressures.

2 Conceptual framework and analytical model

This study builds on the Actor-Oriented Approach (AOA) formulated by Long (1994, 2003) within the sociology of development. The AOA conceives social change not as a linear outcome of top-down policy interventions, but as a process of interaction, negotiation, and contestation among diverse actors who possess different interests, resources, and worldviews (Long, 1994, 2003). Rather than being passive recipients of external policies, local communities are understood as active agents who interpret, adapt, and sometimes transform the initiatives designed for them. Through this perspective, development outcomes are seen as the product of complex interfaces between state agencies, research institutions, private actors, and local groups, all operating within specific institutional and cultural contexts (Cleaver and Whaley, 2018; Long, 1994).

Applied to the agricultural sector, this theoretical lens is particularly relevant to understanding how policies are interpreted and reconfigured at the local level. The actor-oriented approach makes it possible to bridge the gap between policy intent and actual practice by focusing on how farmers, cooperatives, non-governmental organizations (NGOs), and local administrative bodies make sense of and respond to policy orientations. Previous research in Africa has shown that policy implementation often depends less on formal directives than on the ways in which actors appropriate and reinterpret them within their daily realities (Moumouni, 2013; Nederlof and Dangbégnon, 2007). This view highlights the agency of individuals and organizations in shaping agricultural trajectories, despite institutional constraints or limited technical support.

In the context of Benin, the AOA offers an analytical entry point for exploring how local actors perceive and react to the marginal position of Neglected and Underutilized Species (NUS) in national agricultural policy. Although crops such as fonio (*Digitaria exilis*), Bambara groundnut (*Vigna subterranea*), and sesame (*Sesamum indicum*) possess high nutritional, cultural, and economic potential, they have long been excluded from formal agricultural strategies that prioritise export-oriented or high-yield crops like cotton and maize (Hounkpatin and Moumouni-Moussa, 2023; Padulosi et al., 2019). Yet these species remain vital to smallholder farmers, particularly women, who depend on them for income diversification and food security under changing climatic conditions (El Bilali et al., 2024; Hughes and Ebert, 2013). Within this environment of selective policy attention, local actors have developed adaptive strategies to maintain and promote NUS through informal networks, mutual support, and local innovation. Understanding these processes requires a framework that captures both institutional structures and human agency.

The analytical model developed for this study conceptualizes the valorization of NUS as an interactive system linking four dimensions: agricultural policy orientations, local perceptions, resource mobilization, and adaptation strategies (Figure 1). Policy orientations refer to the extent to which NUS are recognized, supported, or neglected in agricultural programs and institutional frameworks. Local perceptions express how actors interpret these orientations and assess their relevance for their own livelihoods and production systems. Resource mobilization represents the tangible and intangible means—financial, material, social, and cognitive—that actors draw upon to sustain NUS-related activities. Adaptation strategies reflect the innovations, collaborations, and coping mechanisms developed to overcome policy and market constraints. These dimensions are not independent. Agricultural policies influence local perceptions, which in turn shape the capacity of actors to mobilize resources. The resources available determine the feasibility and scope of adaptation strategies, while the success or failure of these strategies can feed back into policy discussions and institutional recognition of NUS.

This dynamic interaction forms a circular and adaptive system. It suggests that differences in perception and strategy among actor categories—such as public institutions, NGOs, farmer cooperatives, and private projects—reflect variations in access to information, power relations, and institutional incentives (Cleaver and Whaley, 2018). Consequently, understanding how these actors interpret policies and mobilize resources provides critical insight into why some initiatives succeed while others remain ineffective. The model therefore serves not only as a descriptive framework but also as a diagnostic tool for analyzing how local innovation and policy environments co-evolve in the promotion of underutilized crops. This perspective captures both structural relationships and subjective meanings, offering a comprehensive understanding of how agricultural policies interact with local capacities and constraints. More broadly, it situates the valorization of NUS within current debates on institutional pluralism, adaptive governance, and the co-production of knowledge in sustainable food systems (Cleaver and Whaley, 2018; El Bilali et al., 2024).

3 Methods

3.1 Study area

The study was conducted in the Atacora region of northwestern Benin, a mountainous agroecological zone characterized by marked topographical variation, limited cultivable land, and significant soil degradation (Kombienou et al., 2015). The region is known for its cultural diversity and long-standing traditions of cultivating neglected and underutilized species (NUS), particularly fonio and Bambara groundnut. The climate is Sudanian with a unimodal rainfall regime, consisting of approximately 5 months of rain (mid-May to mid-October) followed by a seven-month dry season. Annual rainfall ranges between 1,000 and 1,400 mm, concentrated over roughly 90 days.

