



An Agri-Food Systems Analysis to Establish a Supportive Environment for Kenya's Flour Blending Policy

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Executive Summary

Kenya's forthcoming national flour blending policy mandates the incorporation of at least 10% of traditional high-value crops, such as sorghum and millet, into maize flour. This policy represents a significant shift in the country's food system, with the potential to drive increased demand for these drought-tolerant crops, promote agricultural diversification, and enhance food security. Taking an agri-food systems perspective, this study provides a critical analysis of the policy, identifying key constraints, knowledge gaps, and leverage points necessary for its successful implementation.

The policy's successful adoption hinges on a coordinated, multi-sectoral approach across different domains of the agri-food system. Agricultural production systems, market structures, processing capacities, and consumer preferences must be aligned to ensure that the scaling of blended flours is feasible

and sustainable. Additionally, the policy has the potential to disrupt the existing maize value chain, with potential winners and losers emerging along the supply chain. This includes smallholder farmers, millers, and traders, who may experience differential adaptation capacities. Some value chain actors, particularly those already engaged in traditional crop production, may benefit from new market opportunities, while others, more dependent on maize, could resist the transition.

The analysis also highlights potential lock-ins, such as entrenched consumer preferences for pure maize flour and the limited infrastructure for processing and distributing traditional grains at scale. Trade-offs may emerge, particularly in terms of balancing short-term economic costs against long-term food system resilience. Therefore, the policy should be implemented with a holistic and cautious approach, ensuring that changes in the agri-food system are coordinated to

minimize disruptions and unintended consequences. To achieve the intended benefits of enhanced nutritional quality, food security, and climate resilience, the policy must be supported by investments in farmer capacity-building, improved market access, and public awareness campaigns to shift consumer preferences. The need for ongoing monitoring and adaptive governance is paramount, ensuring that the policy evolves in response to dynamic feedback from key stakeholders, including farmers, processors, and consumers.

1. Background and context

The early development and use of composite flours in developing countries aimed at reducing wheat imports, with the goal of conserving foreign exchange reserves. The Food and Agriculture Organization (FAO) initiated the “Composite Flour Program” in 1964, supporting technology development in countries like Brazil, Bolivia, Colombia, Senegal, and Sudan. The program encouraged the substitution of wheat with locally available cereals, legumes, and root crops, including maize, rice, sorghum, millet, barley, sweet potato, amaranth, and cassava. Initially, the focus was largely economic, but over time, nutritional considerations, particularly in combating malnutrition, gained prominence. While composite flours have proven technically feasible, their large-scale use has been limited to specific products, such as weaning foods, snacks, and confectioneries, catering more to consumer preferences for variety, nutrition, and affordability rather than mass-scale staple production.

Kenya’s national flour blending policy, developed under The Crops Act (2013), is a response to these emerging trends. It mandates that maize flour be blended with at least 10% of highly nutritious crops, such as sorghum and millet, with plans to gradually increase this proportion to 30%. The policy aims to contribute to food security, improve nutrition, and increase employment opportunities through promoting climate-resilient crops and reducing Kenya’s reliance on maize imports. Sorghum and millet are rich in micronutrients lacking in maize, helping to improve the overall nutritional profile of maize flour products. As maize is more vulnerable to climate stressors, encouraging the use of drought-tolerant crops, like sorghum and millets, particularly in Kenya’s arid and semi-arid lands (ASALs), could enhance food security under changing climate conditions. The policy aims to increase domestic agricultural diversification, reducing Kenya’s dependence on imported maize, which is prone to global market fluctuations and climatic vulnerabilities.

In 2018, the Kenyan government established the Flour Blending Secretariat under the Ministry of Agriculture to oversee policy implementation. The Secretariat’s framework includes six critical focus areas: (i) Enhancing production systems and commercialization, (ii) Promoting agri-nutrition and consumer behavioral changes, (iii) Strengthening private sector engagement and SME investment, (iv) Establishing standards, food safety regulations, and policies, (v) Facilitating partnerships between the national and county governments, and (vi) Mobilizing resources and forming strategic partnerships.

