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Research gaps in neglected indigenous vegetables in sub-Saharan Africa: A roadmap to mainstreaming

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Background: Agrobiodiversity is critical to food security, environmental sustainability and climate resilience in sub-Saharan Africa (SSA). However, mainstream agriculture has marginalised neglected and underutilised indigenous vegetables (NUIVs), despite their adaptability, cultural significance and nutritional value.

Aim: This review aimed to identify and synthesise knowledge gaps impeding the sustainable utilisation and mainstreaming of NUIVs in SSA.

Setting: The study focuses on the SSA region, where food insecurity, malnutrition and climate-induced stresses challenge agricultural productivity and dietary diversity.

Methods: A structured literature review was conducted using peer-reviewed sources accessed via ScienceDirect and Google Scholar. Article selection prioritised recent and relevant studies focused on vegetable species, particularly those with documented ecological, nutritional and socio-economic benefits related to NUIVs.

Results: Major gaps were identified in agronomy, nutritional profiling (including bioavailability), post-harvest handling, markets and policy. Evidence from East Africa shows progress in seed systems and breeding for *Cleome gynandra* and *Solanum scabrum*, while Southern and Central Africa remain constrained by informal seed sectors and weak institutional support. Research outputs have risen since 2019, yet transdisciplinary integration is still limited.

Conclusion: Region-specific strategies linking agronomy, breeding, value chains and policy are needed. This review offers a research and policy roadmap to mainstream NUIVs into climate-smart, nutrition-sensitive food systems, enhancing food security and resilience in SSA.

Contribution: This review guides future research, policy and development interventions. It highlights NUIVs as viable candidates for integration into climate-smart, nutrition-sensitive food systems in SSA and calls for their elevation within agricultural agendas to advance food security goals.

Keywords: neglected and underutilised indigenous plants; locally adapted crops; climate resilience; climate smart crops; African ethnobotany; orphan crops; micronutrient malnutrition in sub-Saharan Africa; food security.

Introduction

Agrobiodiversity is critical for the optimal functioning of agro-ecosystems, sustainable farming and global food security. Cultivating diverse crops enhances nutrition, strengthens agro-ecosystems, reduces pest and disease outbreaks, and supports essential ecosystem services such as pollination and soil stabilisation. However, the industrialisation and globalisation of food and seed systems have significantly reduced plant diversity worldwide, including in sub-Saharan Africa (SSA). The dominance of maize, rice and wheat as staple carbohydrate sources – reinforced by extensive research investments and well-established seed systems – has accelerated the erosion of agricultural biodiversity (Mondo et al. 2021). This shift has replaced diverse traditional diets with limited food options, heightening farmers' vulnerability to malnutrition and climate-induced stresses. Given the heterogeneity of SSA – in agro-ecology, climate and socio-economic context – the suitability and uptake of neglected and underutilised indigenous vegetables (NUIVs), vary markedly. In Southern Africa, pumpkin leaves are more popular than *Amaranthus* spp. *Cleome gynandra* and *Bidens pilosa* (Kodzwa et al. 2023). In semi-arid East African zones, leafy NUIVs such as *C. gynandra* demonstrate drought resilience and nutritional value, while in humid West Africa, *Amaranthus* spp. are widely consumed for their micronutrient content (Olusanya et al. 2021). These regional differences support the need for context-specific research and policy interventions. Diverse diets that supply essential

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nutrients and phytochemicals are often absent from monotonous food systems. According to the World Health Organization (WHO 2024), micronutrient-related malnutrition, particularly among children and pregnant women, remains a major concern, disproportionately affecting low-income and resource-poor countries. Indigenous plant species, commonly used as vegetables in rural and peri-urban areas, thrive under marginal conditions such as low soil fertility and drought, requiring fewer inputs than exotic vegetables such as rape, cabbage and lettuce. Yet, these indigenous species have been marginalised. Conventional crops, lacking local adaptation, may prove increasingly unsuitable under future climatic conditions.

Neglected and underutilised indigenous vegetables in SSA present a largely untapped resource with immense potential to enhance food security, improve nutrition and promote sustainable agricultural practices. These vegetables, integral to local diets and cultural heritage for centuries, are well-adapted to the diverse and challenging environmental conditions across SSA. Their resilience, low input requirements and nutritional richness make them invaluable in combating food insecurity and malnutrition, particularly as drought frequency intensifies in SSA, where it is also projected to be the worst in the world (Mphande, Farrell & Kettlewell 2023).

Despite their benefits, NUIVs remain marginalised because of the prioritisation of commercial crops (Mondo et al. 2021), highlighting a critical need for focused research to unlock their potential. Overlooking NUIVs neglects their resilience and nutritional value, key assets for enhancing food security and dietary diversity in SSA

The increasing crop failures in SSA, because of climate change, and its associated impacts, such as drought and erratic rainfall, have exacerbated malnutrition issues, sparking renewed academic and research interest in NUIVs. This interest is evident in the growing number of scholarly publications and research projects dedicated to these plants. Researchers are beginning to recognise the unique attributes of NUIVs and their potential contributions to sustainable agriculture and resilient food systems.

Agronomists face the urgent challenge of developing innovative crop production systems to mitigate the effects of climate change, such as prolonged droughts and extreme heat, which pose a food security threat. The remarkable resilience of NUIVs to abiotic stresses offers a unique opportunity to develop robust and adaptable agricultural practices.

Integrating NUIVs into mainstream agricultural research and development can enhance crop diversity and resilience, leading to strategies that improve food security and nutritional outcomes in SSA and other vulnerable regions. Promoting NUIVs can also contribute to the development of sustainable agricultural systems globally, aligning with broader goals of environmental sustainability and climate adaptation.

Given the potential of NUIVs to enhance crop diversity, resilience, and contribute to sustainable agricultural systems, it is crucial to address the existing gaps in research. The review identified critical gaps in current studies on NUIVs, with the goal of steering future research towards promoting their broader cultivation and utilisation.

Therefore, this review sought to:

- Assess the status, utilisation and research of NUIVs.
- Identify and categorise key research areas and gaps in the study of NUIVs.
- Provide recommendations for future research priorities that address identified gaps, emphasising transdisciplinary approaches and the integration of NUIVs into mainstream agricultural research and development.
- Suggest policy interventions and practical strategies to support the inclusion of NUIVs in agricultural systems, aiming to enhance resilience and sustainability in food production in the climate-change vulnerable SSA.