Within Atacora, three communes—Boukombé, Natitingou, and Cobly—were purposively selected because they represent the core mountainous areas where NUS cultivation is most widespread and

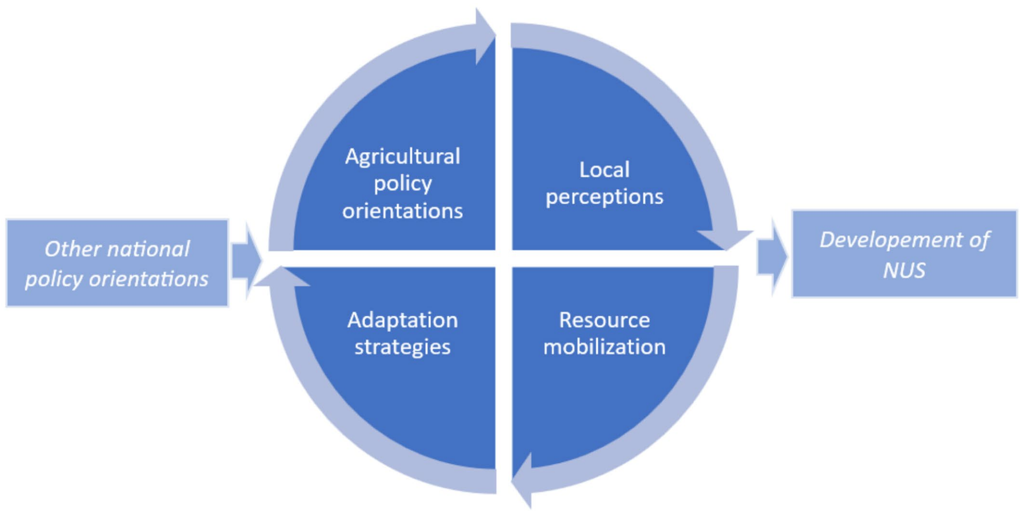

FIGURE 1
Conceptual framework of NUS development based on actor-oriented approach. The diagram illustrates the vertical and horizontal interactions among institutional and local actors in NUS valorization.

socially embedded. These areas are located along the Atacora mountain chain, whose rugged relief contributes to relative physical isolation and creates strong incentives for farmers to maintain resilient and culturally significant crops such as fonio.

Although primary data were collected exclusively in these communes, additional information on the national distribution of NUS was sourced from published literature, institutional reports, and agricultural databases. Consequently, the species distribution presented in Table 1 reflects a combination of locally observed species and secondary data documenting NUS cultivation across other agroecological zones of Benin. This dual sourcing makes it possible to situate the findings from Atacora within the broader national context.

However, secondary data were mobilized to contextualize the field findings by documenting the diversity and geographical distribution of neglected and underutilized species across other agroecological zones of Benin (see Figure 2).

3.2 Research design

The study followed an exploratory, mixed-methods design grounded in the Actor-Oriented Approach (Long, 1994, 2003). This framework views rural actors as knowledgeable agents who interpret, negotiate, and adapt to policy environments rather than as passive recipients of external interventions. The research design therefore sought to capture not only factual information about NUS and relevant institutions but also the meanings, perceptions, and strategies that actors develop in response to limited policy support.

The study combined (i) a documentary analysis of major agricultural policy frameworks in Benin, and (ii) qualitative fieldwork with actors involved in NUS valorization. The analysis aimed to identify how policies incorporate—or neglect—NUS and how these institutional orientations shape actors' perceptions and adaptive strategies.

3.3 Sampling strategy

A purposive sampling strategy was adopted in order to capture the diversity of stakeholders engaged in the production, promotion, or support of NUS. A total of 60 participants were selected: 15 individual producers and 45 representatives of organizations, including cooperatives, NGOs, development projects, research institutions, and public agricultural services (Table 2).

Participants were included based on a single criterion: having been involved at least once in activities related to the valorization, promotion, processing, or support of NUS. This criterion aligns with the Actor-Oriented Approach, which emphasizes actors whose practices and interpretations shape local agricultural outcomes. The sample size was considered adequate because data saturation was achieved; after a certain point, interviews no longer produced new categories or themes, consistent with the definition of saturation proposed by Guest et al. (2006).

3.4 Data collection

Data collection took place through semi-structured interviews conducted between January and May 2025. Interviews were carried out in French or in local languages with the assistance of trained interpreters when necessary. Each interview lasted between 45 and

TABLE 1 Main neglected and underutilized species identified in the study area.

