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WOMEN-LED AGRO-TRANSFORMATION IN NIGER: AN INVENTORY OF TRADITIONAL PRODUCTS PRESENTED AT SAHEL-NIGER 2025

Abdel Kader NAINO JIKA*

University Abdou Moumouni, Faculty of Agronomy, Department of Crop Production, Niamey, Niger
*Corresponding author: kaderjika@gmail.com

ABSTRACT

This study documents and analyzes the diversity and perceived economic value of traditional plant-based products processed by women in Niger. Data were collected during the 2025 edition of SAHEL-NIGER, the national agricultural fair, covering 135 unique products reported by 164 processors, of whom 98.4% were women. The dataset was cleaned and standardized to examine species use, transformation techniques, regional distribution, and self-assessed product value. A total of 42 plant species were recorded, with pearl millet, sesame, moringa, and sorghum being the most commonly used. Shannon diversity indices highlighted Maradi ($H' = 2.81$), Niamey ($H' = 2.25$), and Tillabéri ($H' = 2.24$) as diversity hotspots. Processing techniques were dominated by grinding, cooking, and drying. Logistic regression revealed that grinding-based products were significantly more likely to be perceived as high-value (OR = 2.23; $p = 0.0058$), while neither species nor gender showed a significant effect. The dataset also revealed substantial regional disparities and equipment gaps, particularly in Tahoua. These results suggest that basic processing technologies (not just crop choice) are key to rural value creation. Based on this evidence, we recommend investment in decentralized equipment (e.g., grinders, dryers), participatory breeding programs focused on sesame and moringa traits, and better integration of women's knowledge into innovation systems. Agro-transformation, when rooted in biodiversity and supported by technology, can serve as a powerful pathway for women's economic empowerment in dryland West Africa.

Keywords: *rural innovation, traditional foods, Neglected and Underutilized Species, Niger.*

INTRODUCTION

Across the Sahel, the invisible labor of rural women underpins the survival of local food systems. In Niger, female processors manage an impressively diverse portfolio of plant-based products ranging from fermented porridges to functional cosmetics that draw on both drought-resilient staples (pearl millet, sorghum, cowpea) and a rich assemblage of "neglected and under-utilised species" (NUS) such as *Moringa*

oleifera, *Balanites aegyptiaca* or *Digitaria exilis* (fonio). These micro-scale value chains contribute simultaneously to household nutrition, climate resilience and income generation, yet remain poorly characterized in the scientific literature (Rokka et al., 2025; Akinola et al., 2020).

The 8th edition of SAHEL-NIGER, the country's largest agricultural fair, offered a rare opportunity to capture a rapid snapshot of this gendered ingenuity. By systematically recording the products displayed at official regional stands, we asked four research questions:

Diversity: Which plant species and transformation techniques dominate women's processing repertoires?

Regional patterns: Do product portfolios differ significantly among Niger's eight administrative regions?

Perceived value: What share of products is considered of "high" economic importance by the processors themselves, and is that perception associated with specific species or techniques?

Innovation hotspots: Which regions and commodity groups appear most dynamic and could be prioritised for upgrading programmes?

Answering these questions can guide public and private investments towards the most promising, climate-smart value chains while making women's expertise visible within national innovation policies.

MATERIALS AND METHODS

Data were collected during the 8th edition of the SAHEL-NIGER agricultural fair (22–24 February 2025, Niamey), by systematically recording products exhibited at the eight official regional stands. For each item, we documented the region of origin, gender of the processor, plant species used, product name, transformation techniques, ingredients, and self-reported economic value (Low, Medium, or High), based on consensus with exhibitors. Products displayed at the other stalls were not included. The dataset (164 valid records) was cleaned for inconsistencies in spelling, capitalization, and terminology. Entries listing multiple species, techniques, or ingredients were split and harmonized. Descriptive statistics, diversity indices, association tests, multiple correspondence analysis (MCA), and logistic regression were applied to explore patterns across regions, processing profiles, and perceived economic value.

RESULTS AND DISCUSSION

Gender and Value Perception: Among the 164 products inventoried at the SAHEL-NIGER 2025 fair, 159 (98.4%) were reported by women and only 5 (1.6%) by men. This aligns with the well-documented predominance of women in post-harvest processing in West Africa (Tambol et al., 2025). However, the small number of male entries precludes meaningful gender-based statistical comparisons; Fisher's exact test found no significant association between gender and perceived product value ($p = 0.1675$), but this result suffers from quasi-separation bias in our data (Heinze & Schemper, 2002).

