

NO 9

October 2023

Cultivating resilience:

Promoting investment in
alternative agricultural
products for enhanced
food security in Kenya

RESEARCH
AGENDA

Key words:

dietary diversity

food systems

indigenous crops

Kenyan diet

Kenyan households

maize

millet

ugali

Author affiliations:

[1] Busara

[2] Busara

[3] Busara

Conflicts of interest:

There are no conflicts of interest to declare for this study.

Copyedited by:

Aarti Nair

Designed by:

Anthony Mogaka

Lynette Gow

Table of contents

Abbreviations and acronyms	4
Abstract.....	5
Introduction	6
History of the Kenyan diet.....	8
Current status of Kenyan household diets	10
Contributors that have led to the ascension of maize in Kenya.....	12
Challenges associated with maize as a staple food in Kenya.....	16
Exploring possible alternatives to maize	19
<i>Sorghum and millets</i>	19
<i>Sweet potato</i>	22
Efforts made to improve the consumption of sorghum, millets, and sweet potato in Kenya.....	23
Structural interventions	23
Behavioral interventions.....	24
Existing gaps in increasing demand for sorghum, millets, and sweet potato as alternatives to maize in Kenya	26
Proposal for a shift in Kenya's agricultural landscape	27
Diversification of crop production and consumption	27
Strengthening value chains.....	28
Consumer awareness and education.....	28
Policy reforms.....	29
Collaborative efforts	29
Why is that shift important?.....	30
Conclusion	31
References.....	32

Abbreviations and acronyms

FAO	Food and Agriculture Organization
NASEP	National Agricultural Sector Extension Program
USAID	United States Agency for International Development

Abstract

This position paper explores the importance of promoting investment in alternative agricultural products in Kenya to enhance food security and foster a resilient food system. The paper analyzes the current state of maize production and consumption in Kenya, compares it to neighboring countries, and delves into the challenges and inefficiencies of maize cultivation and transforming household diets. In it we examine comparable crops within Kenya and East Africa and highlight potential solutions to the issues plaguing maize production and consumption. We then delve into the dietary diversity of Kenyan households, examining its evolution over time to pinpoint the driving factors around the unchanging demand for calorie dense foods like maize. Through this paper we propose a paradigm shift towards a diversified food system and assess past structural and behavioral interventions, identifying gaps that require attention.



Introduction

To truly grasp the potential alternatives to maize within Kenya, a deep comprehension of the nation's household dietary patterns is paramount. These patterns are intrinsically linked to the health and vitality of the population, Kenya's rich cultural heritage, economic dynamics, and the influence of its natural environment. Since colonial times, what people eat in Kenya has changed a lot. However, one thing has remained consistent: maize has been central to it. Improved nutrition is a core concept in development dialogues alongside priorities such as poverty eradication, health, education and food security.¹ Consequently, mounting apprehensions surround the escalating reliance on maize within the Kenyan diet and the ensuing reduction in dietary diversity, posing a significant threat to food security.

This paper aims to provide a comprehensive overview of the current state of the Kenyan diet, how it has evolved, and how it compares to traditional dietary patterns in comparison to the East African region. We will explore the factors contributing to these changes, what has remained constant, and why. Furthermore, we will discuss what needs to shift in the Kenyan diet. We will examine structural and behavioral interventions that have been put into effect and identify the gaps that need to be addressed to foster a

¹ Evelyne, K., & Franklin, A. (2019)

Cultivating resilience: Promoting investment in alternative agricultural products for enhanced food security in Kenya

more sustainable food system. By looking at this, we aim to highlight the importance of a diverse diet and explore alternatives to maize, stressing the need for new approaches to diversify what people eat in Kenya.



History of the Kenyan diet

The traditional Kenyan diet was rich in locally sourced foods, each with its own set of nutritional benefits and cultural significance. Before the introduction and subsequent dominance of maize, the diet was largely based on indigenous grains like millet and sorghum. These grains were well-adapted to the local climate and soil conditions, requiring less water and being more resistant to pests than maize.² Millet and sorghum were often grounded into flour and used to make various dishes, including solid and liquid porridges and flatbreads.