Common name	Scientific name	Main use	Main actor categories involved	Location of cultivation (main zones)
Bambara groundnut (Voandzou)	*Vigna subterranea*	Protein-rich legume, porridge, flour	Producers, NGOs, cooperatives	North (Borgou, Alibori, Atacora and Donga)
Fonio	*Digitaria exilis*	Food grain, traditional dishes	Women's cooperatives, local processors	Nord-West (Atacora)
Sweet potato	*Ipomoea batatas*	Root crop, nutrition and trade	Producers, research centers	Centre and South (Zou, Mono and Plateau)
Sorghum	*Sorghum bicolor (L.) Moench*	Cereal grain, beverage preparation	Producers, traditional brewers	North (Bembèrèkè, Kalalé)
Pearl millet	*Pennisetum glaucum (L.)*	Cereal grain, local food and feed	Producers, local processors	North (Borgou, Alibori, Atacora and Donga)
Groundnut (Peanut)	*Arachis hypogaea L.*	Oilseed, roasted food, flour	Producers, traders	North and Centre
Earth pea (Doyiwe)	*Macrotyloma geocarpum*	Traditional protein food, snacks	Women's groups, households	Centre (Glazoué, Dassa)
Sesame	*Sesamum indicum*	Oil extraction, local trade, export	Producers, private processors	Nord-West (Atacora and Donga)
Bitter yam	*Dioscorea dumetorum*	Tuber food, local consumption	Household producers	Centre and South
Taro	*Colocasia esculenta*	Root vegetable, traditional dishes	Household producers	South (Zogbodomey, Bohicon)

Source: Field survey, 2025.

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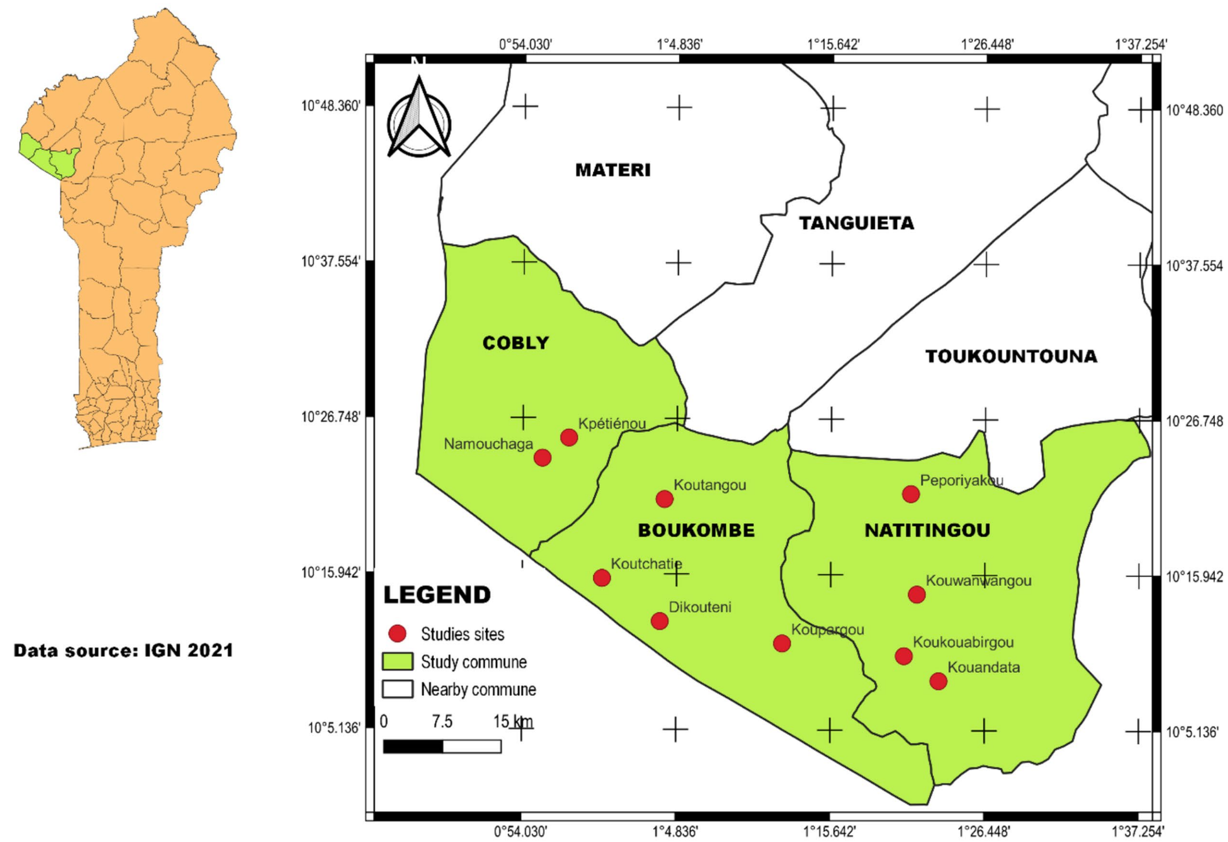

FIGURE 2
Map showing the study area. Source: Authors using data from IGN (2021).