Methodology

Search strategy and data sources

To achieve these objectives, peer-reviewed articles and other sources on various aspects of NUIVs were accessed mainly from ScienceDirect and GoogleScholar databases. The review primarily focused on literature published between 2019 and 2024 to capture the most recent empirical evidence, emerging trends and current gaps related to NUIVs. This time frame aligns with the recent surge in scholarly interest, driven by climate change, nutrition security concerns, and renewed global efforts towards agrobiodiversity conservation. However, foundational studies published prior to 2019 were not categorically excluded, with highly cited or thematically significant earlier works included where they remained relevant to current challenges (e.g., early research on agroecological role [Bunemann et al. 2004] and agronomic studies [Mauyo et al. 2008] on NUIVs). Regarding source selection, these databases were chosen for their wide coverage of peer-reviewed journals across agricultural, nutritional and social sciences. While it is acknowledged that relevant work may exist outside these platforms, their combined use provides access to both high-impact journals and grey literature such as theses and institutional reports. Nonetheless, selection bias is a recognised limitation. To mitigate this, the study included cross-referencing from citations within key articles and reviewed several open-access sources from institutional repositories. Search terms included combinations of keywords such as ‘neglected indigenous vegetables’, ‘underutilised crops’, ‘African leafy vegetables’, ‘climate-resilient crops’, ‘sub-Saharan African traditional vegetables’, and specific botanical names (e.g., *Cleome gynandra*, *Vigna subterranea*, *Amaranthus* spp.). Filters were applied to prioritise studies conducted within SSA and those published within this time frame. Both original research articles and substantive review articles were included.

Screening and selection process

An initial search retrieved ~534 records from the databases. After removing duplicates, 243 studies remained. These were screened for thematic relevance and alignment with the inclusion and exclusion criteria described below. From this pool, 79 peer-reviewed articles and grey literature meeting the study objectives were included, both in-text and in tabular form (Table 1, Table 2, and Table 3).

Inclusion and exclusion criteria

Studies were selected based on the following criteria: publication in English; relevance to the central theme of NUIVs in SSA; and focus on agronomy, nutrition, value chains, policy or environmental dimensions. Peer-reviewed sources were prioritised, although grey literature from credible institutional repositories was also included where it provided unique or locally relevant insights.

Exclusion criteria eliminated studies on non-vegetable neglected crops (e.g., grains and fruits), articles with insufficient scientific rigour, those lacking regional relevance to SSA, and non-peer-reviewed sources unless otherwise justified. Exceptions included studies on exotic vegetables used for comparison, or those conducted outside SSA that offered insights into nutrient content and non-food uses of neglected indigenous species in the region.

Data extraction, thematic framing, and synthesis

Information was manually extracted from selected studies based on key parameters, including botanical names, documented uses (nutritional, medicinal and agronomic), phytochemical properties, resilience traits and socio-cultural significance. The extracted data were organised into major thematic categories that reflect the transdisciplinary scope of the review. These themes included agronomic research, nutritional profiling (e.g., bioavailability), post-harvest handling and value chains, market and socio-cultural dynamics, policy and institutional gaps, environmental benefits, and opportunities for not merely interdisciplinary but transdisciplinary integration. Table 1 and Table 2 summarise the species, their uses and nutrient profiles, while Table 3 presents the status of NUIVs across different subregions of SSA. The synthesis was conducted narratively using thematic analysis, with a particular focus on identifying research gaps, development needs and areas requiring policy intervention to support the wider recognition and utilisation of NUIVs.

Limitations

While numerous articles were reviewed, only a select few were cited in this study because of space constraints. Given the vast number of indigenous plant species in SSA (Mudau et al. 2022), providing a comprehensive list of species and their uses is not feasible. The primary criterion for selecting articles was their focus on vegetable species, aligning with the central theme of this review. Beyond their culinary value, the review also highlights the diverse ecological, economic and cultural value of NUIVs. Such multifaceted benefits are crucial considerations when evaluating the potential of these species for widespread adoption. In addition, while the review applied structured methods, it did not follow a formal meta-analysis protocol or risk-of-bias assessment, as the goal was to provide a broad, integrative synthesis rather than quantitative generalisations.

Results and discussion

The findings in this section derive from the structured review described in the methodology. The 243 records were screened and grouped into five domains: (1) agronomy, (2) nutrition and anti-nutritional factors, (3) post-harvest and value chains, (4) policy and institutional support, and (5) socio-cultural and environmental aspects. Although no meta-analysis was performed, this structured evidence-mapping approach ensured that the results are methodologically grounded and reflect both the most recent (2019–2024) and key earlier studies. Building on this synthesis, the following sections present the status, utilisation and research on NUIVs in SSA, organised thematically and supported by region-specific evidence.

Assessing the status, utilisation and research on neglected and underutilised indigenous vegetables

Neglected and underutilised indigenous vegetables in SSA possess significant potential to enhance regional resilience against climate-induced abiotic and biotic stresses while contributing to improved nutrition, food security and traditional medicine. The growing recognition of their importance is supported by both traditional knowledge and contemporary scientific research, underscoring their diverse benefits.

Definition and classification of neglected and underutilised indigenous vegetables

Understanding the agronomic characteristics of NUIVs is crucial for optimising their cultivation practices for better yields. Not all traditional vegetables are equally neglected regarding established agronomic requirements and nutritional profiles. Some have gained prominence in mainstream agriculture to the extent that they may no longer be classified as 'neglected' in countries where they are widely grown. For example, amaranth is extensively produced in Benin (Azandémè-Hounmalon et al. 2023). Bambara nuts in West Africa (Burkina Faso, Niger, Togo, Nigeria, and Mali) account for over three-quarters of global production (FAOSTAT 2024). On the other hand, in Nigeria alone, annual production exceeds 1.9 million tonnes for okra and 41 million tonnes for cowpea (FAOSTAT 2024). These crops have more advanced agronomic profiles, with well-developed seed and input supply systems and genetic improvements. Nevertheless, their cultivation remains limited across SSA.

TABLE 1: Uses of selected sub-Saharan African neglected and underutilised indigenous vegetables and other plant species.

