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Diversity and Preference of Indigenous Food Crops for Household Food Security in Ikolomani Division, Western Kenya

N O Nyandiko[*] and Muli E

[*]*Masinde Muliro University of Science and Technology, University in Kakamega, Kenya.*

Corresponding author: N O Nyandiko, Masinde Muliro University of Science and Technology, University in Kakamega, Kenya, Tel: 0726745378, 0700764121; E-mail: nomoyo2005@yahoo.com

Abstract

Kenya is endowed with a diverse range of cultivated and wild indigenous crops that have historically sustained household food and nutrition security. Despite their rich nutritional, agronomic, ecological, and medicinal value, these crops have been marginalized due to changing dietary habits, modernization, and policy neglect. Indigenous crops such as African nightshade (*Solanum nigrum*), spider plant (*Cleome gynandra*), and cowpea leaves (*Vigna unguiculata*) offer substantial quantities of essential vitamins, minerals, and dietary fiber, while exhibiting remarkable resilience to environmental stresses. This paper integrates global literature with empirical findings from Ikolomani Division in Western Kenya. The study involves 211 households and 18 key informants and documented over 30 indigenous crop species to assess their role in enhancing household food security, dietary diversity, and climate adaptation. Nyandiko's fieldwork identified the diversity, consumption patterns, and socio-cultural preferences for these crops, while Muli's agro-ecological perspective contextualized their relevance in the broader discourse on sustainable food systems and climate resilience. Traditional preparation methods such as blanching, fermentation, sun-drying, and oil-based cooking were observed to improve nutrient bioavailability and support gut health. The study underscores the urgent need to document, protect, and mainstream indigenous knowledge into national policy frameworks, school feeding programs, and climate-smart agricultural initiatives. Revitalizing indigenous food systems represents a scientifically sound, culturally appropriate, and environmentally sustainable strategy for addressing food insecurity, malnutrition, and biodiversity loss under a changing climate.

Keywords: Indigenous food systems, Agro-biodiversity, Climate adaptation, Traditional vegetables, Food security, Kenya

BACKGROUND

Food security remains a pressing global concern, with the right to adequate food reaffirmed by the World Food Summit and FAO (1996), yet hunger and malnutrition persist, particularly in Sub-Saharan Africa. In Kenya, despite progress in agricultural policy frameworks such as the Vision 2030 agenda, over 30% of the population still experiences chronic food insecurity, exacerbated by climate change, land degradation, and inequality [1,2]. Recurrent droughts, high food prices, and reliance on a limited range of exotic staples have heightened vulnerability, particularly in rural areas where subsistence farming dominates [3,4]. Locally adapted cereals, legumes, roots, fruits, and vegetables offer a strategic solution to these challenges. These crops, such as Sorghum bicolor, *Solanum nigrum*, *Cleome gynandra*, *Corchorus spp*., and *Crotalaria spp*., are nutrient-rich, drought-tolerant, and require fewer synthetic inputs compared to exotic alternatives. Yet their utilization has declined due to modernization, urbanization, and a lack of policy recognition [5,6]. The agro-biodiversity embedded in indigenous food systems includes not only crop varieties but also their symbiotic ecological relationships with pollinators, soil microbiota, and climatic patterns. These systems are integral to ecosystem services, climate adaptation, and food sovereignty [7,8]. Empirical studies such as Nyandiko's 2022 research in Ikolomani Division confirm the enduring reliance on traditional vegetables, pulses, and tubers for dietary diversity and food access. His findings show that 11 cultivated vegetables, 7 wild greens, 2 cereals, 6 pulses, and more than 20 fruits and roots are still used in Western Kenya households. Historical and contemporary literature alike affirm that indigenous crops are often more resilient under climate stress and are more culturally embedded in local foodways than imported alternatives [4,9]. Nevertheless, pressures from monoculture expansion, market-driven agriculture, and demographic shifts are leading to the erosion of this critical agrobiodiversity. This erosion threatens not only food and nutritional security but also intergenerational knowledge systems and ecosystem resilience. Muli [5] emphasizes the urgency of repositioning indigenous food systems within national climate adaptation strategies. She argues for a multisectoral approach that combines ethnobotanical

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research, seed sovereignty, value chain development, and integration into formal education and nutrition programs. Such frameworks are essential for safeguarding local agro-ecological resources and achieving equitable climate resilience. In lig value of indigenous food systems as central pillars in Kenya's sustainable food future.

