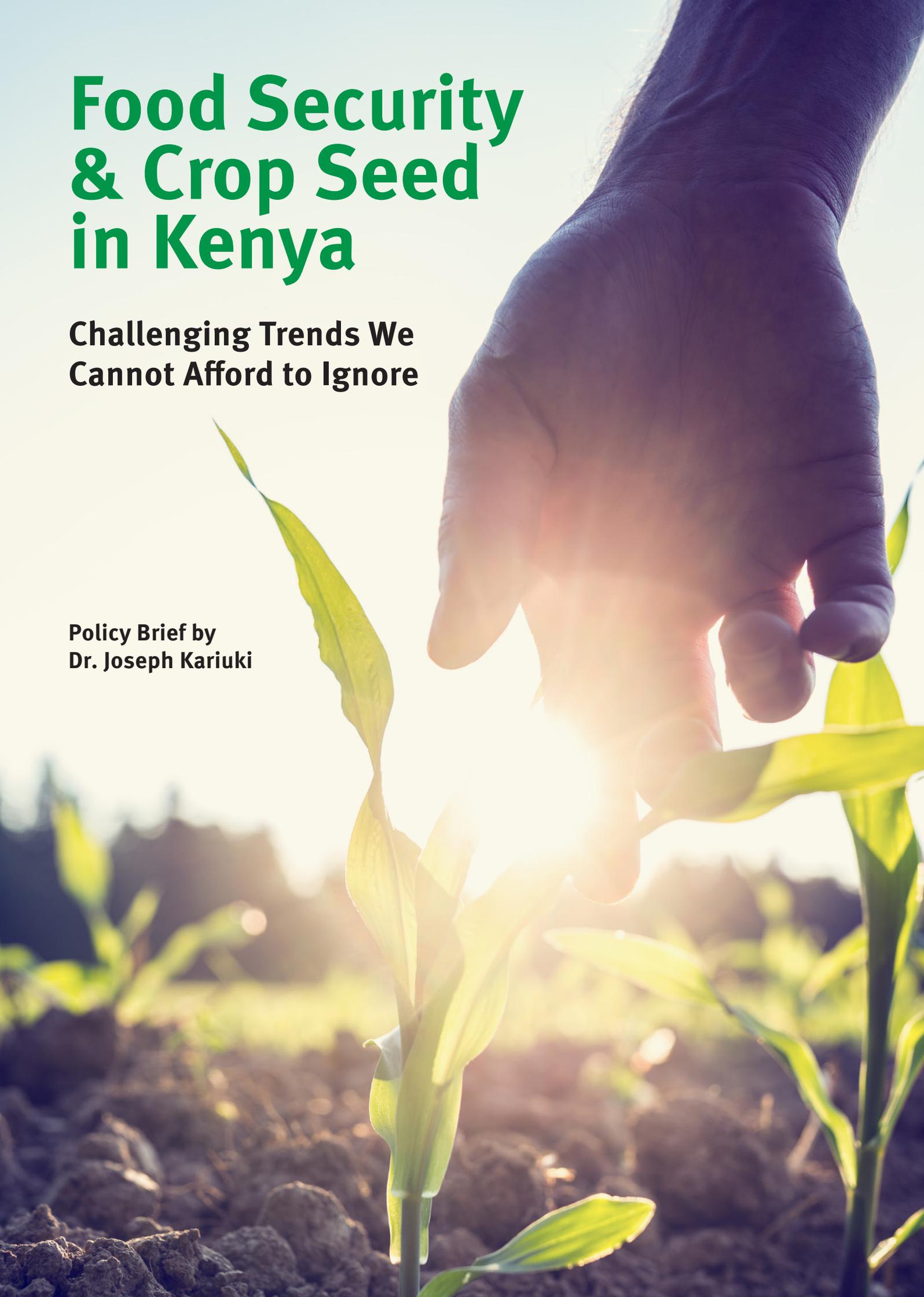


# Food Security & Crop Seed in Kenya

**Challenging Trends We  
Cannot Afford to Ignore**

**Policy Brief by  
Dr. Joseph Kariuki**



# Food Security & Crop Seed in Kenya

## Challenging Trends We Cannot Afford to Ignore

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This policy brief is Part I of a two-part series. Part II, scheduled for early 2016, will address the questions, “How did we get here?” and “What should we do?”

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### **About the Author**

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The opinions expressed and the data presented are solely the work of the author. Questions can be addressed to him at [jkariuki14may2005@yahoo.com](mailto:jkariuki14may2005@yahoo.com).

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## Executive Summary

Kenya faces declining productivity in agriculture accompanied by rapid increases in population, consumption, and food imports. This combination augurs a future of more severe poverty and food insecurity. The first step towards solving any problem is to recognize the nature and severity of the challenge.

The crop seed sector is responsible for breeding and supplying improved varieties of high-yield food crops able to produce well as climates and environments change. Without access to seeds of improved varieties, farmers rely on unimproved varieties and poor quality seeds that will never be high yielding. Improved varieties are at the base of modern agriculture in countries around the world. Kenya cannot significantly advance its agricultural production without widespread farmer access to, and usage of, seed of improved varieties.

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*Food insecurity and poverty affect 43 and 46 percent of Kenya's population, respectively.*

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However, barely half the area under production for Kenya's top four food security crops (maize, beans, sorghum, and cowpea) is planted with high-quality, certified seed. This keeps yields intolerably low. In fact, yields of maize, Kenya's most important food crop, have decreased over the past 30 years.

The report, "Food Security and Crop Seed in Kenya: Challenging Trends We Cannot Afford to Ignore," identifies six trends shaping agriculture and impeding progress against food insecurity and poverty, which affect 43 percent and 46 percent of Kenya's population, respectively.