Use category	Vegetable (common name)	Botanical name	Some of the reported uses and/or parts used	Citation
Nutritional	Amaranth	*Amaranthus* spp.	Leaves, shoots and tender stems	Olusanya, Kolanisi and Ngobese (2023)
Nutritional	Moringa	*Moringa oleifera*	Leaves, seeds and pods, food fortification to boost micronutrient availability	Affonfere et al. (2022)
Nutritional	African nightshade	*Solanum nigrum*	Leaves and shoots consumed as vegetables	Yimer et al. (2023)
Nutritional	Garden huckleberry	*Solanum scabrum*	Leaves and fruits	Kirigia et al. (2019)
Nutritional	Baobab	*Adansonia digitata*	Leaves and pulp, food fortification to boost micronutrient availability	Affonfere et al. (2022)
Nutritional	Spider plant	*Cleome gynandra*	Leaves and young shoots	Kwarteng et al. (2018)
Nutritional	Ethiopian kale	*Brassica carinata*	Leaves	Maru et al. (2024)
Nutritional	Jute mallow	*Corchorus olitorius*	Leaves used in soups and sauces	Biswas et al. (2023)
Nutritional	Roselle	*Hibiscus sabdariffa*	Leaves, calyces, and seeds consumed; beverages	Edo et al. (2023)
Nutritional	African yam bean	*Sphenostylis stenocarpa*	Leaves and seeds	Ojuederie et al. (2021)
Nutritional	Lablab bean	*Lablab purpureus*	Leaves, pods, and seeds	Mthimunye, Managa & Nemadodzi 2023)
Nutritional	Waterleaf	*Talinum triangulare*	Leaves, stems and roots	Atikpo et al. (2021)
Nutritional	False sesame	*Ceratotheca sesamoides*	Leaves	Anyanwu et al. (2021)
Nutritional	Black jack	*Bidens pilosa*	Leaves	Kuo et al. (2021)
Nutritional	Taro, cocoyam	*Colocasia esculenta*	Leaves, corms, stems and petioles	Samadder et al. (2025)
Nutritional	Wild Spinach	*Chenopodium album*	Leaves and young shoots	-
Nutritional	African Eggplant	*Solanum aethiopicum*	Fruit	Kodzwa et al. (2023)
Nutritional	Bambara Groundnut	*Vigna subterranea*	Seeds eaten as a protein-rich food	Maseko et al. (2020)
Nutritional	Cowpea	*Vigna unguiculata*	Leaves, pods, and seeds eaten	-
Nutritional	Pumpkin Leaves	*Cucurbita* spp.	Leaves and shoots consumed; seeds as snacks or oil source	Kulczynski , Gramza-Michałowska & Królczyk (2020)
Nutritional	Bitter Leaf	*Vernonia amygdalina*	Leaves used in soup	Degu et al. (2024)
Nutritional	Drumstick Tree	*Moringa stenopetala*	Leaves, seeds, and pods consumed	Demisse et al. (2024)
Nutritional	African Basil	*Ocimum gratissimum*	Leaves used as herb	Atikpo et al. (2021)
Nutritional	Cassava	*Manihot esculenta*	Leaves consumed as vegetable	Alamu et al. (2021)
Nutritional	Fluted pumpkin	*Telfairia occidentalis*	Leaves and seeds consumed	Atikpo et al. (2021)
Nutritional	Celosia	*Celosia argentea*	Leaves and young shoots consumed	Adegbaju, Otunola and Afolayan (2019)
Nutritional	Wild Jute	*Corchorus tridens*	Leaves, consumed as vegetables, used in soups and sauces	Kudumela et al. (2024)
Nutritional	Slenderleaf (rattle pods, rattlebox, sunhemp)	*Crotalaria brevidens*	Leaves consumed as vegetables	Mwakha et al. (2020)
Nutritional	Slenderleaf	*Crotalaria ochroleuca*	Leaves consumed as vegetables	Mwakha et al. (2020)
Nutritional	Sweet Potato Leaves	*Ipomoea batatas*	Leaves consumed as vegetables	Ijeoma et al. (2023)
Nutritional	African Breadfruit	*Treculia africana*	Seeds and pulp consumed	Ojimelukwe and Ugwuona (2021)
Nutritional	Wild Lettuce	*Lactuca taraxacifolia*	Leaves consumed as a vegetable	Ijarotimi, Adesanya and Oluwajuyitan (2021)
Livestock feed	Drumstick Tree	*Moringa stenopetala*	Leaves, seeds, and pods consumed	Demisse et al. (2024)
Livestock feed	Wild Jute	*Corchorus tridens*	Leaves	Kudumela et al. (2024)
Livestock feed	Lablab Bean	*Lablab purpureus*	Whole plant	Mthimunye et al. (2023)
Medicinal	Amaranth	*Amaranthus spp*	Prevents inflammation	Dania et al. (2024)
Medicinal	African Nightshade	*Solanum nigrum*	For multiple treatments, e.g., pneumonia, toothache, tonsillitis, painkiller, fever	Noumedem et al. (2013)
Medicinal	Moringa	*Moringa oleifera*	Control of cardiovascular diseases, inflammation, headache, malaria, fever, reproductive health etc.	Agoyi et al. (2017), Affonfere et al. (2022)
Medicinal	Baobab	*Adansonia digitata*	Has antioxidant and antimicrobial properties, inhibiting bacteria and fungi	Thompson, Boamah and Badu (2024)
Medicinal	Spider Plant	*Cleome gynandra*	Treatment of headache, stomach ache, diabetes and cardiovascular diseases	Kwarteng et al. (2018)
Medicinal	False sesame	*Ceratotheca sesamoides*	Treatment of malaria, flatulence, hypertension, arteriosclerosis, anaemia	Anyanwu et al. (2021)
Medicinal	African Eggplant	*Solanum aethiopicum*	Treatment of various ailments, including asthma, allergic rhinitis, nasal catarrh, skin infections, rheumatic disease, joint pain, gastroesophageal reflux disease, constipation, and dyspepsia, as well as for its anti-inflammatory, antimicrobial, blood sugar-regulating, and weight management benefits	Han et al. (2021)
Medicinal	Roselle	*Hibiscus sabdariffa*	Prevention and treatment of bacteria responsible for dental caries and periodontal disease; high blood pressure, diabetes, hepatic diseases, gout	Edo et al. (2023)
Medicinal	Garden Huckleberry	*Solanum scabrum*	Anti-inflammatory and cancer-fighting	-
	Sweet Potato Leaves	*Ipomoea batatas*	Leaf extract for treatment of hyperglycemia (diabetes)	Ijeoma et al. (2023)
Medicinal	African Yam Bean	*Sphenostylis stenocarpa*	Seed used for treatment of abdominal pain, severe intoxication, diabetes and inflammation	Ojuederie et al. (2021)

Table 1 continues on the next page →

TABLE 1 (Continues...): Uses of selected sub-Saharan African neglected and underutilised indigenous vegetables and other plant species.