MATERIALS AND METHODS

Study site the study was conducted in Ikolomani Division Western Kenya.

Study Population and Sampling A sample of 211 households was randomly selected for the study with the assistance of the Ministry of Agriculture's divisional Agricultural officers. Multi-stage simple random sampling was used to select locations, sub locations and households. A random sample of 35 households per sub location was done to select the study population.

Data collection to determine indigenous crops and their role in household food security, the study used a pre-tested semi structured questionnaire, interview guide schedule, direct observations, Ranking and scoring techniques and focus group discussions as well as interviews.

Data analysis the questionnaires, KII guide and observation check lists generated both qualitative and quantitative data. Quantitative data were organized and analyzed statistically by use of frequency tables, means and percentages. Simple regression analysis and analysis of variance (ANOVA) were used to determine the association between indigenous crops and household food security. The significance was accepted at 5% probability level ($P<0.05$). The Statically Package for Social Sciences (SPSS) computer software version 26. VO was used to generate the descriptive data.

RESULTS AND DISCUSSION

Preference and Ranking of Indigenous Vegetables Households in Ikolomani grew a variety of indigenous vegetables for home consumption and income generation. Vegetables were the most cultivated and utilized among all indigenous crops. Eleven (11) indigenous vegetables were identified through focus group discussions. In the order of priority, these were; Jew's marrow (*Corchorus spp*), African nightshade (*Solanum nigrum*), cowpea leaves (*Vigna unguiculata*), amaranths (*Amaranthus spp*), spider plant (*Cleome gynandra*), *Crotalaria spp*, Ethiopia kale (*Brassica carinata*) and pumpkin leaves (*Cucurbita spp*). Others were African vine spinach (*Basela alba*), *Colocasia spp* and *Capsicum spp*. African vine spinach (*Basela alba*), was semi domesticated. Ranking vegetables on taste criteria revealed that *Corchorus spp* was the most preferred in taste followed by *Solanum nigrum* and *Vigna unguiculata*. The others, in order of taste preference were; *Amaranthus spp*, *Cleome gynandra*, *Crotalaria spp*, *Brassica carinata*, *Cucurbita spp* and *Basela alba*. *Capsicum spp*. was the least preferred in taste **(Table 1)**. On high market value, *Corchorus spp Cleome gynandra* and *Solanum nigrum* were the most popular. The others were *V. unguiculata*, *Amaranthus spp*, *Crotalaria spp*., *Brassica carinata* and *Cucurbita spp*. in order of preference. The least preferred in marketability were *Basela alba*, *Colocasia esculenta* and *Capsicum spp*. *Cleome gynandra* and *Crotalaria spp*. were the most popular drought tolerant indigenous vegetables. These were followed by *Vigna unguiculata*, *Solanum nigrum* and *Brassica carinata*. The others, in order of priority, were; *Corchorus spp*, *Amaranthus spp*, and *Cucurbita spp*. The least preferred were *Basela alba* and *Capsicum spp*. The most preferred indigenous vegetable on easy to cook criteria was *Corchorus spp*. and *Amaranthus spp*. This was followed by *Vigna unguiculata*, *Solanum nigrum*, *Brassica carinata*, *Cucurbita spp*. and *Basela alba*. The least preferred were *Colocasia esculenta* and *Capsicum spp*. *Amaranthus spp*. and *Corchorus spp*. were the most popular on being cooked in many dishes. These were followed by *Vigna unguiculata*, *Solanum nigrum*, *Cleome gynandra*, *Crotalaria spp* and *Brassica carinata*. The others were *Cucurbita spp* and *Basela alba*. The least preferred in being cooked in few dishes were *Colocasia esculenta* and *Capsicum spp*. These leafy vegetables were stewed and eaten with maize meal, a favorite dish among the residents of the division. For course vegetables, a bicarbonate of soda prepared from burnt banana or beans' peelings was added to soften the sauce to make dishes appetizing.