Kenya is not alone in this predicament. One-in-four people in sub-Saharan Africa are hungry—the highest prevalence of hunger in the world. Without significant interventions, by 2020 the number of food-insecure people in sub-Saharan Africa is projected to more than double, increasing to more than 500 million.

Only by understanding the trends shaping agriculture and the crop seed sector can we identify and implement solutions that will lead to a food secure and prosperous future.

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## EXECUTIVE SUMMARY

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# Six trends shaping Kenya's staple crop agricultural sector

## TREND #1

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### Rising demand for food, especially maize

Kenya has one of the world's fastest population growth rates. Between 2015 and 2050, if current growth rates continue, Kenya's population is expected to increase from 46.8 to 97.2 million people. The population in rural areas is expected to rise by 52 percent, placing serious burdens on land, other natural resources, the food supply, and employment. While some recent estimates indicate slightly declining future population growth rates in Kenya, growth rates are still projected to be high.

This population explosion is driving food demand, particularly for maize. Assuming a constant per-person consumption rate and steady population growth, it is estimated that maize consumption will increase from 4.1 million metric tons today to 8.6 million metric tons in 2050. Given the state of Kenyan agriculture, as outlined in the trends below, where will this food come from?

## TREND #2

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### Growing burden of food imports

Food imports in Kenya have been growing rapidly. For example, in 2010, food imports accounted for 2.96 percent of Kenya's gross domestic product (GDP), at a value of US\$1.2 billion for 2.5 million metric tons. By 2011, food imports had grown to 3.94 percent of Kenya's GDP, equaling US\$1.65 billion for 3.2 million metric tons of food. Such import levels are unsustainable; they have a major negative impact on the Kenyan economy as money is spent to import food rather than on other priorities.

Opportunities also are missed. For example, a rising proportion of imports are consumer-ready food products. Growing domestic supply of the raw inputs for such high-value foods could foster the growth of a thriving food manufacturing sector. Instead, food imports equal job exports, and lost opportunities for job creation and economic development.

Furthermore, the growing value of food imports means that the country's food security is increasingly at the mercy of volatile global food prices. Food price inflation drives overall inflation in Kenya, and has a profound impact on low-income households.

## EXECUTIVE SUMMARY

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### TREND #3

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#### Stagnant crop yields

Kenya's increased production volume over the last two decades is the result of more land area being cultivated, rather than improvements in yields. Historically, in other countries, technology improvements and industry competitiveness, both of which drive yield increases, have changed this dynamic. In the United States, between 1960 and 2013, total area under maize production held fairly constant while innovation and competitiveness drove yields up from about 3 metric tons per hectare to almost 10.

While one can argue that Kenya is not the United States, it is hard to deny the overall principle that improved technology and a competitive private sector, over time, drive productivity increases. This principle has played out in the agriculture sector in many other countries around the world, such as India, and is currently playing out to varying degrees in numerous other countries in sub-Saharan Africa.

### TREND #4

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#### Low production and usage of certified non-maize seed

Perhaps the most important factor affecting low production levels for crops other than maize is the extremely low use of certified seed by Kenya's farmers. A review of the online Seed Sector Platform Kenya ([seedsectorplatformkenya.com](http://seedsectorplatformkenya.com)) reveals that, among 482 improved varieties of 18 crops released in Kenya, more than half of these (258 varieties) are maize varieties. The only other crops with more than a handful of improved varieties are beans, wheat, sweet potato, and sorghum.

In 2013, an estimated 78 percent of the maize growing area was planted with certified seed, but this compares to 3 percent for beans, 16 percent for sorghum, and 13 percent for cowpea. Recycled seed – the majority of it repeatedly recycled for long periods of time – accounted for the remaining land.

While the relative emphasis on breeding maize varieties has improved the prospects for that crop, it also underscores the Achilles heel of Kenyan agriculture: the limited crop diversity found on Kenya's farms. This lack of diversity has significant implications for crop rotation, soil health, managing disease and insect pressure, and dietary nutrition. In addition, it exposes Kenya to the potentially severe consequences of a major crop disease or crop failure.

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## EXECUTIVE SUMMARY

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### TREND #5

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#### **Government involvement and private sector reluctance**

The African Seed Access Index (TASAI, [tasai.org](http://tasai.org)) recently ranked the competitiveness of the crop seed sectors in Kenya, South Africa, Uganda, and Zimbabwe. For the competitiveness measure, Kenya was the only country whose maize sector was rated as “extremely poor,” and no other country’s maize sector was rated even as “poor.”

The sector’s lack of competitiveness can be traced back to the dominant role of Kenyan government parastatals, which produce 70 percent of certified maize seed; 90 percent of certified bean seed; 88 percent of certified cowpea seed; and close to 100 percent of certified rice seed. Only for sorghum do private companies have the larger market share at 81 percent.

Private companies point out that they have difficulty attracting investment financing, given the unusual situation in which the government both regulates and competes against the private sector. As a result, Kenya’s private sector seed companies are relatively slow to invest in significant production increases, improved quality systems, expansive marketing, breeding, and other innovations that would ensure a steady supply, and more seed choices, for Kenya’s farmers.

### TREND #6

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#### **Kenya’s increasing food deficit**

Without aggressive change in the agriculture sector, as Kenya’s population and the demand for maize increase, the deficit in maize production will grow bigger each year. This will prompt even more food imports, a trend associated with higher food prices, rising poverty and anemic domestic growth of the food industry.

Aggressive action needs to be taken, without delay. Even if Kenya increases national maize yields by 6 percent or more annually, maize production levels still will not meet demand levels until 2023 at the earliest. Delaying aggressive action only increases the potential deficits and related economic losses.

## EXECUTIVE SUMMARY

### Conclusion

The evidence is undeniable – Kenya faces major challenges in food security and in its crop seed sector. These challenges are related, and growing more severe over time. However, these challenges also represent real and meaningful opportunities, particularly if best practices from other countries are studied and adapted to Kenya. Addressing issues in Kenya’s crop seed sector will go a very long way towards putting Kenya on a path to food security and stronger economic growth.