However, two major challenges persist: lack adequate volumes of supply of sorghum and millet and limited consumer demand, as preferences still favor white maize products, particularly ugali. Additionally, unintended negative consequences could arise, such as increased prices for these crops, disproportionately affecting low-income populations. The private sector may also experience a shift, with larger market players possibly benefiting faster than smallholders, thereby exacerbating inequalities within the value chain.

For the policy to succeed, it requires a systems-wide approach, leveraging complementary interventions, such as improved seed systems, better market linkages, and consumer demand stimulation. There is also a need to emphasize the importance of supportive complementary actions alongside core interventions. An agri-food systems analysis of Kenya’s flour blending policy, depicted in Figure 1, outlines key interventions and potential investments within this framework. It highlights socioeconomic and environmental drivers, emphasizing how interactions between these drivers influence system outcomes. This perspective is instrumental in managing trade-offs, identifying leverage points, and ensuring the balanced distribution of policy benefits across diverse stakeholders.

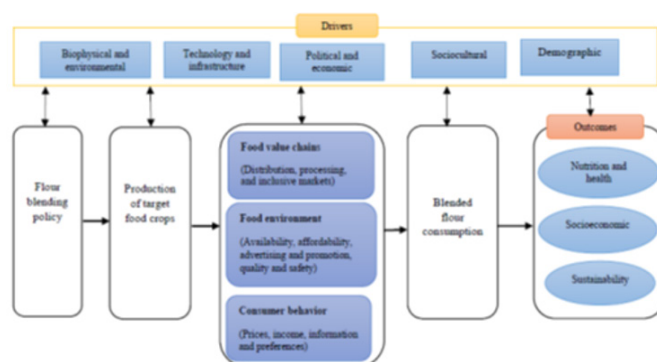


Fig. 1. The agri-food systems framework applied to the flour blending policy analysis. Source: Melesse et al. (2023).

2. Analysis of the flour blending policy's main outcomes

Nutrition and health: The first outcome is to improve nutrition and health, particularly for vulnerable communities, as 26% of Kenyan children under five are stunted. Maize, the staple crop, is deficient in essential micronutrients and prone to aflatoxin contamination, contributing to stunting and micronutrient-related malnutrition.

Blending maize with millet and sorghum, which are rich in energy, amino acids, and essential micronutrients (See Table 1.), improves nutritional quality while reducing mycotoxin risks. These crops also benefit people with diabetes management.

Table 1. Nutrient composition of maize and target crops (mg100g ⁻¹).				
Crop	Protein	Ca	Fe	Zn
Sorghum	10.4	25	5.4	4.4
Finger millet	7.7	350	9.9	1.5
Pearl millet	11.8	42	11.0	2.0
Maize	9.2	26	2.7	0.5

Source: National Research Council (1996)

Socioeconomic gains: The second outcome is to boost domestic agriculture, generating jobs and income along the value chain. Packaged maize flour from large-scale millers is valued at \$444 million annually, while posho maize flour from small-scale mills is worth \$840 million. Maize, the staple for 96% of Kenyans, accounts for 9-18% of household expenditures. In 2017, maize imports cost \$389 million due to drought. The policy also aims to reduce dependence on maize, enhancing food sovereignty and import substitution. The analysis shows that blending 10% millet or sorghum with maize could reduce imports by 42%, saving \$44.8 million annually.

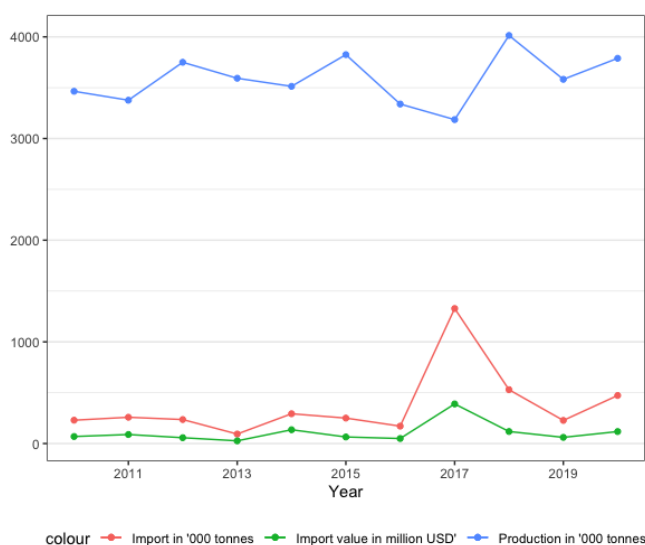


Fig. 2. Maize production and import in Kenya. Source: FAOSTAT.