TABLE 2 Category of actors involved in the study.

Category of actors	Actors	Number
State institution	Public government organizations, Department of Agriculture	14
Research and training institutions	Agricultural technical high school	1
	University	2
	Research institution	4
Technical and financial partner	Private institutions (Projects and programs)	3
	Non-Governmental Organizations (NGOs)	9
producer	Agricultural producers	15
Farmers' organization	Farmers' associations/Cooperatives	10
	Umbrella organizations of farmers' cooperatives	2
Total		60

90 min and followed a standard guide addressing four key areas: (1) NUS cultivated or supported by the actor, (2) perceptions of agricultural policy orientations related to NUS, (3) strategies implemented to promote or sustain NUS between 2011 and 2024, and (4) views on research and advisory services.

With the participants' consent, interviews were audio-recorded and later transcribed. Field notes were used to complement the transcripts. Documentary data were collected from national policy instruments, strategic frameworks, and institutional reports relevant to agricultural development and diversification in Benin. These documents provided the foundation for the policy analysis summarized in Table 3.

3.5 Data analysis

Data analysis involved several steps combining qualitative thematic coding and descriptive statistics. Qualitative data were processed using an inductive-deductive thematic analysis inspired by Braun and Clarke (2006). Initial codes were generated from the interview transcripts,

TABLE 3 Integration of neglected and underutilized species (NUS) in major agricultural policies in Benin.

Policy / Strategic document	General objective	Consideration of NUS	Relevant axes / Pillars
PNIASAN 2017–2021; Link	Mobilize financing for the implementation of the Government Action Program (Agriculture), following a territorialized approach.	No explicit mention of NUS; ecological agriculture and promotion of local foods *implicitly* create entry points.	Axis 3: climate resilience; food and nutrition security.
PSDSA; Link	Improve agricultural performance to achieve food sovereignty and security.	No specific consideration of NUS; prioritizes major value chains.	No axis refers to NUS.
SNCA 2018–2025; Link	Strengthen farmer capacities through a holistic advisory system.	No reference to NUS; advisory services focus on priority crops.	No axis refers to NUS.
SNDAEB 2023–2030; Link	Promote ecological and organic agriculture and strengthen market access.	No explicit NUS actions, but ecological/organic farming *implicitly includes local varieties* such as NUS.	Axes 1.1, 1.2, 2.1, 2.2, 2.3, 3.1–3.3.
PND 2018–2025; Link	Achieve 10% sustainable and inclusive growth through agro-industry and service development.	Diversification emphasized but oriented toward flagship crops (cotton, maize, rice, pineapple, cassava, cashew).	Pillar 1: Agricultural diversification (focused on major crops).
National Agricultural Cluster Strategy; Link	Promote competitive value-chain models.	No integration of NUS; all strategic axes target priority value chains.	Axes centered on major crops.
Agricultural Sector Programmatic Framework (2017); Link	Contribute to national food and nutrition security.	No mention of NUS; emphasis on structured and conventional crops.	No axis mentions NUS.

Source: Policy document review, 2025.

guided by the Actor-Oriented Approach and the research questions. Codes were progressively organized into broader categories reflecting actors' perceptions, resource mobilization practices, and adaptation strategies. This iterative process made it possible to link micro-level narratives with broader institutional patterns.

Descriptive statistics were used to summarize the frequency of actors, species cited, and categories of perceptions. Tables summarizing NUS distribution and actor typologies were constructed by synthesizing primary data with secondary sources. Policy documents were analyzed through a structured content analysis focusing on objectives, strategic axes, and the explicit or implicit treatment of NUS.

To ensure analytical rigor, triangulation was carried out by comparing insights from producers, organizations, and policy texts. Patterns emerging across actor categories were interpreted through the Actor-Oriented Approach, emphasizing how institutional contexts interact with agency.

The study followed standard ethical procedures. All participants were informed of the aims of the research and gave verbal consent prior to participation. Anonymity was respected in all reporting, and no identifying information is disclosed. Data were stored securely and used exclusively for academic purposes.

4 Results

4.1 Actors involved in the valorization of neglected and underutilized species

4.1.1 Actor categories and their roles

The valorization of neglected and underutilized species (NUS) in northern Benin is supported by a diverse network of institutions, organizations, and individuals, each contributing to the development, dissemination, or use of these crops. The heterogeneity of actors reflects the plural governance system in which NUS evolve. State institutions—primarily the Departmental Directorates of Agriculture, Livestock and Fisheries (DDAEP) and the Territorial Agricultural Development Agencies (ATDA)—are mandated to provide extension services and support agricultural development. However, their interventions remain focused on major crops, leaving NUS relatively peripheral to public training and support programs.