#### Abbreviations and Acronyms

<b>ASDS</b>	Agricultural Sector Development Strategy
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>GDP</b>	Gross Domestic Product
<b>Ha</b>	Hectare
<b>H-H Index</b>	Herfindahl-Hirshmann Index
<b>KEPHIS</b>	Kenya Plant Health Inspectorate Service
<b>KSh</b>	Kenyan Shilling
<b>Kg</b>	Kilograms
<b>MT</b>	Metric tons
<b>REMPAI</b>	Resource Management and Policy Analysis Institute
<b>SSA</b>	Sub-Saharan Africa
<b>TASAI</b>	The African Seed Access Index
<b>US\$</b>	United States dollar
<b>USDA</b>	United States Department of Agriculture

# Introduction

This paper aims to contribute to the policy debate on the role of sustainable agricultural development as a means of addressing food insecurity and poverty in Kenya. In particular, it examines the role of Kenya's crop seed sector within the larger context of trends shaping the country's agricultural growth.

More than five years ago, the government of Kenya launched the Agricultural Sector Development Strategy (ASDS). Its overall target was to attain 7 percent growth of the agricultural sector annually between 2010 and 2015. Furthermore, it committed to implementing the African Union's goal of investing 10 percent of the national budget in agriculture. However, halfway into the ASDS's 10-year plan, results are lagging. Agricultural growth is languid and the proportion of the national budget dedicated to agriculture has declined over time. It was only 3.5 percent in the 2015-2016 budget.

This under-investment is apparent in Kenya's crop seed sector, a neglected but crucial component of the overall agricultural system. The crop seed sector is responsible for breeding and distributing improved varieties of the food crops grown by Kenya's 3.5 million smallholder farmers. Without access to high-quality seed of improved varieties, it is impossible for farmers to substantially improve their productivity and incomes. And, without such improvements, the agricultural system itself is not sustainable.

Of course, many other factors also are necessary to achieve an agricultural system that engenders economic growth and stewards natural resources, especially land and water. Improvements in soil health, water availability, finance, and extension are also crucial. But because good seeds are the essential element from which all other food security solutions flow, this paper focuses on the crop seed sector.



# Food Insecurity in Sub-Saharan Africa

## Sub-Saharan Africa

Despite rapid economic growth over the last decade, sub-Saharan Africa (SSA) has the highest prevalence of undernourishment of any world region, with one-in-four people chronically hungry.<sup>1</sup> In 2012-2014, the Food and Agriculture Organization of the United Nations (FAO) estimated the number of undernourished people in SSA at 214.1 million, representing 23.8 percent of the global total of 805.3 million (FAO, *The State of Food Insecurity in the World*, 2014).

In 2010, the most vulnerable countries—those where an estimated 80-100% of the population is food insecure—were clustered in Central and Eastern Africa.<sup>2</sup> Without significant interventions, by 2020, the number of food-insecure people in SSA is projected to exceed 500 million, accounting for 59 percent of the total number of food-insecure people in the world (ibid).

In the Horn of Africa, more than 40 percent of the population is undernourished, and in Eritrea and Somalia the proportion rises to 70 percent. The region's seven countries— Djibouti, Ethiopia, Eritrea, Kenya, Somalia, the Sudan, and Uganda— have a combined population of 160 million people, 70 million of whom live in areas prone to extreme food shortages. Over the past 30 years, these countries have been threatened by famine at least once every decade.<sup>3</sup>

Compared to other parts of Africa that are rich in oil, minerals, and other natural resources, the Eastern African region relies more heavily on agriculture for employment and economic growth. Agriculture— primarily rain-fed crops and livestock—in East Africa contributes slightly more than 40 percent to the Gross Domestic Product (GDP), and 60-80 percent of the population derives livelihood from the sector. Despite the prominent and crucial role of agriculture, SSA is more affected by rising food prices and food insecurity than any other world region. Grain yields in sub-Saharan Africa are among the lowest in the world—about 31 percent of the global average.<sup>2</sup> Only 4 percent of cropland in SSA is irrigated, compared with a global level of almost 20 percent.<sup>4</sup>

High-income countries in Africa may have fewer problems paying for their large food imports because they have ample sources of foreign currency. But agriculture-based countries without oil or mineral wealth have found that their export revenues from agricultural and non-agricultural merchandise are too low to support high food import bills. This highlights the problem of food-import dependency: the difficulties facing countries in paying for the rising import bills.<sup>5</sup>

## Kenya

Food security in Kenya remains a distant goal. More than 43 percent of the country's population is food insecure, and about 46 percent live below the poverty line. Largely due to population growth and low investment in increasing agricultural production of staple food crops, Kenya has gone from being food self-sufficient in 1961 to import-dependent today.

The situation with maize, Kenya's most important crop, illustrates the larger problems of food insecurity and poverty. Some 98 percent of Kenya's 3.5 million small-scale farmers grow maize.<sup>6</sup> However, the domestic maize market has been highly unstable since 1990, and annual maize production has rarely met domestic consumption needs.