Most women-managed products were traditional or multifunctional items, including porridges, flours, and cosmetics. This dominance suggests not only a cultural embedding but also a functional division of labor where women are central to the valorization of local biodiversity.

Declared Economic Value: Processors classified their products as "Low", "Medium", or "High" value. Over half (53.7%) were considered "High" value, suggesting widespread market confidence (Figure 1). While subjective, this valuation is consistent with previous findings that small-scale value addition, such as drying or milling, can substantially raise margins in rural contexts (Brander et al., 2024; van der Werf & Salou, 2017).
However, the absence of actual pricing or revenue data limits the robustness of this metric. Perceptions may have been influenced by popularity, shelf-life, or the prestige of the fair environment.

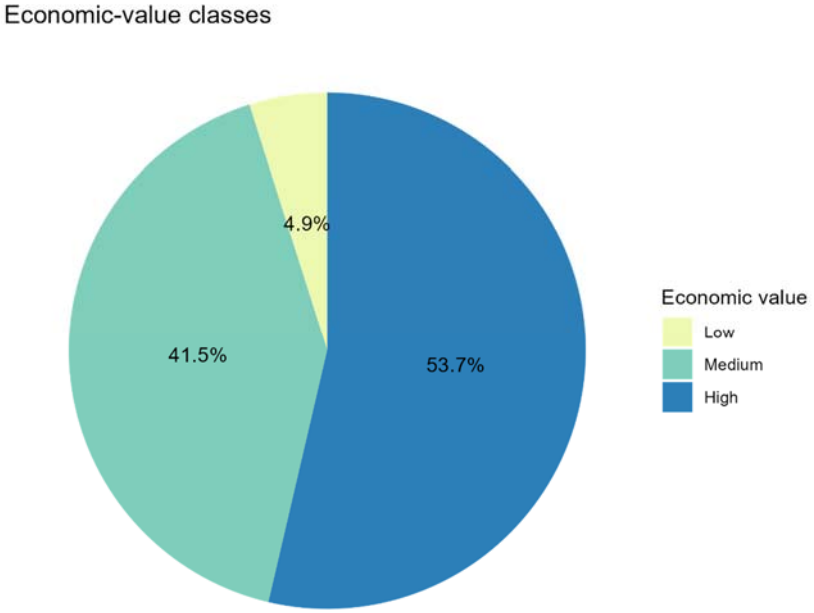

Figure 1. Distribution of perceived economic value.

Species diversity and regional profiles: A total of 42 plant species were recorded, dominated by pearl millet (n = 43), sesame (n = 37), sorghum (n = 33), and moringa (n = 31). Diversity indices (Table 1) reveal that Maradi (H′ = 2.81), Niamey (2.25), and Tillabéri (2.24) are the most diversified regions, while Tahoua (H′ = 0.637) is the least. These patterns may reflect agro-ecological constraints and differing market integration levels (INS, 2024; Issaka et al., 2023).

Table 1. Regional diversity indices.

Region	Maradi	Niamey	Tillabéri	Diffa	Agadez	Dosso	Zinder	Tahoua
Species Richness (S)	21	12	12	11	10	7	5	2
Shannon Index (H′)	2.81	2.25	2.24	2.20	2.27	1.77	1.61	0.637

Transformation techniques drive value: Among 11 processing types identified, grinding, drying, and cooking were most common. Grinding was significantly associated with high-value products (Odds Ratio = 2.23, p = 0.0058), especially for items like cereal flours, souchet paste, or moringa cosmetics. Drying also showed a positive but non-significant association (OR = 1.61). Cooking, although widespread, had a lower association with high-value perception.

These findings suggest that access to basic equipment (e.g., grinders and solar dryers) may directly influence perceived economic value. Similar conclusions have been drawn in rural Ghana and Burkina Faso (Gotor et al., 2021; Woomer et al., 2022).