Use category	Vegetable (common name)	Botanical name	Some of the reported uses and/or parts used	Citation
Medicinal	Pumpkin Leaves	*Cucurbita* spp.	Lower the likelihood of cancer, cardiovascular conditions, and neurodegenerative disorders	Kulczynski et al. (2020)
Medicinal	Bitter Leaf	*Vernonia amygdalina*	For treatment of diarrhoea, diabetes, malaria, hepatitis, gastritis, stomach ailments, bloating, intestinal parasites, urinary retention, anthrax, snake bites, wound healing, tonsillitis, eye infections, headaches, toothaches	Degu et al. (2024)
Medicinal	Wild jute	*Corchorus tridens*	Treatment of fever, pain, inflammation, and sexually transmitted infections	Kudumela et al. (2024)
Medicinal	Drumstick Tree	*Moringa stenopetala*	Antibacterial	Demisse et al. (2024)
Medicinal	African Basil	*Ocimum gratissimum*	For diabetes, cancer, inflammation, anaemia, diarrhoea, painkiller, and fungal and bacterial infections	Ugbogu et al. (2021)
Medicinal	Cassava	*Manihot esculenta*	E.g., for treatment of hypertension, fever, irritable bowel syndrome	Noumedem et al. (2013)
Medicinal	Fluted Pumpkin	*Telfairia occidentalis*	Treatment of anaemia (blood booster), malaria, hypertension and diabetes; enhances sperm production and protects against testicular damage damage	Ojimelukwe (2022)
Medicinal	African Breadfruit	*Treculia africana*	Treatment of various ailments, e.g., throat infections, thrush, ear infections, cough, rheumatism, rashes, malaria, whooping cough, and gastrointestinal infections etc.	Ojimelukwe and Ugwuona (2021)
Medicinal	Wild Lettuce	*Lactuca taraxacifolia*	Protective effects on DNA and kidney health, antimicrobial and anti-inflammatory benefits, antioxidant properties, cholesterol-lowering potential, and use in epilepsy treatment.	Ijarotimi et al. (2021)
Medicinal	Taro, cocoyam	*Colocasia esculenta*	Antioxidant, for treatment of cancer, diabetes, constipation, bloating, excessive gas, stomach cramps, diarrhoea; antibacterial and antifungal	Samadder et al. (2025)
Soil improvement	Cowpea	*Vigna unguiculata*	Nitrogen fixation, green manure crop, cover crop, soil organic matter enhancement	-
Soil improvement	Bambara Groundnut	*Vigna subterranea*	Nitrogen fixation	-
Soil improvement	Lablab bean	*Lablab purpureus*	Nitrogen fixation, green manure crop	Mthimunye et al. (2023)
Soil improvement	Slenderleaf	*Crotalaria spp*	Green manure crops, nitrogen fixation, cover crop	Mwakha et al. (2020)
Soil improvement	African yam bean	*Sphenostylis stenocarpa*	Cover crop, nitrogen fixation	Ojuederie et al. (2021)
Phytoremediation	Jute Mallow	*Corchorus olitorius*	Remediation of cadmium from the soil	Atikpo et al. (2021)
Phytoremediation	Amaranth	*Amaranthus* spp.	Remediation of cadmium and lead from the soil	Atikpo et al. (2021)
Phytoremediation	Purslane	*Portulaca oleracea*	Remediation of chromium, zinc, copper and other heavy metals	Zanganeh et al. (2022)
Phytoremediation	Deadly nightshade	*Solanum nigrum*	Remediation of cadmium, copper, zinc, lead and chromium from the soil	Rehman et al. (2017)
Phytoremediation	Black jack	*Bidens pilosa*	Remediation of arsenic, cadmium, lead and zinc from the soil	Wei et al. (2023)
Phytoremediation		*Talinum triangulare*	Remediation of cadmium, chromium, lead, and zinc	Atikpo et al. (2021)
Miscellaneous uses	Baobab	*Adansonia digitata*	Used as an ingredient in cosmetic products	Komane et al. (2017)
Miscellaneous uses	Jute Mallow	*Corchorus olitorius*	Fibre production	Biswas et al. (2023)
Miscellaneous uses	Lablab Bean	*Lablab purpureus*	Ornamental plant	Mthimunye et al. (2023)
Miscellaneous uses	Moringa	*Moringa oleifera*	Water purification	Affonfere et al. (2022)
Miscellaneous uses	Miscellaneous uses	*Crotalaria spp*	Crop protection: Used in rotation to control nematodes	Mwakha et al. (2020)

Note: Please see full reference list of this article: Mphande, W., 2025, 'Research gaps in neglected indigenous vegetables in sub-Saharan Africa: A roadmap to mainstreaming', *Journal of Underutilised Crops Research* 4(1), a33. https://doi.org/10.4102/jucr.v4i1.33 for more information.

However, most of the traditional vegetables are more accurately categorised as NUIVs. Indigenous plant species that do not require sowing but naturally grow as arable weeds in farmers' fields, gardens, and near homesteads, or in forests, and are utilised as vegetables, are true NUIVs. These traditional vegetables are particularly well-adapted to local conditions, making them crucial for sustainable agricultural practices and food security strategies in the region (Kodzwa et al. 2023). Because of their resilience, these plants are not actively cultivated by consumers, leading to their agronomic neglect. Beyond their nutritional value, it is these NUIVs that require greater promotion in SSA in the context of climate change and rising food security challenges, such as prevalent malnutrition.

Stress resilience and agronomic potential

Research demonstrates that many NUIVs are highly adapted to local environmental conditions, exhibiting drought and heat tolerance, and pest resistance (Kodzwa et al. 2023). Unlike the introduced conventional crops, they also require fewer external inputs such as fertilisers and pesticides, enhancing both sustainability and cost-effectiveness for smallholder farmers. However, as NUIVs typically occur in mixed stands rather than monocultures, further research is needed to determine whether their resilience, particularly pest resistance, is primarily genetic, ecological or a combination of both. Monocultural trials could clarify resilience mechanisms observed in semi-wild environments. Specific examples, such as the superior drought tolerance of *V. subterranea* to *Beta vulgaris* (Maseko et al. 2020), and the high biotic and abiotic stress tolerance of *C. gynandra* and *Solanum aethiopicum* (Kodzwa et al. 2023), highlight their agronomic potential. Furthermore, amaranthus demonstrates resilience to heat, drought, salinity and extreme pH conditions (Achigan-Dako et al. 2014). These attributes position NUIVs as promising candidates for sustainable cultivation across diverse and challenging environments.

TABLE 2: Selected mineral and vitamin C content (mg per 100 g of sample) of neglected and underutilised indigenous vegetables and exotic species.

Class	Species	Calcium (mg)	Magnesium (mg)	Potassium (mg)	Iron (mg)	Vitamin C (mg)	Cumulative nutrient content†	References
Indigenous	*Adansonia digitata*	2640.0	535.0	1080.0	254.0	300.00	4809.00	Yazzie et al. (1994), Kamatou et al. (2011)
Indigenous	*Amaranthus hybridus*	798.0	440.0	550.0	11.4	64.00	1863.40	Muchuweti et al. (2009)
Indigenous	*Hibiscus sabdariffa*	2375.0	555.0	2630.0	111.9	4.50	5676.40	Salami and Afolayan (2021)
Indigenous	*Bidens pilosa*	370.0	600.0	600.0	17.4	70.00	1657.40	Muchuweti et al. (2009)
Indigenous	*Cleome gynandra*	4985.4	1247.6	3368.1	43.1	155.70	9799.90	Sogbohossou et al. (2019), Houdegbe et al. (2022)
Indigenous	*Corchorus olitorius*	628.0	93.0	534.5	9.4	191.00	1455.90	Ouédraogo et al. (2024)
Indigenous	*Solanum aethiopicum*	36.0	62.5	952.5	112.5	2.30	1165.80	Han et al. (2021)
Exotic	*Asparagus officinalis* (asparagus)	21.1	14.9	202.3	1.0	18.20	257.50	Redondo-Cuenca et al. (2023)
Exotic	*Brassica oleracea* (cabbage)	33.0	14.0	175.0	30.0	14.00	266.00	Pongrac et al. (2019), Sayeed et al. (2021)
Exotic	*Brassica oleracea* (kale)	539.0	67.0	341.0	3.1	102.00	1052.10	Korus (2011), Thavarajah et al. (2021)
Exotic	*Brassica rapa* (Chinese cabbage)	68.4	12.5	195.2	0.7	0.03	276.83	Song et al. (2023)
Exotic	*Beta vulgaris* (Swiss chard)	477.1	104.5	455.5	2.2	33.10	1072.40	Ivanović et al. (2019), D'Imperio et al. (2024)
Exotic	*Lactuca sativa* (lettuce)	75.5	41.3	647.0	2.2	30.20	796.20	Fernández-Tucci et al. (2025)
Exotic	*Solanum melongena*	13.4	65.8	39.3	1.1	5.50	125.10	Das et al. (2011), Emeribe and Ogbuehi (2024)

Note: Please see full reference list of this article: Mphande, W., 2025, 'Research gaps in neglected indigenous vegetables in sub-Saharan Africa: A roadmap to mainstreaming', *Journal of Underutilised Crops Research* 4(1), a33. https://doi.org/10.4102/jucr.v4i1.33 for more information.