To meet this deficit, the country has partially relied on official and unofficial imports from Tanzania and Uganda. However, these sources

can be unreliable. In 2008-2009, for example, when Kenya needed five times its normal maize imports, neighboring countries with their own food security concerns were unable to supply the required maize, particularly at lower prices. Kenya therefore turned to the larger international market with higher prices.<sup>7</sup> Historically, large imports have come from South Africa, Malawi, the United States, Brazil, and Argentina.<sup>8</sup>

In July 2011, Kenyans paid a record US\$45 per bag of maize, which was more than double the price at the beginning of that year and about 70 percent above the already high world market prices. Between January 2007 and December 2011, domestic maize prices were lower than the global prices for only three short months (September-November 2010).<sup>9</sup>

## TREND #1

# Kenya's Rising Demand for Food

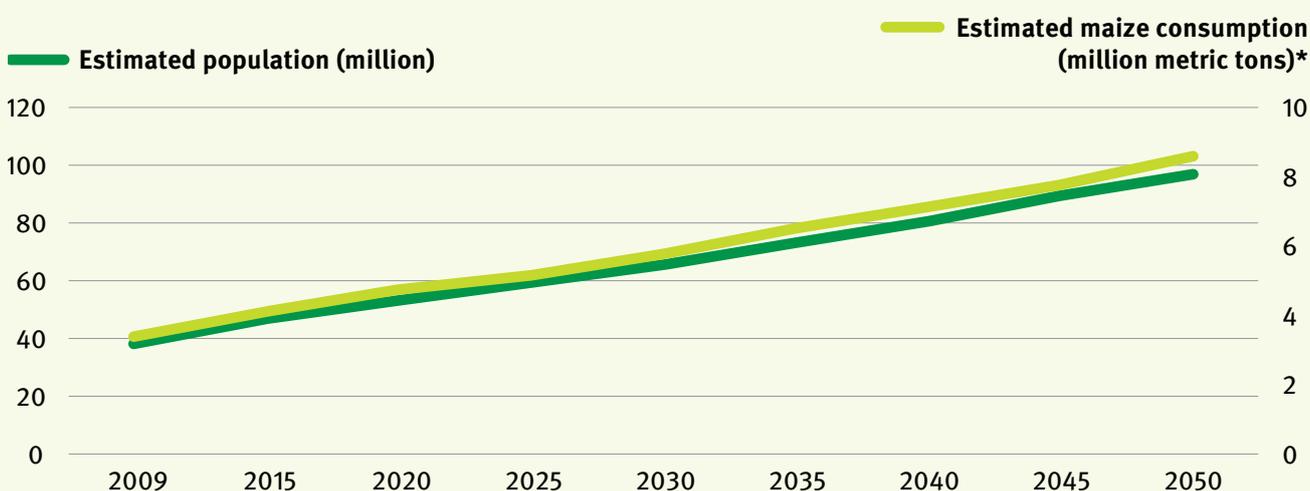
Declining mortality and high fertility have led to one of the world's fastest population growth rates. The Kenyan population increased from 10.8 million in 1969 to 38.6 million in 2009—a factor of 3.6, representing an average growth rate of more than 3.5 percent per year. Even at the current growth rate of about 2.7 percent per year, the population is expected to reach 66.3 million by 2030.

In 2014, Kenya's population of 45.9 million made it the world's 30<sup>th</sup> largest country in terms of population numbers.<sup>10</sup> Although much emphasis is put on urban growth, Kenya's rural population is predicted to rise by 52 percent between 2015 and 2050, placing serious burdens on land, other natural resources, the food supply, and employment.<sup>11</sup> Already, the country's rural population is highly concentrated. Approximately 74 percent of the population is found on only 20 percent of the arable land. About 15 percent of Kenya's smallholder farming area has a population density exceeding 550 persons per square kilometer.

Large increases in the food supply, particularly of maize, will be required to support this population growth. Annual per capita maize consumption in Kenya is among the highest in the world. Some researchers estimate maize consumption at about 88 kg/capita/year<sup>12</sup>, while other estimates are in the range of 90-125 kg/capita/year.<sup>13</sup> In comparison, according to FAO global per capita maize consumption is only 14.8 kg; for Africa as a whole, it is 27.9 kg, and for Latin America, it is 38.4 kg.

Based on the 88kg/capita/year estimate, Kenyans consumed 3.4 million metric tons of maize in 2009, but these figures will increase sharply in the coming decades. As shown in Figure 1, at Kenya's current population growth and maize consumption rates, both population and the resulting requirement for maize supply will more than double by 2050.

**FIGURE 1: Estimated population and maize consumption, 2009-2050**



\*Estimated consumption is based on per capital consumption of 88kg/year. Source: Kenya National Bureau of Statistics, Kenya Housing and Population Census 2009; World Population Review: <http://worldpopulationreview.com/countries/kenya-population/>.

## TREND #2

# Kenya's Growing Food Import Burden

## Food imports versus exports

Kenya's main food crops include: cereals (maize, wheat, sorghum, rice); roots and tubers (Irish potato, cassava, sweet potato); pulses (beans, cowpeas, pigeon peas, green grams); and vegetables (kale, tomatoes, onions, cabbages, etc.). In spite of this variety, maize is the primary staple by a large margin, and forms the most important component of the average diet. It accounts for 36 percent of all calories consumed and 65 percent of staple food calories consumed. Heavy dependence on a narrow food base is one factor contributing to food insecurity; maize certainly plays this role in Kenya. Kenya does not produce enough maize, rice, or wheat to meet demand, and uses imports of raw cereals to fill the gap.

Kenya is also a major importer of processed food. In 2013, the U.S. Department of Agriculture (USDA) reported a major increase in Kenyan imports of consumer-ready foods, with the value of imports projected to “reach a record high of \$300 million in 2013 and to continue increasing over the next five years.”<sup>14</sup> The European Union (8 countries) accounted for 40.1 percent of total imports of consumer-oriented food products in 2012, and South Africa, the largest single supplier of consumer-oriented food products, accounted for 11.3 percent. The two top East African Community exporters to Kenya (Uganda and Tanzania) together accounted for 13.1 percent of Kenya's 2012 imports.

Figure 2 shows imports of major foods in Kenya in 2011. The three main imports were wheat, rice, and maize. Wheat was the single largest import with 1.5 million metric tons imported, valued at US\$457 million or 28 percent of the total food import value.