Research and training institutions, including universities and national research centers, contribute mainly through small-scale trials, varietal characterization, and training activities supported by external projects. NGOs and development programs constitute the most dynamic group of actors, providing training, improved processing technologies, and organizational support to cooperatives and women's groups. Cooperatives and farmer associations play an essential role in production, seed conservation, small-scale processing, and local marketing. At the household level, women are central to post-harvest transformation and the maintenance of culinary and cultural practices around NUS.

Table 4 summarizes the main actor categories and their respective roles. Together, these actors form a polycentric system in which the promotion of NUS depends largely on non-state initiatives and community-based efforts rather than on structured public programs.

4.1.2 NUS identified and valorized

Field data revealed a rich diversity of NUS cultivated and utilized across the study area, complemented by secondary sources documenting NUS production in other agroecological zones of Benin. Bambara groundnut (*Vigna subterranea*) and fonio (*Digitaria exilis*) emerged as the most frequently cited species (Figure 3). Fonio, in particular, remains a culturally emblematic crop in Atacora, cultivated on marginal soils and embedded in traditional food systems. Its growing market appeal—driven by nutritional and gluten-free properties—contributes to renewed interest, particularly among women processors and urban consumers. Bambara groundnut also occupies a central place due to its drought tolerance and high protein content.

Sweet potato (*Ipomoea batatas*) plays a dual role as a widespread food crop and a source of income, benefiting from a short production cycle and increasing nutritional promotion by development projects.

TABLE 4 Typology of actors involved in the valorization of NUS and their main roles.

Type of actor	Examples	Main roles in NUS valorization
State institutions	DDAEP, ATDA	Policy implementation, training, and monitoring
Research and training institutions	Universities, INRAB, agricultural schools	Agronomic trials, characterization of local varieties, student training
NGOs	Local and international NGOs	Technical training, equipment supply, support to women's groups
Development projects	Donor-funded initiatives	Funding, equipment, training on processing and marketing
Cooperatives and associations	Women's groups, producer cooperatives	Production, transformation, local trade, seed conservation
Private sector actors	Traders, microenterprises	Packaging, distribution, market intermediation

Source: Field survey, 2025.

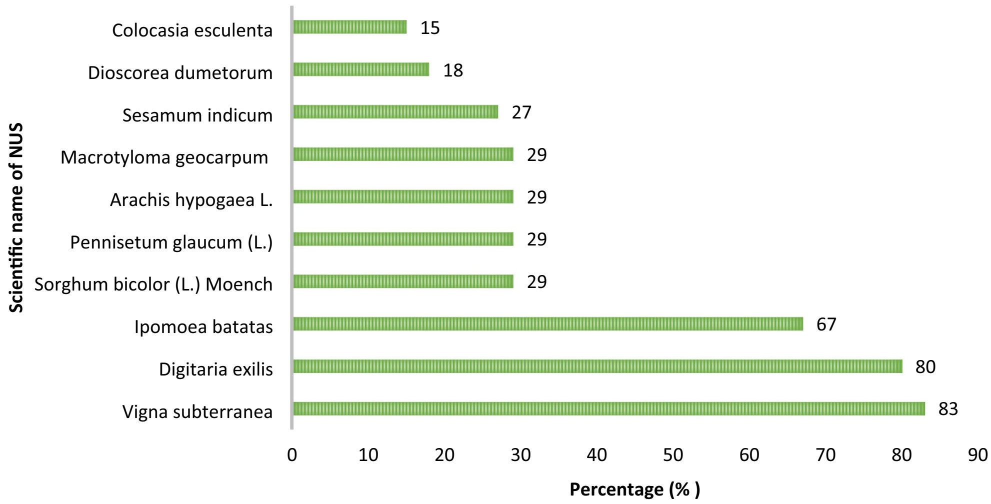

FIGURE 3
Percentage of main neglected and underutilized species cultivated in the study area. Source: Field survey, 2025.

Sesame (*Sesamum indicum*) continues to expand in central and northern zones due to market opportunities, while African yam bean (*Sphenostylis stenocarpa*) remains emerging but valued for its protein content and culinary versatility.

Other species—including sorghum, millet, groundnut, earth pea (doyiwe), bitter yam, and taro—illustrate the broader agro-biodiversity of the region and reflect adaptation to specific ecological niches. Their relative importance varies across agroecological zones: semi-arid northern communes concentrate fonio, Bambara groundnut, sorghum, and millet, while central and southern areas favor species such as sweet potato and taro.