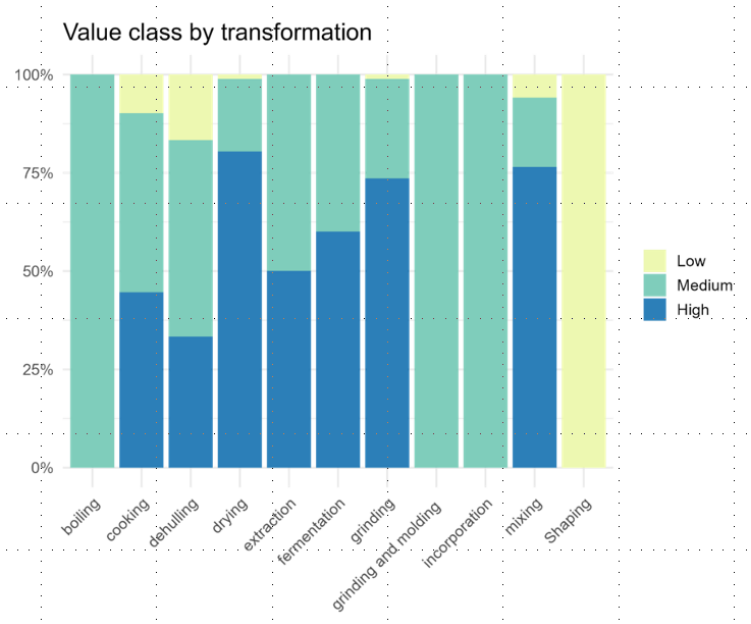

Figure 2. Value class by transformation technique

Key Predictors of Product Value: A logistic regression model confirmed that grinding is the strongest predictor of perceived value, independent of species, region, or gender. No specific species, including sesame or moringa, showed significant effects. This reinforces the view that technology access, not crop choice alone, drives product valorization (Hidayati et al., 2021; Gamage et al., 2024).

Table 3. Logistic regression summary (selected predictors)

Driver	Grinding	Drying	Extraction	Sesame-based	Region / Gender
OR (95% CI)	**2.23** (1.27–4.02)	1.61 (0.84–3.09)	1.54 (0.81–2.95)	0.97 (0.27–3.57)	Various (non-significant)
***p*-value**	**0.0058**	0.16	0.18	0.46	>0.95
Interpretation	Improves product texture, storage, and consumer convenience	Concentrates flavor, extends shelf life	Used for oils and cosmetics	Not statistically different from other species	No systematic regional or gender difference detected

Implications for rural-development and genetic-improvement agendas: The SAHEL-NIGER 2025 inventory reveals not only the diversity of local plant-based products but also the technological and biological drivers of their economic valorization. Three main directions emerge for policy and research:

- Support women-led value chains through appropriate technologies:

The logistic regression highlighted that grinding-based products were significantly more likely to be rated of high value (OR = 2.23; $p = 0.0058$), a result consistent with earlier studies in Burkina Faso showing higher net margins for groundnut processors using hammer mills (Woomer et al., 2022). This suggests a strong return on investment in small-scale processing equipment (e.g., motorized grinders and dehullers, solar dryers for leafy vegetables such as baobab and moringa, hybrid extractors for sesame and balanites oils).

Decentralized access to such equipment through cooperatives or microcredit could raise women's income and reduce post-harvest losses, especially in regions with low current processing diversity (e.g., Tahoua).

- Prioritize sesame and moringa in crop improvement:

Although species-level odds ratios were not statistically significant in the regression, sesame emerged as consistently associated with high-value products (e.g., biscuits, oils, soaps), echoing its intrinsic market value noted in regional seed systems. We recommend targeted Participatory breeding programs focusing on:

- oil content and oxidative stability for sesame (Sesamum indicum),

- low-glucosinolate and high-leaf-biomass varieties of moringa (Moringa oleifera),
- shattering resistance and shelf-life traits, in collaboration with farmer cooperatives and national research systems.

Embed women's expertise into rural innovation systems: Women represented 98.4% of processors in the inventory. Rather than treating gender as a technical variable, policies should:

- Strengthen women-led cooperatives.
- Support inclusive access to credit and infrastructure.
- Recognize women as custodians of agrobiodiversity and local knowledge.

CONCLUSION

This study contributes to filling a key knowledge gap in the empirical characterization of women-led agro-transformation in the Sahel, offering a replicable data-driven framework for similar national inventories. Results show that processing technique (particularly grinding) was the strongest predictor of perceived product value, far more than species or region. The inventory also reveals a rich yet uneven landscape of plant biodiversity and transformation skills, with regional disparities reflecting both ecological constraints and market access.

While limitations exist (e.g., self-reported value, low male representation, absence of pricing data), the findings support targeted interventions in equipment access, participatory breeding, and regional product valorization. Documenting these dynamics is a first step toward repositioning female processors not as beneficiaries, but as drivers of innovation, income diversification, and genetic stewardship in the Sahelian agri-food landscape.

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