Sustainability: The third outcome aims to improve sustainability by promoting climate-tolerant crops, like sorghum and millet, which are more resilient than maize in drylands facing climate change risks. These crops have gained interest as part of a “New Green Revolution”, especially in the ASALs, where recurrent drought makes maize cultivation increasingly risky.

ICRISAT has over 50 years of experience in sorghum and millet research and can provide technology and research to help smallholders adapt and navigate complex agri-food systems.

3. Analysis of food supply chains for sorghum and millets

3.1. Production

Sorghum, finger millet, and pearl millet are vital crops for low-income households in Kenya. They are primarily grown by small-scale farmers in arid regions. However, production is concentrated in eastern and western Kenya, with subsistence farming limiting yields and market access. The flour blending policy aims to boost the commercialization of these crops, but success depends on increasing supply and maintaining stable prices.

Key challenges include underdeveloped seed systems, with most farmers relying on local seeds due to high costs and poor distribution. Although over 40 sorghum, 12 finger millet, and three pearl millet improved varieties have been developed and released to date through the collaboration between ICRISAT, national agricultural research systems, especially the Kenya Agricultural & Livestock Research Organization (KALRO), and universities in Kenya, seed systems for the crops are still undeveloped.

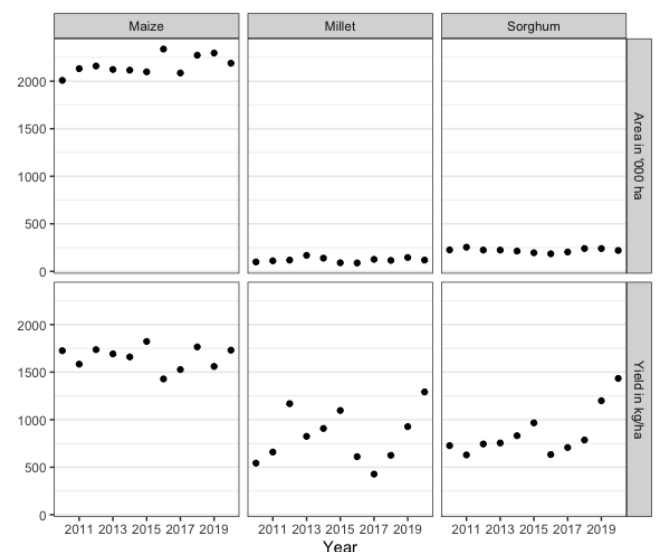


Fig. 3. Area allocation and crop productivity in Kenya. Source: FAOSTAT.

Limited awareness and expensive seeds further hinder the adoption of improved varieties. Kenya's maize-focused extension services neglect these crops, necessitating revamped support and awareness campaigns to shift negative perceptions. Additionally, productivity must rise through innovations, like irrigation, to meet competing demands from the food, brewing, and animal feed industries.

To meet the policy's goal of blending maize flour with 10% millet or sorghum, millet production must increase by 85% and sorghum by 65% from the current baseline production levels. Achieving this requires targeted interventions to support smallholder farmers.

3.2. Grain market linkages

Millet demand comes from specialty markets (e.g., weaning food, formulations for expecting and lactating mothers and diabetics), while sorghum is mainly used for beer. Current demand is too low to absorb large volumes, but the flour blending policy could increase it, creating new opportunities for smallholder farmers.