†, Note that while the figures are mathematically sound, the cumulative nutrient content (mg/100g) represents the unweighted sum of selected individual nutrient concentrations (Ca, Mg, K, Fe and vitamin C) per 100 g of edible plant material.

TABLE 3: A summary of neglected and underutilised indigenous vegetables development framework in sub-Saharan Africa subregions.

Subregion	Research, breeding and production	Commercialisation and markets	Policy and institutional support	Representative references
Central Africa	Very limited formal research; traditional leafy vegetables like eru (*Gnetum* spp.), bitterleaf, African eggplant used extensively; genebank records sparse, informal seed sector. Beyond ethnobotany, structured agronomic and nutritional studies are largely absent.	Low market value, virtually no commercialisation or formal markets; most consumption remains household or local community-based.	Minimal policy focus; research and extension systems are weak; knowledge largely community- or non-governmental organisation-generated.	Mondo et al. (2021), van Zonneveld et al. (2021)
East Africa	More active breeding and varietal improvement (amaranth, cleome, African nightshade), often via WorldVeg and national research systems, formal genebank in Kenya	Growing demand in urban and peri-urban areas; NUIVs sold in markets and increasingly in supermarkets; value-added products emerging	Moderate institutional support via nutrition-focused programs and gender-sensitive initiatives; better awareness campaigns, lack of extension services	Ntawuruhunga et al. (2020), Van Zonneveld et al. (2021); Mativavarira et al. (2024a)
Sahel	Emerging agroecological research on drought-adapted NUIVs (jute mallow, baobab leaves, okra, roselle); limited varietal breeding. Low species diversity, semi-arid conditions constrain cultivation. Formal agronomic studies remain sparse, mostly descriptive, highlighting the need for targeted breeding and seed systems.	Informal urban market demand significant (especially in Mali, Niger, Burkina Faso); undeveloped value chains, modest value addition	Regional frameworks via CORAF or WECARD support resilient cropping systems; some inclusion in food-security strategies, lack formal recognition in policy documents	Van Zonneveld et al. (2021), Rokka et al. (2025) West Africa Agricultural Productivity Program (2016)
Southern Africa	Research is fragmented; few improved varieties beyond amaranth, spider plant, African nightshade. Most cultivation is informal and subsistence-based. Formal genebank in South Africa	Limited market penetration; most NUIVs sold informally; seasonal supply gaps; lack of processing and value addition.	Weak policy inclusion; NUIVs largely absent from national nutrition or crop diversification strategies.	Van Zonneveld et al. (2021), Mativavarira, Simango et al. (2024a)
West Africa	Ethnobotanical knowledge is rich; traditional vegetables like fluted pumpkin, jute mallow, okra well-documented and mainstreamed in some countries; breeding less systematic	Well-established informal and urban markets; processing and seasonal storage practiced; some export potential	Regional initiatives (e.g., CORAF or WECARD) support seed systems and value chains; some state-level policy attention, lack substantive policies. Policy and governance frameworks are either insufficiently supportive or, in some cases, may even impede NUIVs	Ogwu et al. (2016), West Africa Agricultural Productivity Program (2016), Van Zonneveld et al. (2021), Azandémè-Hounmalon et al. (2023), Olusanya et al. (2023)

Note: Please see full reference list of this article: Mphande, W., 2025, 'Research gaps in neglected indigenous vegetables in sub-Saharan Africa: A roadmap to mainstreaming', *Journal of Underutilised Crops Research* 4(1), a33. https://doi.org/10.4102/jucr.v4i1.33 for more information.

NUIVs, neglected and underutilised indigenous vegetables.

Traditional knowledge and cultural significance

Traditional knowledge encompasses practices, cultivation techniques, conservation and uses that have been transmitted through generations. Indigenous communities have historically gathered, cultivated and consumed NUIVs, relying on their resilience to local climatic conditions and their nutritional benefits (Mondo et al. 2021). Through empirical experience, these communities have long recognised the health benefits and drought tolerance of NUIVs, highlighting their historical and cultural significance. This traditional knowledge forms the foundation for scientific inquiry and further research into NUIVs. For example, *Artemisia afra* (African Wormwood), long utilised in African ethnopharmacology for treating a range of ailments, has been scientifically validated for its antimalarial properties, as well as its efficacy in managing respiratory infections, including tuberculosis (Kellogg et al. 2024). Furthermore, scientific surveys have been conducted to provide empirical insights into utilisation trends and species diversity (e.g., Mondo et al. 2021). A comprehensive overview of scientific studies highlighting the ethnobotanical, nutritional, industrial and other diverse applications of NUIVs is presented in Table 1.

Scientific validation and nutritional profiling

Sub-Saharan Africa hosts a vast diversity of traditional vegetables, many of which possess significant but undocumented nutritional value (Mudau et al. 2022). Although the medicinal properties of some indigenous species are increasingly studied, clinical validation remains limited. Recent research has advanced understanding of the nutritional benefits, agronomic traits and stress resilience of NUIVs (Table 1). These vegetables, often overlooked in mainstream agriculture, offer promising avenues for enhancing food security, nutrition and climate resilience in SSA.

Neglected and underutilised indigenous vegetables are rich in essential nutrients, including antioxidants (e.g., vitamins and flavonoids) and minerals, playing a key role in addressing malnutrition and preventing chronic diseases. For instance, *Moringa oleifera* is notable for its high concentrations of vitamins A, C, and E, calcium, potassium and protein (Javed et al. 2024); *Corchorus olitorius* provides substantial vitamins A and C, iron, and dietary fibre (Biswas et al. 2023); and amaranth is rich in iron, calcium, and vitamins A and C (Achigan-Dako et al. 2014). Comparative studies suggest that NUIVs often surpass exotic vegetables in nutritional value (Sayeed et al. 2021), underlining their potential to diversify diets and combat micronutrient deficiencies.

Table 2 presents selected nutrient profiles (Ca, Mg, K, Fe and vitamin C) of both NUIVs and exotic vegetables, using the highest reported values to facilitate direct comparison of maximum nutrient potential. Cumulative nutrient scores were calculated to provide indicative nutritional density rankings, recognising that this method does not account for bioavailability differences.

Despite growing evidence of their nutritional and health benefits, significant research gaps persist. Large-scale, region-specific studies on nutrient composition and bioavailability are lacking, as is agronomic research on cultivation practices suited to low-input and climate-stressed environments. Genetic diversity in NUIVs remains underexplored, limiting breeding efforts for yield, adaptability and consumer traits. Post-harvest handling, shelf-life extension and value chain development are also poorly characterised (Mdimi et al. 2024). Addressing these gaps is essential to fully realising the potential of NUIVs in building resilient and nutrition-sensitive food systems in SSA.