Table 1 presents the species identified, their uses, and their main production areas. This combination of primary and secondary information positions the NUS cultivated in Atacora within the wider national landscape and underscores their ecological, nutritional, and cultural multifunctionality.

4.2 Institutional context shaping policy perceptions

A review of major agricultural and development policy instruments reveals that NUS occupy only a marginal and implicit position within Benin's agricultural policy framework. Across strategic documents—including the PNIASAN, PSDSA, SNCA, and the National Agricultural Cluster Strategy—priority is consistently given to established commercial value chains such as cotton, maize, rice, cashew, pineapple, and cassava. Even policy frameworks that reference diversification or ecological agriculture provide no concrete mechanisms targeting the development, processing, or marketing of NUS.

Only the National Strategy for Ecological and Organic Agriculture (SNDAEB) provides an indirect opening for NUS by promoting biodiversity, local varieties, and low-input systems, although no specific programs or funding streams address NUS directly. Table 3 synthesizes the extent to which the main agricultural policy instruments integrate—or fail to integrate—NUS.

The analysis demonstrates a clear policy vacuum: NUS are recognized rhetorically, but this recognition does not translate into operational interventions. This institutional gap shapes how actors understand public commitment to NUS and influences the level of support they expect from the state.

4.3 Actors' perceptions of agricultural policies related to NUS

Perceptions of agricultural policies offer insight into how actors interpret institutional priorities and how these interpretations influence their own strategies and expectations. Producers and organizations express distinct, yet complementary, perceptions shaped by their institutional roles, access to information, and experience with public services.

4.3.1 Producers' perceptions

Producers' perceptions of agricultural policy orientation toward NUS are dominated by limited awareness and perceived neglect. As shown in Figure 4, more than half of interviewed producers report having no clear information about governmental initiatives related to NUS. This lack of visibility reflects the limited territorial penetration of policy actions and the weak communication between state agencies and rural communities. Many producers rely primarily on NGOs and development projects—not public extension—for support and information related to NUS.

A quarter of respondents express openly negative perceptions, arguing that policies favor major cash crops and leave little room for NUS development. Only a minority report positive views, often in villages where local authorities or NGO-led initiatives have provided training or equipment indirectly associated with public policies.

These findings show that from the producers' perspective, public action remains distant, poorly communicated, and insufficiently aligned with the realities of NUS production systems. This contributes to a sense that NUS are not institutional priorities, despite their ecological and nutritional relevance.

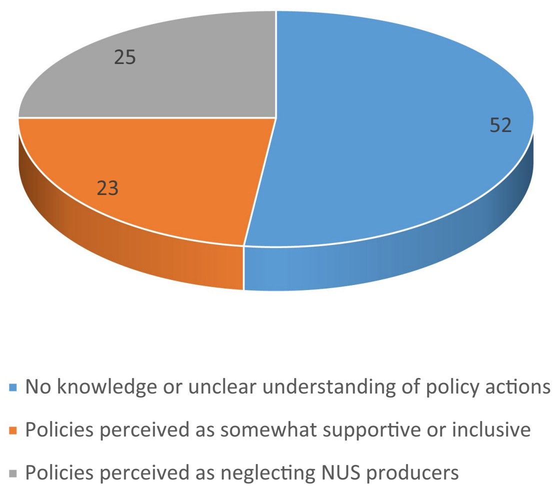

FIGURE 4
Producers' perceptions of agricultural policies related to NUS. Source: Field survey, 2025.

4.3.2 Organizational perceptions and differentiation

At the organizational level, perceptions are more structured and reflect actors' institutional positioning. Table 5 presents an expanded typology of perception types, including the actor groups most associated with each perception, the underlying issues, and examples illustrating their origins. Most organizations—including cooperatives, NGOs, and development projects—identify significant gaps in policy visibility, design, and implementation. They highlight the absence of dedicated programs, insufficient extension support, and the lack of varietal improvement initiatives for NUS.

Public institutions and research centers were the only groups expressing moderately positive perceptions, often based on broad policy objectives such as diversification or ecological agriculture, which they interpret as indirectly supportive of NUS. Their proximity to policy formulation and access to strategic information shape these more favorable perceptions.

Overall, the divergence between public institutions and non-state actors reveals structural asymmetries in information flows and decision-making processes. These asymmetries contribute to a fragmented governance environment in which NUS rely more on NGO-driven and community-based initiatives than on structured public action.

4.4 Adaptation models and strategies for the valorization of NUS

In response to limited policy support, actors employ a range of adaptation strategies aimed at sustaining, promoting, or expanding

TABLE 5 Differentiated organizational perceptions of NUS-related agricultural policies in Benin.