Table 1. Ranking and Scoring of Wild vegetables Grown in Ikolomani.

Species	Criteria and rank						
	Taste	High market value	Drought tolerant	Easy to cook	Cooked in many dishes	Score	Rank
Triumfeta spp	2	1	3	2	1	9	1
Erythroccoca fischeri	1	1	3	1	1	7	2
Sesamum calycimum	1	1	3	1	1	7	2
Agystasia gangetica	1	1	3	1	1	7	2
Cleome hirta	1	1	2	1	1	6	5
Corchorus spp	1	1	2	1	1	6	5
Camelina benghalensis	1	1	2	1	1	6	5

The study also identified seven wild vegetables found in Ikolomani Division **(Table 2)**. In order of priority, these were *Triumfeta spp*., *Erythroccoca fischeri*, *Sesam calycinum*, *Agystasia gangetica* and *Cleome hirta*. The others were *Corchorus spp* and *Camelina benghalensis*. The wild vegetable was consumed rarely especially during a serious food crisis such as severe drought. **Tables 1 & 2** presented gives a summary of the ranking and scoring of wild vegetables grown in Ikolomani and the preference ranking of cultivated vegetables in Ikolomani division.

Table 2. Preference ranking of cultivated vegetables in Ikolomani division.

Vegetable species	Criteria and rank						
	Taste	High market value	Drought tolerant	Easy to cook	Cooked in many dishes	Taste	High market value
Vigna unguiculata	4	3	3	3	3	16	3
Corchorus spp	5	4	2	4	4	19	1
Solanum nigrum	4	4	3	3	3	17	2
Amaranthus spp	3	3	2	4	4	16	3
Cleome gynandra	2	4	4	2	3	15	5
Crotalarias pp	2	3	4	2	3	14	6
Brassica carinata	2	2	3	3	3	13	7
Cucurbita spp	2	2	2	3	2	9	8
Basela alba	1	1	1	3	2	8	9
Colocasia esculenta	1	1	2	1	1	6	10
Capsicum spp	1	1	1	1	1	5	11

Factors Influencing the Consumption of Indigenous Crops

Through FGDs and KII, respondents identified factors that promoted continued consumption of indigenous vegetables. The factors included good tastes such as *Solanum nigrum* and *Corchorus spp*, high market value such as *Solanum nigrum* and *Cleome spp* and drought tolerant such as *Cleome spp* and *Crotalaria spp*. *Amaranthus spp* was preferred due to its faster growth and higher yield. Factors that hindered the utilization of these indigenous vegetables were also identified. Such factors included low yields especially *Cleome spp* and Crotalaria, bitter taste such as *Cleome spp* and *Crotalaria spp* and long cooking periods such as *Cleome spp* and *Crotalaria spp*. The wild and semi domesticated vegetables were consumed mostly during period of food crises particularly drought. The most preferred wild indigenous vegetable was (*Triumfeta spp*).