**FIGURE 2:**  
**Agricultural imports, Kenya, 2011**

Rank	Commodity	Quantity (MT)	Value (1000 \$)
1	Wheat	1,467,709	457,146
2	Rice	358,031	191,082
3	Maize	258,525	88,757
4	Palm oil	165,702	206,260
5	Sugar Raw Centrifugal	149,935	121,663
6	Sugar Refined	114,626	99,195
7	Tea	99,762	168,541
8	Cake of Soybeans	69,215	14,523
9	Sunflower Cake	61,575	9,583
10	Sorghum	58,223	19,466
11	Bran of Maize	57,694	3,228
12	Beans, dry	51,697	28,589
13	Flour of Wheat	50,766	23,971
14	Peas, dry	47,341	30,381
15	Flour of Maize	46,601	26,016
16	Food Preparation, Flour, Malt Extract	38,508	37,059
17	Bran of Wheat	34,440	3,340
18	Fatty Acids	30,176	28,187
19	Breakfast Cereals	18,596	20,886
20	Food Preparations (NES*)	18,390	68,451
21	Cake of Cottonseed	18,150	5,870
<b>Total</b>		<b>3,215,662</b>	<b>1,652,194</b>

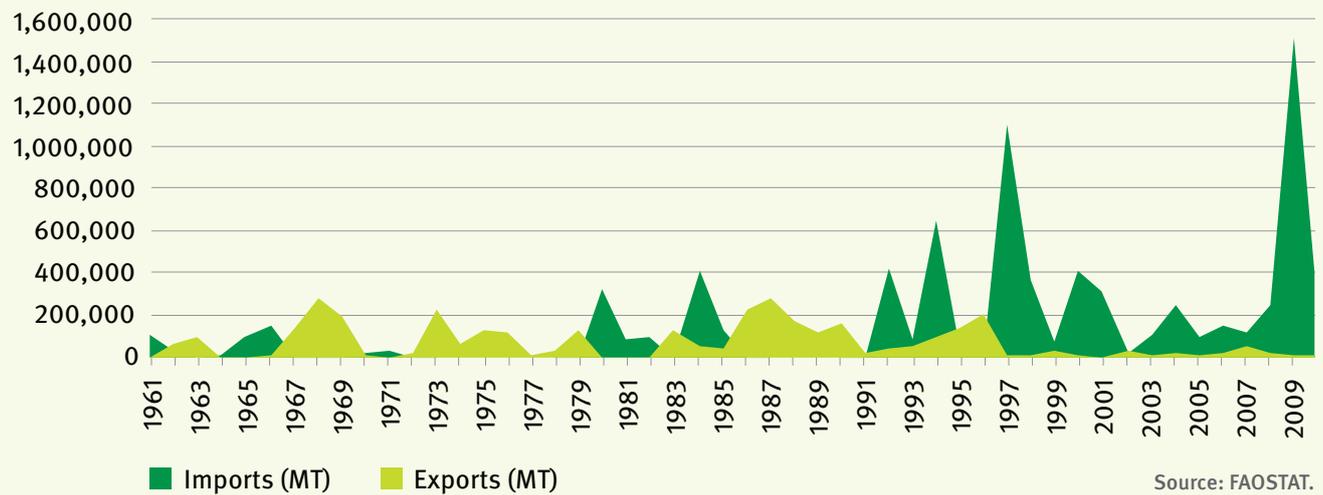
\*NES=Not elsewhere specified. Source: FAOSTAT

Kenya also imported 358,000 metric tons of rice valued at more than US\$191 million, and 259,000 metric tons of maize worth US\$89 million. In total, the country imported 3,215,662 metric tons of food worth US\$1.65 billion, at an average value per metric ton of US\$514.

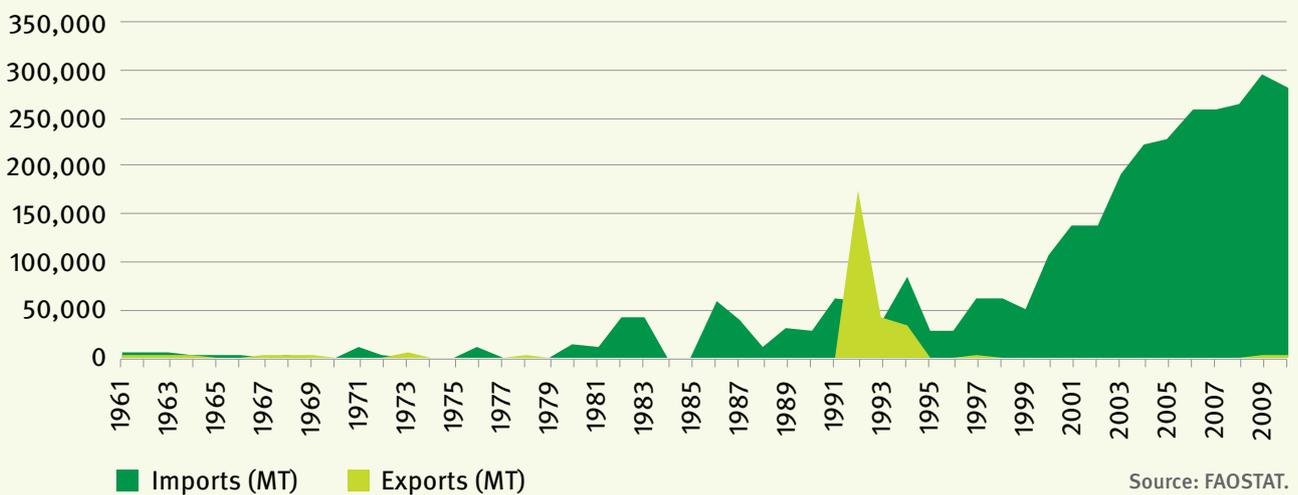
Figure 3 shows that imports of maize exceeded exports over the 52-year period 1961 to 2012. Six years (1984, 1992, 1994, 1997, 2001, and 2009) saw major spikes in imports, recording volumes between 400,000 and 1,500,000 metric tons in each year.