Perception type	Frequency (%)	Actor groups most associated	Underlying issue (theme)	Illustrative example (summary)
Weak policy support	28.9	Cooperatives, NGOs	Operational weakness	Limited access to extension or training on NUS
Limited recognition	13.3	Producer associations	Institutional visibility	NUS rarely mentioned in local agricultural plans
Positive appreciation	11.1	Public institutions, research centers	Policy interpretation	Diversification policies seen as indirectly supportive
Absence of specific program	11.1	Cooperatives, NGOs	Policy design gap	No dedicated program or budget line for NUS
Low visibility of NUS	11.1	NGOs, development projects	Institutional visibility	NUS missing in communication and extension campaigns
Limited interest from policymakers	8.9	Cooperatives	Policy priority gap	Policy meetings rarely address NUS
Inadequate policy framework	8.9	NGOs, experts	Policy design gap	Frameworks do not target minor crops or biodiversity
No varietal improvement policy	6.7	Research centres, NGOs	Research & innovation gap	No breeding program or improved seeds for NUS
Total	100.0	—	—	—

Source: Field survey, 2025.

NUS within local food systems. These strategies can be grouped into two broad categories: endogenous strategies driven by producers and community organizations, and exogenous strategies originating from NGOs, development projects, research institutions, and public structures.

Endogenous strategies include labor mobilization, diversification of livelihood activities, the creation of small shops for NUS products, organization of NUS cultural events, and facilitation of seed exchange within communities. These actions reflect the capacity of local actors to innovate and respond collectively to institutional gaps. Exogenous strategies include certification initiatives, development of training modules, provision of processing equipment, establishment of cooperatives, and creation of business models linking actors along the value chain.

Table 6 presents these strategies and their origins. Together, they illustrate a hybrid model of governance in which grassroots efforts compensate for institutional shortcomings, while external interventions provide technical and organizational support. This combination demonstrates the central role of actor agency in sustaining NUS despite weak policy recognition.

The coexistence of these adaptation mechanisms demonstrates the ability of local actors to navigate and respond to institutional shortcomings. Producers and their organizations rely on community-driven solutions to sustain NUS within local food systems, despite the lack of dedicated government support. Meanwhile, NGOs, research institutions, and public agencies introduce technical, organizational, and commercial innovations that help formalize and scale local practices. This interplay between endogenous and exogenous strategies reflects an emerging hybrid governance system that maintains the vitality of NUS value chains in a context of institutional gaps and evolving market opportunities.

These adaptive mechanisms highlight the resilience, creativity, and agency of actors involved in the NUS sector. They also underscore the importance of strengthening synergies between local initiatives and institutional interventions—an issue further explored in the discussion section.

TABLE 6 Adaptation models for the valorization of NUS.

Adaptation model	Origin
Certification of processed products	Exogenous
Diversification of activities	Endogenous
Development of training modules	Exogenous
Production technical sheets	Exogenous
Facilitation of access to seeds	Endogenous
Establishment of shops selling NUS-derived products	Endogenous
Technical capacity building of artisans for dehulling equipment	Exogenous
Establishment of cooperatives	Exogenous
Facilitation of access to credit	Endogenous
Mobilization of labor	Endogenous
Organization of NUS cultural or international days	Endogenous
Exhibition of processed products at fairs	Exogenous
Awareness-raising activities for grassroots actors	Exogenous
Collective income-generating activities	Endogenous
Development of business models to promote value-chain linkages	Exogenous

Source: Field survey, 2025.

5 Discussion

This study analyzed the governance environment shaping the valorization of neglected and underutilized species (NUS) in the Atacora region of Benin through an actor-oriented lens. The findings reveal a persistent mismatch between national agricultural policy priorities and the realities of local production systems dominated by smallholder farmers. Despite the nutritional, cultural, and ecological significance of crops such as fonio and Bambara groundnut, NUS remain largely absent from major agricultural strategies. This institutional marginalization aligns with previous observations that NUS in West Africa often fall outside state-supported programs due to their limited commercialization compared to dominant value chains (El Bilali et al., 2024; Padulosi et al., 2019). However, by situating the analysis within the Actor-Oriented Approach, this study goes further in demonstrating how actors interpret, negotiate, and compensate for these institutional gaps.

The results highlight a striking asymmetry in policy interpretation. Public institutions and research structures tend to perceive diversification-oriented policies as indirectly supportive of NUS. Meanwhile, producers, cooperatives, and NGOs overwhelmingly interpret policies as neglectful or insufficiently visible. These contrasting views reflect differences in institutional positioning and access to information (Long, 1994; Nederlof and Dangbégnon, 2007). Organizations closer to the field emphasize operational weaknesses—limited extension support, lack of improved seeds, absence of funding—while institutions closer to policy design emphasize strategic intentions rather than concrete implementation. This divergence illustrates what Long (2003) and Cleaver and Whaley (2018) describe as the “interpretive flexibility” of development policies, whereby actors internalize and reinterpret policy signals depending on their experiences and constraints.