In spite of these advancements, the research landscape remains limited to a few species, leaving many NUIVs uncharacterised both agronomically and nutritionally. In fact, among the NUIVs whose nutritional profiles have been determined are species that are difficult to cultivate. An example of such species is *C. gynandra*, which, although it has very high nutritional value, is characterised by poor germination and is susceptible to pest damage (Houdegbe et al. 2022). These and other research gaps significantly impede the full realisation of the potential benefits that NUIVs can offer. The limited cultivation and adoption of NUIVs highlight the urgent need for expanded research and the resolution of institutional barriers. Addressing these challenges requires transdisciplinary approaches that bridge agronomy, nutrition, breeding, and policy. Such integrated frameworks are critical for advancing knowledge and embedding NUIVs within mainstream agricultural and nutritional strategies. By doing so, the contribution of NUIVs to mitigating food and nutrition insecurity in SSA can be maximised. Future research should therefore prioritise these areas while systematically addressing existing gaps to unlock the full potential of NUIVs in strengthening food systems and improving nutritional outcomes in SSA.

Besides West Africa, East Africa has emerged as a significant hub for NUIV research and utilisation. In Kenya, Uganda and Tanzania, species such as *C. gynandra*, *Solanum scabrum* and *Crotalaria brevidens* are widely consumed and have attracted research interest for their stress tolerance and dietary value (Houdegbe et al. 2022; Mwakha et al. 2020). However, limitations such as bitterness, underdeveloped seed systems and institutional neglect continue to constrain their wider adoption (Mondo et al. 2021). A study performed in Kenya by Ntawuruhunga et al. (2020) revealed that although farmers were knowledgeable and had positive attitude towards NUIVs, use of improved agronomic practices was poor. Revisiting earlier studies also highlighted research on agronomic and agro-ecological potential of NUIVs. For example, Mauyo et al. (2008) found that nitrogenous fertiliser significantly increased the marketable leaf yield of *C. gynandra*, while a study by Bünemann et al. (2004) showed that *Crotalaria* spp. were effective in improving the soil nitrogen economy through fixation. These studies reinforce the agronomic value of NUIVs within East African cropping systems. Incorporating this regional evidence provides a more representative synthesis of the opportunities and challenges surrounding NUIVs across SSA. It affirms the importance of context-specific interventions and strengthens the rationale for mainstreaming NUIVs into sustainable, nutrition-sensitive food systems.

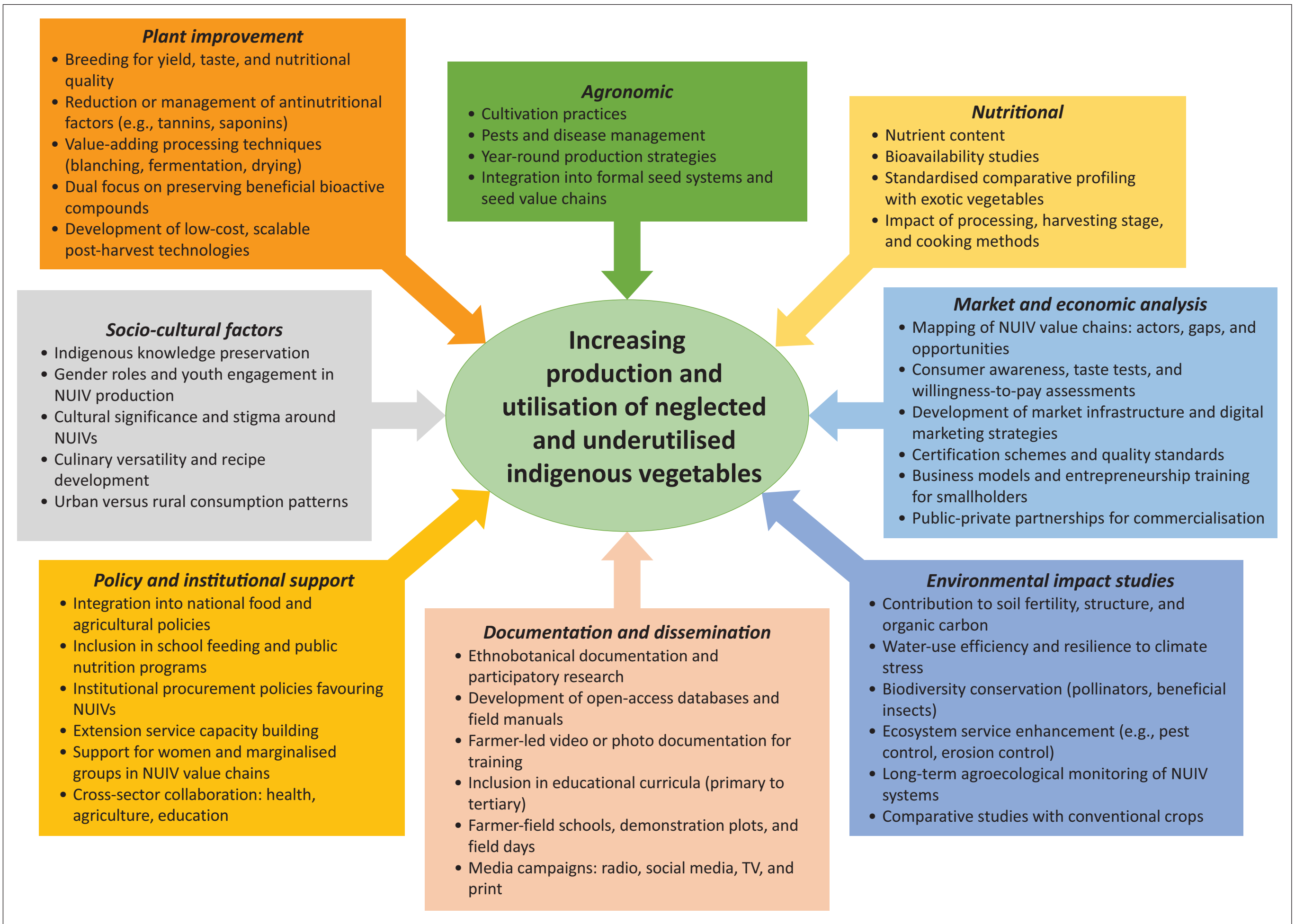
Research gaps and future directions

Research on NUIVs has increased notably since 2019, driven by climate and nutrition agendas. East and West Africa dominate this output, while Central Africa and the Sahel remain underrepresented, with most work limited to ethnobotanical documentation rather than agronomic or breeding research. Targeted investment is needed to close these gaps. The diversity within SSA – spanning contrasting production systems, market structures and cultural preferences – demands that research and policy approaches be tailored to regional contexts. For instance, while East Africa has seen progress in seed system development for *C. gynandra* and *Solanum* spp., with formal and informal sectors (Mativavarira et al. 2024a), similar initiatives remain limited in parts of Southern Africa, where farmer-to-farmer and informal markets dominate seed access and exchange (Mativavarira et al. 2024a). Table 3 summarises the NUIVs development framework across research, markets and policy domains in the subregions of SSA.

Literature highlights the substantial benefits that NUIVs could offer, yet numerous research gaps impede their effective integration into mainstream agriculture. These gaps need to be addressed for a comprehensive understanding and effective utilisation of NUIVs. The following infographic (Figure 1) summarises the research gaps and suggested recommendations discussed in detail below it.