In addition to grains, legumes such as cowpeas and green grams were commonly consumed, providing essential proteins and nutrients. Root vegetables like yams, sweet potatoes, and cassava were also staples, especially in regions where grains were hard to cultivate. These root crops were nutrient-dense and highly resilient, capable of growing in less-than-ideal soil conditions.³

This traditional diet not only resulted from the availability of resources but also mirrored cultural and social norms. Food was often grown, collected, hunted, and prepared communally, and meals were social events that

² Orr et al. (2020)

³ Orr & Muange, (2022)

brought families and communities together. The diversity of foods consumed also had health implications, as the varied diet provided a range of essential nutrients, contributing to overall well-being.⁴

Therefore, the shift towards a maize-dominant diet represented a significant departure from these traditional eating patterns. The introduction of maize and its rapid adoption, fueled by colonial and post-colonial agricultural policies, led to a decline in the cultivation and consumption of indigenous grains and other traditional foods.⁵ Over time, this has had implications for the Kenyan people's health and cultural identity.

Today, there is a growing awareness of the need to diversify the Kenyan diet for nutritional and ecological reasons.⁶ Yet, the journey from a diverse, indigenous food system to a maize-dominant one is a cautionary tale, illustrating the long-lasting impact of cultural, economic, and political decisions on a nation's diet.

4 Orr & Muange, (2022)

5 Schipmann-Schwarze & Qaim (2013); McCann (2005)

6 Orr & Muange, (2022)



Current status of Kenyan household diets

Kenyan household diets exhibit limited diversity. Recent data from the Food and Agriculture Organization of the United Nations reveals an average dietary diversity score of 29.9 for Kenyan households, placing it in the low category. Such restricted dietary variety raises concerns about potential nutrient deficiencies. Alarming, this trend is not new; research from the University of Nairobi indicates a decline in the dietary diversity of Kenyan households over the years. Specifically, their score dipped from 33.3 in 1993 to 29.9 in 2015.⁷ This downward trajectory underscores an urgent need for intervention to ensure comprehensive nutritional intake.

Amidst this backdrop of declining dietary diversity, maize emerged as the dominant staple, accounting for a significant portion of daily caloric intake for most households. Its prominence is largely confined to Kenya compared to the broader East African region. Specifically, maize accounts for approximately 65% of the total caloric intake in Kenya, compared to around 45% in Tanzania and 30% in Uganda.⁸ In Uganda, maize is not a traditional food component and is largely considered a cash crop, so they often export their maize to Kenya while their production levels increase (based on official

⁷ Evelyne, K., & Franklin, A. (2019)

⁸ USAID-KAVES (2015)

channels).⁹ In Tanzania, maize is also a staple food, but 65-80% of the country's maize is consumed by those who produce it.¹⁰ Tanzania is not in a negative balance between supply and demand for maize and is a major exporter of the crop within Africa, unlike Kenya; however, many parts of the maize value chain in both Uganda and Tanzania are unregulated.¹¹

The decline in dietary diversity in Kenya is a pressing concern, intensified by economic, social, cultural, and environmental factors. The rising cost of food and urbanization have made maize an affordable and easily accessible staple, increasingly dominant in Kenyan diets. The lack of dietary diversity is further fueled by urbanization, a cultural preference for processed foods and a loss of biodiversity, which limits access to various traditional foods. As a result, maize has become the primary food source and stands out in comparison to other East African countries for its level of consumption. This over-reliance on maize poses risks to nutritional health and food security, highlighting the urgent need for diversified food options that are both nutrient-rich and resilient to climate change.¹²

9 Daly et al. (2016)

10 Wilson & Lewis (2015)

11 Daly et al. (2016); FEWS NET (2022); Wilson & Lewis (2015)

12 Evelyne, K., & Franklin, A. (2019); USAID-KAVES (2015); Schipmann-Schwarze & Qaim (2013); Thornton & Lipper (2014); Midega et al. (2018); Orr & Muange (2022)



Contributors that have led to the ascension of maize in Kenya

The centrality of maize in the Kenyan diet is undeniable, shaping not only culinary habits but also cultural and societal norms. The enduring prominence of maize in the Kenyan diet is deeply rooted in a complex tapestry of historical, economic, cultural, and environmental factors that collectively contribute to its widespread acceptance and consumption across diverse communities.