Smallholders face challenges, like inconsistent supply, poor infrastructure, and high transaction costs, especially in semi-arid areas. These factors limit their participation in formal markets and make meeting larger buyers' quality and volume demands challenging. Coordinated efforts are needed to reduce transaction costs, improve storage, and link smallholders with traders and aggregators. Digital platforms can provide real-time market data, helping farmers engage better in value chains. Collective action models, warehouse receipt systems, and contract farming can help smallholders scale up, manage risks, and secure better market access. These mechanisms offer price stability, access to inputs, and better negotiation power. The National Cereals and Produce Board manages warehouse receipts systems serving maize marketing in Kenya. These systems may be broadened to cover sorghum and millets. Smallholders often lack commercial goals and market knowledge. Shifting their attitudes towards commercialization is essential for them to benefit from emerging market opportunities. But farmers must understand production costs and market prices to negotiate fair deals. Droughts and household food security needs may cause farmers to prioritize self-consumption, affecting supply reliability.

3.3. Processing blended flour

Processed flour is the dominant use for sorghum and millets in Kenya, accounting for 88% of crop use, but blending with maize flour is not widely practiced. Most processing occurs informally, with small traders milling and selling the flour in open markets. Millers must upgrade equipment and processes to meet blending

standards, but small millers, responsible for 70% of maize flour production, may need more resources. Supporting small millers with subsidies, training, and financing could help them benefit from local markets. Large millers are crucial to policy success but require proof of market viability and consumer demand.

4. Analysis of the demand for blended flour

Blending maize flour with sorghum and millet will boost the nutritional value of ugali but may alter its color, taste, texture, and cooking process. Kenyans' strong preference for pure maize ugali could hinder the acceptance of blended flours, making it essential to test different formulations and increase consumer awareness about their benefits. Poor consumers may struggle with the higher cost of blended flours, making demand-side interventions crucial, including public education and price adjustments.

Consumer behavior change requires more than just information; it demands motivation, capability, and opportunity. Strategies should include leveraging schools, hospitals, and religious institutions for promotion, targeting community leaders and health workers, and improving physical and economic access to blended flours. Everyday prompts, including physical proximity, affordability, labeling, advertising, quality, and safety signals, must support interventions aiming at behavioral change.

Economic factors, such as higher costs of sorghum and millet compared to maize, could limit consumer support, particularly among poorer urban households. Policies facilitating direct public investments to boost production and lower costs are necessary to make blended flours more affordable and accessible, while balancing rural and urban food security needs.

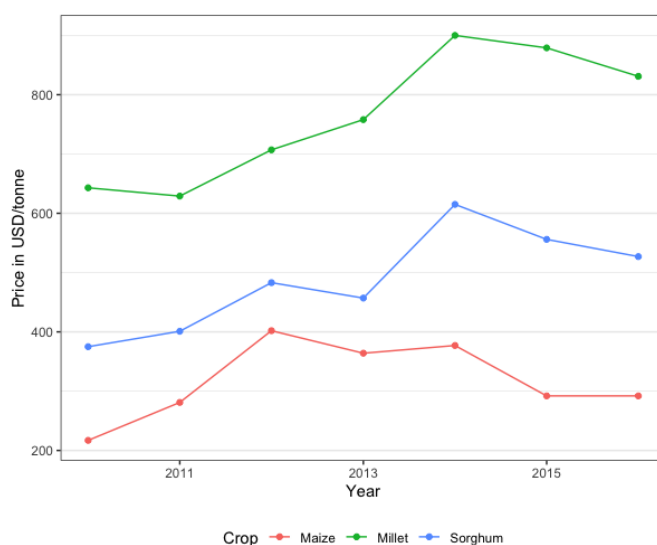


Fig. 4. Annual producer prices of crops in Kenya. Source: FAOSTAT.

5. Analysis of the political economy

The flour blending policy, part of Kenya's "Big Four Agenda," is driven by strong political motivations. While the government has pledged substantial resources and support, the policy's success is contingent on continued political backing. This close relationship creates a dependency that could expose the policy to risks from shifts in government priorities, especially if government continues to favor maize production.

The political economy may also create misalignments, as existing structures favor maize over sorghum and millets as they are considered 'orphan' crops. The dominance of maize in agricultural support and market infrastructure could undermine the flour blending policy. Powerful market actors with vested interests in maize might resist or obstruct the policy. To mitigate these risks, it is crucial to integrate the policy into broader agricultural strategies, coordinate among ministries, allocate adequate resources, and engage potential opposition early to address concerns and ensure smoother implementation.