Limited agronomic research

There is a deficiency in detailed agronomic studies on NUIVs. Essential aspects such as optimal cultivation practices, pest and disease management, and post-harvest handling remain inadequately documented. This research gap limits the ability to enhance yields and ensure the sustainability of these crops. Furthermore, integrating NUIV seeds and other propagation materials into existing seed value chains is crucial. Seed companies need to take interest in breeding and adding the species to their seed systems. Partnerships with seed companies, incentives for breeders, or community seed banks can help promote agronomic profiles of NUIVs. Addressing seed quality issues is imperative to boosting the visibility and production of NUIVs. Given that crop production in SSA is predominantly rain-fed, the access and consumption of NUIVs are largely restricted to the rainy season, and no preservation or processing takes place (Mudau et al. 2022). It is essential to adopt these species into mainstream horticulture to ensure year-round availability and consumption of NUIVs. This integration cannot be overemphasised, as it holds the potential to significantly improve food security and nutritional outcomes in the region. Finally, to fully understand the pest resistance mechanisms of NUIVs, it is essential to determine whether this trait is primarily governed by genetic factors, agro-ecological conditions, or an interaction between them. Given that NUIVs typically grow in mixed plant stands with other weed species rather than in monocultures, their observed resistance traits may be influenced by complex ecological interactions. Agronomic research is therefore needed to assess whether these resistance attributes would persist in monoculture systems, which characterise the current conventional agriculture. Understanding the relative contribution of these factors is critical for harnessing pest resistance in breeding and sustainable production systems. To disentangle genetic resistance from agro-ecologically mediated resistance, robust methodologies are required. One promising approach



NUIVs, neglected and underutilised indigenous vegetables.

FIGURE 1: Infographic on research gaps and recommendations that may contribute to increasing the production and utilisation of neglected and underutilised indigenous species.

involves controlled environment experiments, where NUIVs are grown under uniform conditions in greenhouses or growth chambers. By minimising environmental variability, these setups would allow researchers to isolate and assess genetic-based resistance traits, such as antixenosis, antibiosis or tolerance, by monitoring pest behaviour and performance across different genotypes. Such investigations would provide critical insights into the stability and adaptability of NUIVs' resistance mechanisms across different production environments.

Nutritional profiling

Nutritional profiling of NUIVs is another area with substantial gaps. While research has been conducted to provide nutrient contents for some species (e.g., as in Table 2), there is a need for more comprehensive and standardised nutritional profiling of NUIVs. This includes understanding the bioavailability of nutrients; and the impact of various processing and cooking methods on nutrient content. Harvesting methods – fresh or dry – age of the plant at harvest, post-harvest handling alongside cooking methods need researching as they are likely to impact the nutritional value of the vegetables. Despite increasing recognition of the nutritional significance of NUIVs, there is a notable lack of well-structured, multilocation studies that compare their nutrient and nutritional profiles and with those of exotic vegetable species under standardised laboratory protocols and agronomic conditions. Existing studies often report inconsistent results, likely because of variations in factors such as geographic location, soil composition, plant maturity at harvest and analytical methodologies. For example, Mageney, Baldermann and Albach (2016) reported substantial intraspecific variation in carotenoid concentrations among kale (*Brassica oleracea* var. sabellica) cultivars, with levels ranging from 50 mg to 300 mg per 100 g fresh weight. Similarly, Drozdowska et al. (2020) demonstrated that mineral concentrations in red cabbage (*Brassica oleracea* var. capitata f. rubra) differed markedly with developmental stage, with young, actively growing shoots exhibiting significantly higher levels of calcium (2413.7 mg/100 g vs. 235.7 mg/100 g), magnesium (398.4 mg/100 g vs. 169.3 mg/100 g), potassium (5320.5 mg/100 g vs. 3416.4 mg/100 g), and iron (19.7 mg/100 g vs. 12.1 mg/100 g) compared to mature tissues. Such variability – arising from genotype, developmental stage and environmental conditions – complicates cross-study comparisons and may obscure the true nutritional potential of NUIVs. Conducting concurrent cultivation of NUIVs and exotic species at the same sites across diverse agro-ecological zones would minimise environmental confounding, providing more reliable and generalisable assessments of their relative nutrient density as well as nutritional value.

Plant improvement and post-harvest handling

Breeding programmes aimed at enhancing desirable nutritional traits are required. For example, although *C. gynandra* is highly nutritious, it is known for its bitterness, which may be attributed to tannins or saponins, antinutritional factors (ANF), which make the crop less desirable. Oxalates, phytates, alkaloids and goitrogens are other ANFs found in many NUIVs (Samtiya, Aluko & Dhewa 2020). Antinutritional factors reduce nutrient bioavailability by inhibiting digestion, impairing absorption or chelating essential nutrients. Despite their presence, many ANFs can be significantly reduced or eliminated through simple post-harvest processing techniques without necessitating genetic improvement through breeding. Methods such as blanching, boiling, fermentation and soaking can mitigate the effects of ANFs, thereby enhancing the bioavailability of key nutrients (Samtiya et al. 2020). While ANFs do not entirely diminish the nutritional potential of NUIVs, they underscore the critical need for appropriate preparation practices to optimise their dietary value. The limited awareness and application of such techniques remain a barrier to fully harnessing the potential of NUIVs in promoting dietary diversification and addressing micronutrient deficiencies. Furthermore, it should be acknowledged that in moderation, some ANFs also have health benefits (e.g., saponins and tannins are anti-inflammatory and antimicrobial).

Market and economic analysis

The market potential and economic viability of NUIVs are poorly understood (Arumugam et al. 2022). To address this gap, creating robust market linkages and value chains is crucial. This involves consumer education, market infrastructure development, and support for processing and packaging industries to enhance NUIV appeal and convenience. Economic incentives and market research can identify new opportunities.

Firstly, detailed mapping of the NUIV value chain – from production to consumption – is essential. This includes identifying the roles of farmers, intermediaries, processors, retailers, and consumers, and pinpointing inefficiencies. Cost-benefit analyses are needed to evaluate the economic feasibility of cultivating NUIVs, considering input costs, labour and potential income.

Secondly, consumer surveys should assess awareness, preferences and willingness to pay for NUIVs. Analysing market trends in health and wellness, organic produce, and sustainable food systems can identify growth areas. Tailored marketing strategies can enhance NUIV appeal and acceptance. Digital marketing and social media platforms can be useful tools for reshaping consumer narratives around NUIVs. For example, nutritional storytelling, influencer campaigns and short educational videos can highlight the health benefits, cultural significance and sustainability attributes of these crops. Engaging popular nutritionists, chefs and community leaders in these campaigns can also enhance their credibility and reach.

Thirdly, exploring consumer preferences regarding the taste and culinary versatility of NUIVs through taste tests and culinary demonstrations is important. Developing modern recipes and emphasising the nutritional benefits of NUIVs can boost consumption.

Finally, targeted subsidies for smallholder NUIV producers, certification schemes to build consumer trust, and government-led or NGO-led market access programmes aimed at integrating NUIVs into formal value chains are part of the strategies for strengthening NUIV commercialisation.