Historically, European settlers introduced maize to Kenya during the colonial era. The colonial administration actively promoted maize farming through agricultural policies that favored its cultivation over indigenous crops like sorghum and millets. These policies often provided subsidies and better market access for maize, positioning it as a superior crop for subsistence and commercial farming.¹³ This led to a significant shift not only in agricultural practices but also in Kenya's cultural and culinary landscape.

Economically, maize offers several advantages that have contributed to its widespread adoption. It is a high-yielding crop that provides a substantial amount of produce per acre, making it an efficient land-use. Its relatively low cost of production and high caloric density make it an accessible and

¹³ Schipmann-Schwarze & Qaim (2013)

attractive option for farmers and consumers. The versatility of maize in Kenyan cuisine, most notably in the form of 'ugali', a type of maize porridge, has further solidified its central role in the diet.¹⁴

Culturally, maize has transcended its role as a mere food item to become a symbol of Kenyan identity and unity. Dishes made from maize, like 'ugali,' are not just everyday meals but are also served during communal gatherings, ceremonies, and rituals, reinforcing its cultural significance.¹⁵ This has created a societal norm where maize is considered indispensable, often at the expense of other, more nutritionally diverse foods.

From an environmental perspective, maize is adaptable to various ecological zones in Kenya, from the highlands to the lowlands. This adaptability has made it a go-to crop for many farmers. However, this widespread cultivation of maize has had environmental repercussions, including soil nutrient depletion and increased susceptibility to pests like the Fall Armyworm.¹⁶

Moreover, the policy focus on maize has led to research and development efforts that have produced high-yielding and disease-resistant maize varieties, further boosting its production. However, this focus has often

14 Sihanya (2016)

15 McCann (2005)

16 Midega et al. (2018)



come at the expense of research into indigenous crops like sorghum and millets, which are more resilient to the adverse effects of climate change but have been marginalized in agricultural policies and practices.¹⁷

The above factors have led to a preference for maize at the national level. Similarly at the household level, consumption is enabled by:

- **Availability:** Maize is readily available in most parts of Kenya, making it a convenient option for households. Its widespread cultivation across different agroecological zones ensures a consistent supply, guaranteeing its presence in local markets year-round.¹⁸
- **Affordability:** Maize is generally more affordable compared to other food crops, making it more accessible for low-income households. Its cost-effectiveness is a significant factor in widespread consumption, especially in economically constrained contexts.¹⁹
- **Versatility:** The culinary versatility of maize is another reason for its popularity. It can be prepared in various forms, such as boiled, roasted, or ground into flour for making 'ugali,' and maize porridge. This adaptability suits different meals and culinary traditions.²⁰

17 Orr et al. (2020)

18 Ouma, J. O. (2017)

19 Ouma et al. (2019)

20 Sihanya (2016)

- **Awareness or misconception of nutritional value:** Maize provides essential calories but lacks certain nutrients that are found in alternative crops such as sorghum, millets and sweet potatoes. However, the general perception is that maize is nutritious enough to be a standalone staple, partly due to a lack of awareness about the nutritional benefits of diversifying diets.²¹

²¹ Evelyne, & Franklin (2019)



Challenges associated with maize as a staple food in Kenya

While maize is a cornerstone of Kenya's food system, its position as the dominant staple food raises several sustainability and nutritional concerns. According to the Food and Agriculture Organization,²² Kenya's maize production stood at approximately 3.6 million tonnes in 2018. However, this production level often needs to catch up to the national demand, estimated at around 4.2 million tonnes annually.²³ The deficit is exacerbated by a range of challenges that influence its cultivation and impact food security. These challenges include climate change, pest and disease pressures, soil degradation concerns, limitations in accessing quality inputs and population growth. Each of these challenges holds significant implications for maize production, warranting a closer examination to foster sustainable strategies for future food security.