Preference and Ranking of Indigenous Cereals and Legumes
Two indigenous cereals were identified in Ikolomani Division. In the order of prioritization, these were; finger millet (*Eleusine indica*) and sorghum (Sorghum bicolor). However, it was revealed that, a number of factors have hampered the full utilization of indigenous cereals in household food security. These factors included poor palatability, in case of sorghum, high labor requirement and difficulty in cooking dishes especially finger millet (*Eleusine indica*). They were preferred due to cultural attachment, tolerance to drought and stressful conditions. The study also identified six indigenous legumes cultivated and consumed in Ikolomani **(Table 3)**. In the order of preference, they were; beans (*Phaseolus vulgaris*), groundnuts (*Arachis hypogea*), bambara nuts (*Vigna subterranea*), cow pea seeds (*Vigna subterranea*), green grams (*Phaseolus aureus*) and (*Lagenaria spp*). Legumes were planted by 97 per cent of households. Individual group interviews established that they are mainly used as desert or stewed and eaten 7 with maize meal. *P. vulgaris* was the most popular in terms of contribution to household food. This was followed by *V. subterrenea*. The others, in the order of priority, were A. hypogea, *V. unguiculata*, *P. aureus* and *Lagenaria spp*. *A. hypogea* were the highest ranked for income preference. This was followed by *Phaseolus vulgaris*, *Vigna subterranea* and *Vigna unguiculata*. The others were *Phaseolus aureus* and *Lagenaria spp*. *P. vulgaris* and *V. hypogea* were the highest ranked with respect to high palatability followed by *V. subterranea* and *V. aureus*. *Lagenaria spp* was the least ranked with poor palatability. On high yielding criteria, *P. vulgaris* was the most preferred. The rest, in the order of preference, were; *A. hypogea*, *V. subterranea*, *V. unguiculata* and *P. aureus*. The least ranked indigenous legume on high yielding was *Lagenaria spp*. These legumes, it was revealed, are mainly used as desert. They are planted in uniform stand and are mainly sold in local markets. The focus group discussions identified pests and diseases and lack of poor planting seeds as major factors

undermining legume farming particularly beans in Ikolomani.

Table 3 below gives a summary of the ranking and scoring of legumes.

Table 3. Ranking and scoring of legumes grown in Ikolomani division western Kenya.

Species	Criteria and rank						
	Food	Income	Drought tolerant	Palatable	High yielding		
Phaseolus vulgaris	5	3	2	4	5	19	1
Arachis hypogea	2	4	3	4	3	16	2
Vigna subterranea	3	3	3	3	3	15	3
Vigna unguiculata	2	3	3	3	3	14	4
Phaseolus aureus	2	2	3	3	3	13	5
Lagenari aspp	2	2	3	2	2	11	6

Preference and Ranking of Indigenous Fruits

The study further identified seven indigenous fruits domesticated and another twelve (12) wild fruits the preferred indigenous fruits, in order of priority, were paw paw (*Papaya Carica*), mango (*Mangifera indica*), lemon (*Citrus spp*) and *Passiflora Spp*. This was followed by tree tomato (*Cyphomandra spp*), guava (*Psidium spp*) and loquart (*Eriobotyra japonica*). The group discussions revealed that fruits did not form a significant part of household diet. They were popular and consumed more by younger residents of Ikolomani division. Through observations, the fruits were grown in few stems around the homesteads. *Carica papaya* and *Curcubita spp* were the highest ranked domesticated indigenous fruits on food criteria. *Mangifera indica* and *Psidium guava* followed them. The rest, in order for priority, were *Citrus spp*, *Passiflora edulis, Cyphomandra betaceae, Psidium guava* and *Eriobotyra japonica*. On drought tolerance criteria, *Carica papaya*, *Mangifera indica*, *Citrus spp*. and *Cyphomandra betacea* were the most popular. The others, in order of priority, were, *Passiflora Spp*., *Psidium guava*, *Eriobotyra japonica* and *Cucurbita spp*. *Citrus spp* and *Passiflora edulis* was the most popular on taste followed by *Carica papaya* and *Mangifera indica*. The others were *Cyphomandra betacea*ce, *Psidium guava*, *Eriobotyra japonia* and *Cucurbitta spp*. On high yielding, *Carica papaya* was the most popular followed by *Cyphomandra betaceae* and *Cucurbita spp*. The others were *Mangifera indica*, *Citrus spp*, *Passiflora edulis*, and *Psidium guava* in order of preference. The least ranked indigenous fruit on high yielding was *Eriobotyra japonica*. The fruits were preferred for high-income generation and nutrition. Findings from observation revealed that most fruits were grown along the homesteads in a few stems. The preferred and commonly used fruits were paw paws, pumpkins and mangoes, which are eaten directly but the pumpkins are cooked. They are consumed and preferred most by children contributing very little to overall households' diet in Ikolomani. The study further identified eleven wild fruits found in Ikolomani **(Table 4)**. In order of priority they were *Psidium spp*, *Rubus Pedalus*, *Eriobotrya japonica* and *Sygygium subcordata*. The others were *Rhus vulgaris*, *Lannea chimperii*, *Solanacea spp*., *Lantana Carmara*, *Rubiacea spp*, *Pappea spp*. and *Piliostigma spp* Focus group discussions revealed that general cultivation and utilization of indigenous fruits had been on decline. Three factors were identified which hampered the cultivation and utilization of the fruits. These were lack of knowledge on nutritive 8 9 value of fruits, lack of planting seeds and reduced farm sizes. **Table 4** below gives a summary of the ranking and scoring of wild fruits grown in Ikolomani.