Addressing these gaps is essential for identifying viable market opportunities and developing effective commercialisation strategies for NUIVs.

Socio-cultural factors

Although some studies on the role of socio-cultural factors in the acceptance and utilisation of NUIVs have been carried out, this aspect remains underexplored. Understanding local knowledge, traditions and cultural perceptions is crucial for promoting their cultivation and consumption. Collaborating with local farmers and communities to record and preserve indigenous knowledge can enhance the relevance and acceptance of NUIVs, which is said to be low (Arumugam et al. 2022). Additionally, exploring traditional culinary uses, including generational recipes and cooking methods, can enhance their cultural appeal. Introducing NUIVs at an early stage in schools might improve acceptability by the younger generation. Bridging these research gaps will help stakeholders create an environment conducive to the growth and acceptance of NUIVs, contributing to food security, nutrition and sustainable agricultural practices in SSA.

Policy and institutional support

Research on the policy frameworks and institutional support for promoting NUIVs is lacking. There is a need for studies on the role of government policies, extension services and non-governmental organisations (NGOs) in supporting NUIV production, marketing and utilisation. However, there is evidence that government and private sector support towards NUIVs is lacking. For example, a study by Mondo et al. (2021) in the Democratic Republic of Congo revealed that the NUIVs seed system was informal, dominated by farmer-saved seeds and local exchanges between individuals, indicating a lack of formal support structures. Effective policy and institutional support are crucial. Policies that preserve cultural heritage and traditional agricultural practices should be optimised through research. Inclusive agricultural policies that support women and marginalised groups are essential and require investigation into their development and impact on NUIV adoption. Integrating NUIVs into school feeding programmes may enhance youth acceptance; however, systematic evaluation of these initiatives is essential to measure their impact. Collaborations with health and nutrition programmes to promote NUIVs' benefits are also necessary, with studies needed to assess their impact on public health and dietary habits.

Environmental impact studies

Neglected and underutilised indigenous vegetables enhance soil health through deep roots and organic matter contribution. They contribute to biodiversity conservation on farms and surrounding ecosystems, but their impact is not well-documented (Mondo et al. 2021). Studies should explore how diverse NUIVs enhance agricultural biodiversity, support beneficial insects and pollinators, and maintain genetic diversity. Furthermore, examining their role in ecosystem services such as pest control, pollination and water regulation is essential.

Research needs in three areas include comparative studies between NUIVs and conventional crops that can reveal data on input requirements, yield stability, and environmental impacts, highlighting integration advantages and trade-offs. Also, long-term studies are necessary to assess the sustainability of NUIV cultivation over multiple seasons, uncovering trends in soil health, pest and disease cycles, and ecosystem impacts. Finally, developing models incorporating agronomic, environmental, and socio-economic data can predict the outcomes of scaling up NUIV cultivation, guiding policymakers and farmers in adopting NUIVs in sustainable practices.

Transdisciplinary approaches

There is still a lack of transdisciplinary research that integrates agronomy, nutrition, economics, sociology and environmental science to provide a holistic understanding of the potential of NUIVs despite previous appeals in its favour. To bridge this research gap, comprehensive strategies for promoting NUIVs need to be developed, involving multiple stakeholders and sectors. These strategies should include:

Public feeding places

Encourage restaurants, hotels and other public feeding places to include NUIVs on their menus through awareness campaigns, partnerships with chefs, and showcasing their culinary potential. Increased visibility in public dining spaces can boost demand and create market opportunities for farmers. One viable strategy involves leveraging public-private partnerships. Governments can provide policy support and create enabling environments, while private-sector actors can contribute expertise in supply chain management, food processing and distribution. Furthermore, collaborations with civil society organisations can foster community engagement, nutrition education and advocacy.

Educational institutions

Integrate NUIVs into meal plans of boarding institutions. Schools, colleges and universities can introduce young people to the nutritional and cultural value of NUIVs. Educational programmes and collaborations with nutritionists can institutionalise these vegetables in daily diets.

Community and farmer engagement

Participatory approaches can harness local knowledge while empowering communities to promote and cultivate these vegetables. Farmer-field schools, extension services and community programmes can facilitate this engagement. To enhance knowledge integration and co-creation, participatory research approaches – such as farmer-led experimentation, community-based participatory research and co-design of agricultural interventions – should be emphasised. These methods can allow researchers to collaboratively develop and test innovations with end-users, increasing the relevance, adoption and sustainability of NUIV-related interventions. Farmer-led trials, for instance, can generate valuable insights into varietal preferences, local adaptability and best agronomic practices under real-world conditions.

Joint research

Future research should integrate agronomic trials, genetic characterisation and socio-economic studies to facilitate the adoption of NUIVs in climate-smart agriculture. Agronomy and ethnobotany are critical for understanding cultivation practices and traditional knowledge systems (Mativavarira et al. 2024b). Nutrition science provides the basis for validating health benefits and dietary contributions. Sociology and economics help in mapping consumer behaviour and market dynamics, while policy studies can inform institutional frameworks for mainstreaming NUIVs into national development agendas.

Documentation and dissemination

The limited documentation and dissemination of knowledge on NUIVs (Mdimi et al. 2024) constrain the sharing of best practices. Addressing this requires ethnobotanical surveys to capture species diversity, nutritional profiles and traditional uses through community engagement. Publishing scientific evidence on health benefits, agronomic practices and economic value is critical. Creating accessible databases, online repositories, magazines and cookbooks on cultivation, nutrition and culinary uses will support knowledge transfer. Participatory methods involving farmers through videos and photographs are encouraged. Education and training – via workshops, seminars, and field days – should target farmers and agronomists. Integrating NUIV knowledge into educational curricula at all levels is vital: primary education can include simple plant identification, school gardens and traditional stories; secondary education can explore their nutritional, environmental and economic benefits; and tertiary institutions can offer specialised modules in ethnobotany, sustainable agriculture, food systems and biodiversity conservation. Strengthening extension services, establishing demonstration plots and leveraging media campaigns are essential for outreach. Collaboration with NGOs, community groups and international agencies (e.g., Food and Agriculture Organisation [FAO], WHO), along with policy advocacy and market development, is crucial for mainstreaming NUIVs.

Conclusion

Neglected and underutilised indigenous vegetables are critical for enhancing food security and climate resilience in SSA because of their local adaptability and nutritional value. However, research on their transdisciplinary aspects remains limited. Key gaps include insufficient agronomic studies on cultivation practices, pest and disease management, post-harvest handling and comprehensive nutritional profiling necessary to improve their acceptability. Further research should prioritise breeding programmes, agronomic trials and participatory approaches involving farmers to enhance the cultivation potential of NUIVs.

In addition, the market and economic viability, socio-cultural drivers of consumption and supportive policy frameworks are underexplored. Addressing these gaps through targeted, transdisciplinary research, strengthened documentation and effective dissemination of existing knowledge and successful case studies is essential. Unlocking the full potential of NUIVs will contribute to more resilient, sustainable and equitable food systems capable of addressing climate adaptation, malnutrition and livelihood challenges in SSA.

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Author’s contribution

W.M. is the sole author of this research article.

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