The perceived disconnect between policy and practice has significant implications for the resilience of NUS systems. Producers’ limited knowledge of public initiatives—combined with their reliance on NGOs and development projects for training and equipment—reinforces an uneven governance landscape in which non-state actors play essential roles in maintaining and expanding NUS value chains. This finding echoes observations that in many African contexts, informal networks and NGO-led initiatives often compensate for the inadequacies of public agricultural services (Moumouni, 2013). In Atacora, this dynamic is particularly evident in the organization of cultural events, collective labor mobilization, seed exchange, and the local processing and marketing of NUS-based foods.

The analysis of adaptation strategies underscores the central role of grassroots innovation. Producers and their organizations deploy endogenous strategies such as livelihood diversification, labor mobilization, and collective marketing to sustain NUS despite structural barriers. Exogenous strategies—such as training, certification, and value-chain development—provide complementary technical and organizational support but remain largely project-driven. The coexistence of these strategies demonstrates the hybrid governance structure characterizing NUS development in Benin. This finding echoes previous evidence from the Micro-Veg initiative, which showed that actor coalitions can play decisive roles in strengthening neglected crop sectors when public policy support is weak (Adechian et al., 2019). Similar patterns of collective experimentation and innovation were observed in the present study (through actors' associations or cooperatives) reinforcing the relevance of actor-oriented perspectives for understanding NUS governance. It also shows that local actors exercise considerable agency within constrained institutional environments, consistent with the Actor-Oriented Approach's emphasis on negotiation, creativity, and local problem-solving (Adechian et al., 2019; Long and Long, 1992; Cleaver and Whaley, 2018).

Together, these results suggest that the future of NUS valorization depends not only on technical interventions but also on the recognition of local knowledge systems, the strengthening of decentralized institutional capacities, and the alignment of policy frameworks with the lived realities of producers. Strengthening communication channels between public institutions and rural communities, creating dedicated NUS support programs, and integrating NUS into advisory services and research funding could help reduce the institutional fragmentation documented in this study. By foregrounding actors' perceptions and strategies, this research contributes to broader debates on institutional pluralism and adaptive governance in sustainable food systems.

6 Conclusion

This study examined how agricultural policies, local perceptions, and adaptive strategies interact to shape the valorization of neglected and underutilized species (NUS) in the Atacora region of Benin. Using the Actor-Oriented Approach, the analysis demonstrated that NUS occupy a marginal position in national agricultural strategies, despite their ecological, nutritional, and cultural importance. The resulting policy vacuum contributes to weak institutional visibility and limited support for producers, while creating space for NGOs, research institutions, and community organizations to assume central roles in sustaining and promoting NUS.

The findings show that producers and intermediary organizations overwhelmingly perceive agricultural policies as insufficiently supportive of NUS, while public institutions tend to interpret diversification policies as indirectly beneficial. These asymmetries highlight deep structural inequalities in access to information and participation in policy processes. In response, actors employ a mix of endogenous and exogenous adaptation strategies—ranging from collective labor mobilization and seed exchange to training modules, certification initiatives, and value-chain development. Together, these strategies illustrate a hybrid governance system in which local agency compensates for institutional shortcomings.

The study underscores the need to place NUS more explicitly at the center of agricultural development strategies in Benin. Strengthening institutional support—through dedicated research programs, improved extension services, and better integration of NUS into diversification and ecological agriculture policies—would enhance the resilience of local food systems. Equally important is the recognition of local innovations and the strengthening of multi-actor collaborations that have already demonstrated effectiveness in sustaining NUS value chains.

By revealing how actors negotiate and adapt within a fragmented policy environment, this research contributes to ongoing discussions on sustainable food systems, agro-biodiversity governance, and the co-production of knowledge in development practice. Future research could deepen this analysis by exploring market dynamics, gendered dimensions of NUS valorization, and the long-term sustainability of hybrid governance arrangements. Strengthening the institutional anchoring of NUS remains essential for advancing food and nutrition security in regions facing climatic, socioeconomic, and ecological pressures.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Conseil Scientifique de l'Université de Parakou. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

BD: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. SA: Conceptualization, Data curation, Formal analysis, Methodology, Software, Validation, Writing – review & editing. JE: Conceptualization, Methodology, Validation, Writing – review & editing. IM-M: Supervision, Validation, Writing – review & editing. MB: Supervision, Validation, Writing – review & editing.

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Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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