Table 4. Ranking and scoring of wild fruits grown in Ikolomani.

Species	Criteria and rank						
	Food	Income	Drought tolerant	Taste	High yielding	Score	Rank
Psidium guava	2	1	3	3	1	10	1
Rubus Pedalus	1	1	3	3	1	9	2
Eriobotrya japonica	1	1	3	3	1	9	2
Syzygium subcordata	1	1	3	1	1	7	4
Rhus vulgaris	1	1	3	1	1	7	4
Lannea chimperi	1	1	3	1	1	7	4
Solanacea spp	1	1	1	2	2	7	7
Lantana camara	1	1	2	1	1	6	7
Rubiacea spp	1	1	2	1	1	6	7
Pappea capensis	1	1	2	1	1	6	7
Piliostigma thoningii	1	1	2	1	1	6	7

Preference and Ranking of Indigenous Roots and Tubers

The study identified four main indigenous roots and tubers cultivated in Ikolomani Division, Kenya: sweet potatoes (*Ipomoea batatas*), yams (*Colocasia esculenta*), cassava (*Manihot esculenta*), and arrowroots (*Maranta arundinacea*). These were grown by approximately 11.4% of surveyed households. The crops were ranked based on five criteria: food value, income generation, drought tolerance, taste, and yield potential. **Table 5** presents a summary of the ranking results. Sweet potatoes (*Ipomoea batatas*) ranked highest across most categories including food value, income, taste, and yield. This is consistent with findings by the International Potato Center (CIP) and Kenya Agricultural and Livestock Research Organization (KALRO) [10], which have documented sweet potatoes as rich in beta-carotene and adaptable to poor soils and erratic rainfall [10,11]. Cassava (*Manihot esculenta*) and yams (*Colocasia esculenta*) were also valued for their high drought tolerance and moderate income returns, supporting earlier work by the World Food Programme [2] highlighting cassava's role in food security among smallholder farmers in Western Kenya. Arrowroots (*Maranta arundinacea*), although present, were ranked lowest due to their limited yield and market access. Sim sim (*Sesamum indicum*), an underutilized oilseed crop, was reported to have untapped potential, especially for household oil production and nutritional diversification [12].

Table 5. Ranking of roots and tubers according to preferences grown in Ikolomani.

Species	Criteria and Rank						
	Food	Income	Drought tolerant	Taste	High yielding	Score	Rank
Ipomea batatas	4	4	3	4	4	19	1
Manihot esculenta	3	3	4	2	4	16	2
Colocasia esculenta	3	2	3	3	3	14	3
Matanta arundinacea	2	1	4	1	2	10	4