6. Recommendations for effective implementation of the flour blending policy

Adopt an agri-food systems approach: Implementing the flour blending policy requires a coordinated response across the entire food system. By integrating socioeconomic and environmental factors, this approach enables the identification of key drivers influencing policy outcomes and reveals potential feedback loops. A holistic, multi-sectoral strategy ensures that the policy not only promotes crop diversification but also strengthens food security, resilience to climate change, and long-term agricultural sustainability.

Enhance crop production systems: To meet the increased demand for sorghum and millet, scaling up production will require the development of resilient seed systems, improved farming techniques, and access to inputs. Investment in research and extension services is essential to support smallholder farmers in adopting these climate-resilient crops, ensuring consistent supply for blending purposes.

Support market development: Strengthening value chains for sorghum and millet is critical. This includes building market linkages between producers, processors, and retailers, as well as fostering partnerships with private sector actors to improve processing capacities. Targeted interventions, such as incentives for small- and medium-sized enterprises (SMEs), can stimulate the growth of local food processing industries that incorporate blended flours.

Promote nutritional awareness and consumer behavior change: Public awareness campaigns should emphasize the nutritional benefits of sorghum and millet, shifting consumer preferences away from white maize products. Behavioral science-based strategies can help change consumption patterns, particularly for staple foods like ugali, where demand remains heavily skewed toward maize.

Address potential trade-offs and equity issues: The policy could result in uneven benefits across the value chain, with larger market players potentially capturing the bulk of the advantages. Efforts must be made to ensure that smallholder farmers and marginalized groups, who are crucial to the success of the policy, are not left behind. Targeted interventions, such as capacity-building programs and equitable market access initiatives, can mitigate the risk of exclusion.

Monitor and adapt: Continuous monitoring and adaptive governance are crucial to the policy's long-term success. The evolving dynamics of the agri-food system require flexibility in implementation, with mechanisms in place to respond to emerging challenges, such as price fluctuations or supply shortages, while maintaining focus on the broader policy goals.

7. Conclusion

In conclusion, Kenya's flour blending policy is a bold initiative that aims to bridge urban consumption and rural production, fostering synergies between rural and urban development, while prioritizing local markets. However, its success depends on recognizing and navigating the complexities of agri-food systems. This highlights that such policies cannot be scaled in isolation, as systemic constraints often lead to lock-ins and trade-offs. Therefore, comprehensive interventions across technological, economic, institutional, sociocultural, and political domains are crucial.

To mitigate trade-offs and unlock the policy's potential, coordinated efforts in production, market development, and policy reform are essential. This includes improving access to quality seeds, adapting extension systems, strengthening farmer organizations, and situating processors near production areas. Moreover, consumer campaigns and public procurement strategies will be pivotal in shifting preferences towards blended flours. In addition, achieving the policy's goals will require transformative changes in technology, infrastructure, incentives, and research priorities. Collaboration with key stakeholders, like ICRISAT that has over 50 years of expertise in sorghum and millet research, can provide critical support for smallholder adaptation. Ultimately, by embracing an integrated approach, the policy can create a resilient, sustainable, and inclusive agri-food system that benefits both producers and consumers.

Reference

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About

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a pioneering non-profit organization focused on scientific research for development, committed to transforming dryland farming and agri-food systems. Working with global partners, ICRISAT develops innovative solutions to address hunger, poverty, and environmental degradation, benefiting 2.1 billion people across the drylands of Asia, Africa, and beyond.

ICRISAT was established under a Memorandum of Agreement between the Government of India and CGIAR, dated 28 March 1972. In accordance with the Headquarters Agreement, the Government of India has extended the status of a specified "International Organization" to ICRISAT under section 3 of the United Nations (Privileges and Immunities) Act, 1947 of the Republic of India through Extraordinary Gazette Notification No. UI/222(66)/71, dated 28 October 1972, issued by the Ministry of External Affairs, Government of India.

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