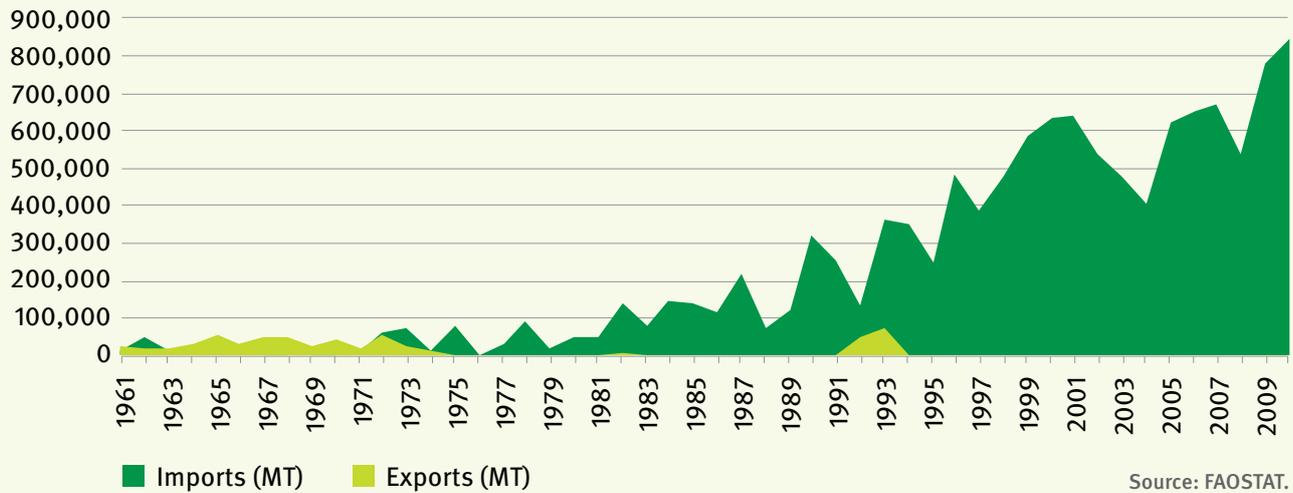
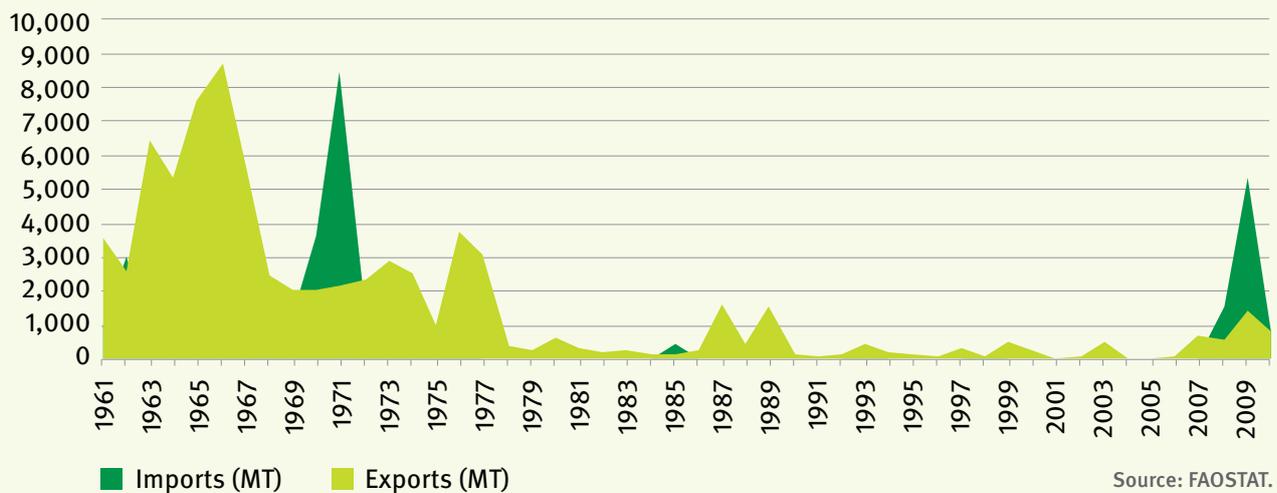
A review of exports and imports of maize, wheat, rice, and Irish potato over the period 1961-2012 shows that imports far outstripped exports (Figures 3-6).

**FIGURE 3: Volume of maize imports and exports, 1961-2012**



**FIGURE 4: Volume of rice imports and exports, 1961-2012**



**FIGURE 5: Volume of wheat imports and exports, 1961-2012****FIGURE 6: Volume of Irish potato imports and exports, 1961-2012**

The implications of such huge reliance on basic food imports are profound, and it is doubtful that Kenya would be able to sustain such high rates of growth for expenditures on food imports. In addition, remaining in the position of an importer is an enormous missed opportunity for economic growth. As an agricultural country with a hard-working and knowledgeable labor force, Kenya should be exporting food to countries with less developed agricultural infrastructure and less skilled workforces.

In the absence of change, the country will have to devote more of its resources to food imports at a time when it urgently needs to create jobs for a growing and restive youth population. Poverty levels will move from bad to worse with the potential for serious social crisis. There also is the risk of depending on a volatile regional market for maize; commodities may not be available when needed. A recent media report, for example, indicated that Tanzania is exploring the Chinese export market for its maize.<sup>15</sup> Such a development could drive up prices in the region, forcing import-reliant Kenya to pay a higher price.

## Impact of food import bill on the economy

World Bank data shows that Kenya's annual GDP averaged US\$11.50 billion from 1960 until 2013, reaching an all-time high of US\$55 billion in 2013. As a percentage of GDP, imports of goods and services in Kenya ranged between 33.2 and 38.8 percent for the years 2010 to 2013 (Figure 7).<sup>16</sup>

Food imports account for a significant proportion of this total, and for rapidly rising overall levels (Figure 8).