Beyond roots and tubers, Ikolomani households depend significantly on indigenous leafy vegetables such as *Amaranthus spp*., *Solanum spp*., *Corchorus spp*., and *Vigna unguiculata*. These vegetables provide essential micronutrients like vitamins A and C, calcium, and iron, making them crucial for combating hidden hunger, especially among children and lactating mothers [1,13]. Wild indigenous vegetables still comprise 39% of total household vegetable consumption, largely collected from uncultivated land. These species include *Cucurbita maxima* (pumpkin leaves), *Basella alba* (Malabar spinach), and *Cleome gynandra* (African spider plant), known for their antioxidant properties and adaptation to local agro-ecological conditions [14,15]. Observation and key informant interviews revealed that most households cultivate these crops in kitchen gardens, demonstrating the vital role of home-based agrobiodiversity in dietary diversification and climate resilience [4]. Moreover, cereals such as sorghum 10 (Sorghum bicolor) are also common in Ikolomani, providing proteins, fiber, iron, and slow release carbohydrates, especially critical for food security during dry seasons [2]. Indigenous crops not only offer nutritional security but are increasingly recognized as pillars of climate adaptation strategies due to their resilience and low input requirements. Studies by Egerton University and Indigenous Knowledge Research Institute (IKRI) have confirmed that promoting these crops through value addition and seed preservation programs can enhance both household income and food system sustainability in Western Kenya [16,17].

CONCLUSIONS

This study reinforces the central role that indigenous food crops especially vegetables play in the food and nutrition security of communities in Ikolomani, Western Kenya. A total of eleven domesticated and seven wild vegetables, alongside indigenous cereals, pulses, fruits, and roots, were found to be in active use by households. Despite their high nutritional value, cultural significance, and ecological resilience, a large proportion of these indigenous crop remain underutilized, neglected, or threatened by environmental degradation, land-use change, and loss of traditional knowledge. The agro-biodiversity observed in Ikolomani not only contributes to household resilience against food shocks and climate variability but also supports sustainable ecological practices through reduced reliance on agro-chemicals and water. Traditional preparation techniques further enhance the bioavailability of nutrients and maintain the cultural continuity of food systems. However, commercialization and value-chain development for these crops are still lacking, limiting their broader economic impact. The findings also highlight an alarming trend of genetic erosion and diminishing ecological niches for wild species due to population pressure, deforestation, and climate change. This calls for urgent conservation strategies to preserve both biodiversity and traditional agricultural knowledge. By bridging indigenous practices with modern scientific insights, food systems can be diversified, localized, and made more resilient to climate shocks.

RECOMMENDATIONS

To leverage the full potential of indigenous vegetables and related food crops for climate adaptation and food security, the following strategies are recommended:

1. **Policy Integration and Institutional Support:** Indigenous crops should be formally recognized in agricultural policies and integrated into national and county-level food security frameworks, especially within climate-smart agriculture, school feeding programs, and nutrition initiatives.
2. **Community-Based Conservation and Domestication:** Establish on-farm conservation programs, seed banks, and training for the domestication of wild edible species. This will counter genetic erosion and ensure continuity of indigenous crop cultivation.
3. **Value Chain Development and Market Access:** Encourage smallholder farmers to commercialize indigenous vegetables by providing infrastructure, market information, and access to micro-financing. This would transform indigenous crops from subsistence level to income-generating commodities.
4. **Research and Documentation:** Support interdisciplinary research that validates the nutritional, medicinal, and ecological value of indigenous crops. Develop open-access databases and participatory documentation methods that include elders, women, and youth as knowledge custodians.
5. **Culinary and Nutritional Education:** Promote culinary innovation using traditional crops to appeal to younger generations. Integrate indigenous food preparation techniques into nutrition training, health campaigns, and gastronomy festivals.
6. **Climate Resilience Planning:** Utilize agro ecological zoning and climate vulnerability assessments to promote region-specific indigenous crops that align with local adaptation goals and ecological sustainability. Revitalizing indigenous food systems offers a low-cost, high-impact solution to multiple challenges including malnutrition, rural poverty, biodiversity loss, and climate vulnerability. This paper's outlook on Ikolomani's case provides a model for rural Kenya and similar agro 12 ecological zones in Sub-Saharan Africa to rethink their food systems through the lens of tradition, sustainability, and resilience.

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