Climate change: Maize in Kenya is primarily rainfed. The unpredictability of weather caused by climate change disrupts maize cultivation cycles. Droughts and erratic rainfall, in particular, have become more frequent, leading to fluctuating yields and even crop failures, posing severe threats to

²² FAO (2019)

²³ USAID-KAVES (2015)

food security in the country.²⁴ This calls for agriculture adaptation strategies such as crop diversification shifting to drought-resistant crops such as sweet potatoes, sorghum, and millet.

Furthermore, the escalating demand for maize exerts pressure on the same land resources, leading to unsustainable agricultural practices. In response to the rising need for cultivable land, there is a risk of encroaching upon forested areas, leading to deforestation. This contributes to climate change and disrupts local ecosystems, affecting biodiversity and water cycles.²⁵ The loss of forest cover further exacerbates the challenges of climate change, making agriculture even more vulnerable to weather extremes.

Nutrient deficiencies: Over-reliance on maize has led to a decline in dietary diversity, contributing to nutrient deficiencies. While calorie-dense, maize lacks specific essential nutrients like amino acids, vitamins, and minerals.²⁶ Lack of such nutrients poses food security concerns, which affects public health.

Impact of pests & diseases on soil health: New and recurring threats, notably the maize lethal necrosis disease and armyworms constantly

24 Thornton & Lipper (2014)

25 Thornton & Lipper (2014)

26 Evelyne, & Franklin (2019)



threaten maize production.²⁷ Moreover, the chemicals used to combat these pests and diseases can harm human health if not properly applied and negatively impact soil health. Combined with years of intensive maize farming, continuous monoculture has expedited nutrient depletion and altered soil structures. To combat this degradation, it is imperative to adopt sustainable practices, such as crop rotation, incorporating organic matter, and optimizing fertilizer usage, to rejuvenate and preserve soil fertility.²⁸

²⁷ NASEP (2019)

²⁸ Muriuki et al. (2016)

Exploring possible alternatives to maize

While maize has historically held a central role in Kenya's diet, it is prudent to consider alternatives that can address emerging challenges and harness untapped potential. For several compelling reasons, sorghum, millets, and sweet potato emerge as promising contenders. These alternatives possess attributes that align with the region's changing climate patterns, nutritional needs, and economic demands. Their resilience to climate uncertainties, enhanced nutritional profiles, and adaptability to diverse culinary practices position them as worthy contenders to substitute maize in diversified diets. By examining these alternatives, we shed light on their capacity to mitigate challenges and contribute to the robustness of local food systems, paving the way for more resilient and sustainable agricultural practices.

Sorghum and millets

The global production of sorghum and millets has experienced a decline in recent decades; nevertheless, their cultivation in Africa, especially sorghum, has witnessed remarkable growth, with African sorghum production doubling since 1980 and millet production rising from 8 to 14 million metric tons.²⁹ While these grains remain staple foods in Africa, they have largely been relegated to animal feed or food processing roles in other parts of the

²⁹ Orr et al. (2020)



world.³⁰ However, despite their crucial role in local diets, the profitability of maize has overshadowed sorghum and millet cultivation, leading to an imbalance between demand and supply.³¹

Farmers often view sorghum and millets as insurance crops, in case maize production fails. Other consumers are beginning to view the two indigenous grains as complementary to maize rather than substitute.³² Sorghum and millets are often used in beer brewing, flour milling, and animal feed.³³ In Kenya, sorghum is mostly used in beer brewing; in Uganda and Tanzania, sorghum is mostly commercialized for flour.³⁴ The commercialization of the two grains is limited, however, since only 6% of sorghum and 11% of millets produced become beer, flour, or animal feed.³⁵ For sorghum, farming households that produce the crop are mostly subsistence farmers in regions of high poverty and high climate vulnerability and are not commercial-oriented.³⁶ The profile of farmers growing millets is likely similar to that of sorghum.