The growing value of food imports means that the country's food security is increasingly at the mercy of global food prices. Kenya's national current account deficit was 9 percent of GDP in 2014, according to the World Bank. A significant reduction of food imports could have a very positive impact on the current account deficit.

**FIGURE 7: Imports of goods and services relative to GDP**

	2010	2011	2012	2013
Imports of goods and services (% of GDP)	33.6	38.8	35.5	33.2
Total GDP (US\$1000s)	39,999,659	41,953,434	50,410,164	54,930,814

Source: World Bank. <http://data.worldbank.org/indicator/NE.IMP.GNFS.ZS>

**FIGURE 8: Kenya imports according to World Bank indicators**

Indicator	1990	2000	2010
Agricultural raw materials imports (% of merchandise imports)	2.9	2.5	1.6
Food imports (% of merchandise imports)	9.3	14.0	12.1
Food imports (US\$1000)	206,739	434,700	1,463,244
Fuel imports (% of merchandise imports)	19.9	22.2	22.1
Manufactures imports (% of merchandise imports)	65.5	59.6	62.8
Ores and metals imports (% of merchandise imports)	2.1	1.5	1.5
Merchandise imports (US\$1000)	2,223,000	3,105,000	12,092,926

Source: World Bank. <http://www.tradingeconomics.com/kenya/food-imports-percent-of-merchandise-imports-wb-data.html>

## Food price inflation

Food price inflation drives overall inflation in Kenya, with maize and sugar playing the biggest roles.<sup>17</sup> Expensive imports can easily exacerbate inflation. For example, global maize prices increased from a nine-month average of US\$167 per metric ton in 2010 to US\$299 in 2011. However, in 2011, Kenyans ended up paying up to US\$343 per metric ton for maize, due to additional policy distortions that disrupted the domestic food market.

In the first half of 2015, maize prices rose in most markets in Kenya. The 2015 “short-rain” harvest in the beginning of the year had below-average output of maize, and the country relied on substantial imports from Uganda and Tanzania. Wholesale maize prices in major markets increased by 15-20 percent between March and May 2015. However, in Nairobi, strong urban demand drove an average maize price increase of more than 40 percent over this period, from US\$250 to US\$360 per metric ton. In most marginal agricultural areas, households

that had already exhausted their food stocks struggled to obtain maize and other foods at affordable prices in local markets.<sup>18</sup>

Large food imports have negatively impacted the country’s foreign exchange reserves and the exchange rate. Even though food importers are often private entities, their demand for foreign exchange weakens the exchange rate, which then has a ripple effect, impacting all other sectors that depend on foreign exchange. The use of scarce foreign exchange resources on food imports means that other needed goods and services (such as medical equipment needed in government hospitals) become difficult to procure at attractive foreign exchange rates. In emergencies, the government normally removes duty payable on imports to incentivize the importers. But this loss of government revenue can reduce government expenditures important to social welfare.

## Multiplier effect forgone

Money spent to purchase food from abroad is not spent on other goods and services in the Kenyan economy. And, rather than creating jobs at home, money spent on imports supports jobs abroad. To make matters worse, food imports increasingly include value-added products that could be

produced domestically, providing jobs and building an agricultural manufacturing base. Thus, imports prevent investments that could have a “multiplier effect,” creating many economic opportunities. Instead, income leaves the country.

## TREND #3

# Crop Production Increase Driven by Land Area

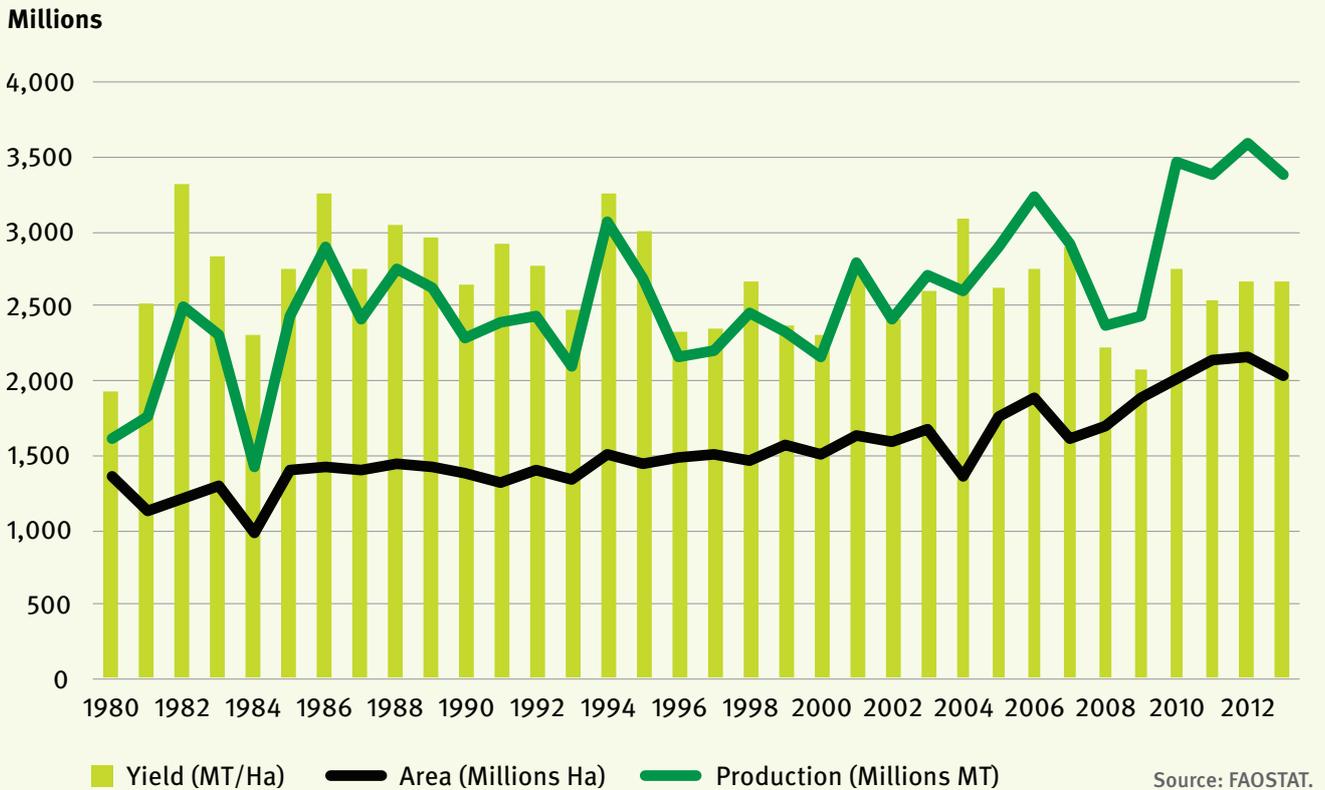
Over the last two decades, and longer in some cases, crop production increases in Kenya have largely been driven by expansion in the area planted while yields have largely been stagnant. This is amply demonstrated by the following graphs (Figures 9-13).