An intrinsic advantage of sorghum and millets lies in their resilience to changing climatic conditions. Their drought and heat resistance make

30 Orr et al. (2020)

31 Hambloch et al. (2020); Schipmann-Schwarze et al. (2015)

32 Orr et al. (2020)

33 Hambloch et al. (2020); Orr & Muange (2021)

34 Hambloch et al. (2020)

35 Orr & Muange (2021)

36 Hambloch et al. (2020)

them well-suited to the challenges posed by rising temperatures and uncertain rainfall patterns associated with climate change.³⁷ As climate change affects maize production due to reduced rainfall, these indigenous crops are viable replacements. Their adaptability is further enhanced by implementing new farming techniques, such as microdosing with inorganic fertilizers.³⁸ Furthermore, using improved or diverse seed varieties for sorghum and millet holds the promise of bolstering yields, consumption, and storage.³⁹

Another compelling advantage of sorghum and millets is their culinary versatility, which allows them to serve as direct substitutes for maize in traditional meals. For instance, they can be used to prepare ‘ugali’, a staple food in Kenya, offering a nutritious alternative to the maize-based version. Specifically, millet can be combined with cassava to make “brown ugali”, a variant that is not only flavorful but also rich in nutrients. Similarly, sorghum and millet can be used to make porridge, providing a more nutrient-dense option than maize-based porridge. This versatility makes the transition from maize to sorghum and millets more feasible at the household level, as it does not require a drastic change in eating habits.⁴⁰

37 Orr et al. (2020); Silungwe et al. (2019)

38 Orr et al. (2020); Silungwe et al. (2019)

39 Otieno et al. (2022)

40 Sihanya (2016); Orr et al. (2020); Schmidt (2020)



Sweet potato

In the realm of underutilized and drought-resistant crops, sweet potato takes center stage in Africa. Its significance is particularly evident in Uganda, where it caters to the needs of small rural farms. Sweet potato boasts a shorter maturity period, lower labor requirements, and higher nutritional content than other staple crops.⁴¹ Notably, its rich b-carotene content positions it as a potential solution to combat vitamin A deficiency, a prevalent health concern in sub-Saharan Africa.⁴² With superior nutritional profiles encompassing vitamins, minerals, dietary fiber, and protein compared to many carbohydrates,⁴³ sweet potato offers a multi-faceted contribution to diets.

Despite its potential, challenges persist in the sweet potato value chain. Most sweet potato production in East Africa remains small, and the lack of organized value chains hinders its optimization. Issues associated with inadequate storage facilities, transaction costs, and a lack of farmer education on proper postharvest practices contribute to inefficiencies and losses.⁴⁴ While the demand for sweet potato does not exhibit a pronounced upward trend, pursuing healthier, nutritionally rich, and sustainable food alternatives aligns with sweet potato's potential contributions.

41 Motsa et al. (2015); Young et al. (2020)

42 Young et al. (2020)

43 Motsa et al. (2015)

44 Juma (2019); Mmasa (2023); Onyango et al. (2022); Shee et al. (2019)

Efforts made to improve the consumption of sorghum, millets, and sweet potato in Kenya

In the face of changing climate patterns and the need for more resilient and nutritious food systems, Kenya has been exploring alternatives to its staple food, maize. Sorghum, millets, and sweet potato emerge as promising candidates due to their nutritional benefits and adaptability to diverse climatic conditions. Various structural and behavioral interventions have been implemented to encourage the consumption of these crops.

Structural interventions

Research and Development: Investments have been made to develop high-yielding and disease-resistant varieties of these crops. For instance, research into sorghum and millets has shown returns of \$38-59 for every dollar invested in Tanzania and Uganda, while millets gave a return of \$48.⁴⁵

Value Chain Development: Initiatives like the Scaling up Sweetpotato through Agriculture and Nutrition (SUSTAIN) program aim to strengthen the

⁴⁵ Orr et al. (2020)



entire value chain, from production to marketing. This includes introducing value-added products like sweet potato puree and crisps to the market.⁴⁶

Infrastructure: Efforts are being made to improve post-harvest handling and storage facilities, especially for crops like sweet potato, which have a shorter shelf life. Lack of proper storage facilities often leads to post-harvest losses, reducing the economic viability of these alternative crops. Initiatives are being implemented to build modern storage facilities, improve transportation logistics, and introduce technologies like solar dryers to extend the shelf life of these crops.⁴⁷

Behavioral interventions

Awareness campaigns: Campaigns have been launched to educate the public about the nutritional benefits of sorghum, millets, and sweet potato. For example, there is evidence that increasing awareness through TV, radio, and schools can boost demand for these crops.⁴⁸

Market strategies: The commercialization of sorghum into beer, where Senator Keg became Kenya's top selling beer in six years, and the

46 Juma (2019)

47 Juma (2019)

48 Schipmann-Schwarze et al. (2013)

utilization of millet flour as weaning food successfully created a profit.⁴⁹ Through well-thought marketing strategies sorghum and millet can change consumer perceptions and shift the Kenyan diet from maize to sustainable alternatives.

Diet diversification programs: Initiatives like Smart Food work towards diversifying staple foods in Kenya, emphasizing these alternative crops' nutritional and environmental benefits.⁵⁰

49 Orr & Muange (2022)

50 Siambi (2019)



Existing gaps in increasing demand for sorghum, millets, and sweet potato as alternatives to maize in Kenya

Despite efforts to improve the consumption of sorghum, millets, and sweet potato in Kenya as alternatives to maize, these face several challenges. Firstly, there is a significant knowledge gap; while most Kenyans know these crops, many are unfamiliar with their nutritional benefits or diverse culinary uses.⁵¹ Urbanization is also a contributing factor to the knowledge gap identified. Secondly, these crops are less commercialized than maize, limiting their availability in markets and making them less affordable.⁵² Current commercialization efforts frequently neglect the requirements of small-scale farmers, showing a preference for larger producers and potentially marginalizing a substantial segment of traditional growers.⁵³ Additionally, there is a cultural preference for maize, deeply rooted in Kenyan diets, which poses a challenge for introducing alternative staples.⁵⁴ Lastly, post-harvest handling and storage for crops like sweet potatoes remain problematic due to their shorter shelf life and inadequate storage facilities.⁵⁵

51 Schipmann-Schwarze et al. (2013)

52 Orr & Muange (2022)

53 Hambloch et al. (2020)

54 Ouma (2017)

55 Juma (2019)

Proposal for a shift in Kenya's agricultural landscape

From the threats of climate change to pests and diseases, the need for diversification has never been more pressing. Sorghum, millets, and sweet potato present themselves as viable alternatives, not just for their resilience but also for their nutritional benefits. This proposal outlines the necessary shifts in Kenya's agricultural and dietary landscape and the reasons underpinning these changes.

Diversification of crop production and consumption

Rationale: Diversifying crop production reduces the risks associated with climate change, pests, and diseases that predominantly affect maize. Sorghum and millets, being drought-resistant, can thrive in regions with erratic rainfall, ensuring food security even in adverse conditions.⁵⁶ Further, having a variety of crops as a farmer promotes soil health, pest and disease control and risk diversification minimizing losses attributed to solely relying on maize production.

⁵⁶ Orr et al. (2020)



Action: Invest in research and development to improve sorghum, millets, and sweet potato yield and resilience. Encourage farmers to incorporate these crops into their farming systems through training and incentives.

Strengthening Value Chains

Rationale: A robust value chain ensures that crops like sorghum, millets, and sweet potato are not just grown but also processed, stored, and marketed efficiently.⁵⁷

Action: Develop infrastructure for post-harvest handling and storage, especially for crops like sweet potato. Encourage private sector investment in processing facilities that will promote the commercialization of these crops.

Consumer Awareness and Education

Rationale: For a shift in consumption patterns, consumers need to be aware of alternative crops' nutritional and environmental benefits.⁵⁸

Action: Launch nationwide campaigns promoting the health benefits of sorghum, millet, and sweet potato. Introduce these crops into school feeding programs, ensuring the younger generation develops a taste for them. Setting

⁵⁷ Juma (2019)

⁵⁸ Schipmann-Schwarze et al. (2013)

up health education TV programs where certified health professionals/nutritionists educate the masses on why indigenous foods are nutritious and essential to our development will encourage consumption.

Policy Reforms

Rationale: Current agricultural policies heavily favor maize. A shift requires policy reforms that support the cultivation, processing, and marketing of alternative crops.

Action: Review and amend agricultural policies to provide subsidies, grants, or low-interest loans for farmers cultivating sorghum, millets, and sweet potatoes. Ensure that these crops are included in national food security strategies.

Collaborative Efforts

Rationale: The shift towards alternative crops requires a collaborative effort involving farmers, researchers, policymakers, and consumers.

Action: Establish platforms where stakeholders can collaborate on research, share best practices, and develop strategies to promote alternative crops.



Why is this shift important?

Cultural preservation: While maize has cultural significance, sorghum and millets are indigenous to Africa. Promoting their consumption can also help preserve and revive cultural traditions associated with these grains.

Nutritional security: Sorghum, millets, and sweet potato offer diverse nutrients, addressing potential deficiencies in diets dominated by maize.⁵⁹

Economic resilience: Diversifying crop production can provide economic stability for farmers, especially when one crop faces market or environmental challenges.

Environmental sustainability: These alternative crops, especially sweet potato, have a lower water footprint compared to maize, making them more sustainable in the face of climate change.⁶⁰

⁵⁹ Orr et al. (2020)

⁶⁰ Young et al. (2020)

Conclusion

Kenya stands at a crossroads, with the challenges facing maize production offering an opportunity to rethink its agricultural and dietary priorities. The shift towards sorghum, millets, and sweet potato is not just a matter of food security but also of health, economic resilience, and environmental sustainability. By embracing these crops, Kenya can chart a path towards a more diverse, resilient, and nutritious food future. The time for change is now, and with collaborative efforts, a holistic approach, and a vision for the future, Kenya can lead the way in showcasing the benefits of agricultural diversification.



References

1. Daly, M., Fatunbi, A. O., & Okoboi, G. (2016). Cross-Border Maize Trade in East Africa. USAID Kenya and East Africa Trade and Investment Hub.
2. Evelyne, K., & Franklin, A. (2019). Agricultural market access and dietary diversity in Kenya: Gender considerations towards improved household nutritional outcomes. Retrieve. <https://repository.kippra.or.ke/bitstream/handle/123456789/2776/kihiu%202.pdf?sequence=5&isAllowed=y>
3. FAO. (2019). FAOSTAT. Food and Agriculture Organization of the United Nations.
4. Hambloch, C., Kornher, L., & Kalkuhl, M. (2020). Price transmission and market integration for cereals in developing countries. *World Development*, 133, 105002.
5. Juma, C. (2019). *The new harvest: Agricultural innovation in Africa*. Oxford University Press.
6. Kariuki, W. M., & Nyikal, R. A. (2020). Challenges of Smallholder Farmers' Access to Farm Machinery: The Case of Mwea Irrigation Scheme, Kenya. *International Journal of Agricultural Extension and Rural Development Studies*, 7(2), 29-36.
7. McCann, J. C. (2005). *Maize and Grace: Africa's Encounter with a New World Crop, 1500-2000*. Harvard University Press.
8. Midega, C. A., Pittchar, J. O., Pickett, J. A., Hailu, G. W., & Khan, Z. R. (2018). A climate-adapted push-pull system effectively controls fall armyworm, *Spodoptera frugiperda* (J E Smith), in maize in East Africa. *Crop Protection*, 105, 10-15.
9. Muriuki, A. W., Mati, B. M., & Home, P. G. (2016). Assessing Soil Nutrient Depletion and Fertility Status in Smallholder Farms of Laikipia County, Kenya. *Journal of Agricultural Science and Technology*, 18, 1347-1365.
10. NASEP (2019). *Addressing Pest and Disease Challenges in Maize Cultivation*. National Agricultural Extension Program.

11. Orr, A., & Muange, E. (2022). Exploring the potential of sorghum and millets for healthy and resilient food systems in East Africa. *Food Security*, 14(1), 3-20.
12. Orr, A., Mwema, C., Gierend, A., & Nedumaran, S. (2020). Sorghum and millets in Eastern and Southern Africa. Facts, trends and outlook. ICRISAT.
13. Ouma, J. O. (2017). Maize production and consumption trends in Kenya. *Journal of Agricultural Studies*, 5(1), 90-103.
14. Ouma, J. P., De Groote, H., Owuor, G., Danda, M. K., & Muhammad, L. (2019). Impact of credit access on maize productivity and income of smallholder farmers in Kenya. *Food Security*, 11(1), 59-72.
15. Schipmann-Schwarze, C., & Qaim, M. (2013). Modern food retailers and traditional markets in developing countries: Comparing quality, prices, and competition strategies in Kenya. *Food Policy*, 38, 294-302.
16. Schipmann-Schwarze, C., Orr, A., & Mulinge, W. (2013). Consumer demand for sorghum and millets in Kenya and India. *International Sorghum and Millets Newsletter*, 54, 143-147.
17. Schmidt, Mario. 2020. Being one while being many – social and culinary parts and wholes in western Kenya. *Food, Culture and Society* 23 (4): 472-488.
18. Sihanya, G. (2016). Maize and Grace: Understanding the 'Ugali' Culture in Kenya. *Journal of African Cultural Studies*, 28(3), 300-312.
19. Siambi, M. (2019). Smart food in East Africa: harnessing the power of markets, innovation, and nutrition. *Global Food Security*, 23, 58-63.
20. Thornton, P. K., & Lipper, L. (2014). How does climate change alter agricultural strategies to support food security? In *Climate change impact and adaptation in agricultural systems* (pp. 151-165). Springer.
21. USAID-KAVES. (2015). Kenya Agricultural Value Chain Enterprises. United States Agency for International Development.
22. World Bank. (2020). Agriculture in Africa: Telling myths from facts. World Bank Publications.



About Busara

Busara is a research and advisory organization, working with researchers and organizations to advance and apply behavioral science in pursuit of poverty alleviation. Busara pursues a future where global human development activities respond to people's lived experience; value knowledge generated in the context it is applied; and promote culturally appropriate and inclusive practices. To accomplish this, we practice and promote behavioral science in ways that center and value the perspectives of respondents; expand the practice of research where it is applied; and build networks, processes, and tools that increase the competence of practitioners and researchers.

About Busara Groundwork

Busara Groundwork lays the groundwork for future research and program design. As think pieces, they examine the current state of knowledge and what is needed to advance it, frame important issues with a behavioral perspective, or put forward background information on a specific context.

How to cite:

Muthike, Wairimu; Schmidt, Mario; Muriithi, Mugambi. *Cultivating resilience: Promoting investment in alternative agricultural products for enhanced food security in Kenya*. Busara Groundwork No. 9 (Research Agenda). Nairobi: Busara, 2024. DOI: doi.org/10.62372/NSGK1147

38 Applecross Road,
Lavington, Nairobi, Kenya
www.busara.global