In maize, for example, Figure 9 shows that, from 1980 to 2013, production in Kenya has largely risen and fallen in conjunction with the area under production. Yield increases per hectare have not driven production increases. Yields have ranged from 1.2 metric tons per hectare (MT/ha) to 2.07 MT/ha—averaging around 1.67 MT/ha for the entire period and 1.62 MT/ha since the year 2000.

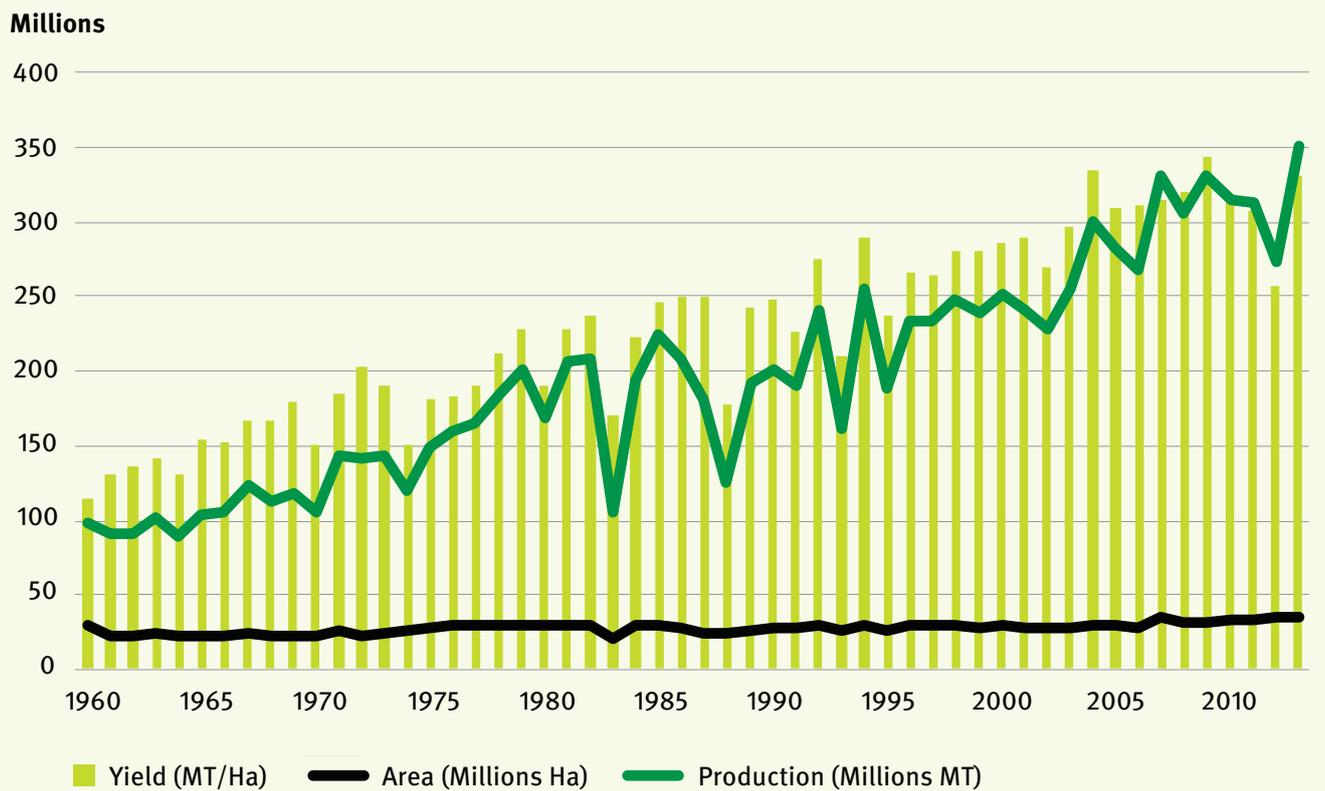
This pattern changes when a country continuously invests in improved technology and industry competitiveness. For example, as seen in Figure 10, in the United States, the area under maize was fairly constant between 1960 and 2013. However, there was consistent growth in total production, driven by yield increases. While many observers argue that Kenya is not the United States, it is hard to ignore the general principle that consistent investment in raising yields, over time, enables production volume increases that are not solely dependent upon increasing land under cultivation.



**FIGURE 9: Maize: area, production, and yields in Kenya, 1980-2013**



**FIGURE 10: Maize: area, production, and yields in the United States, 1960-2013**

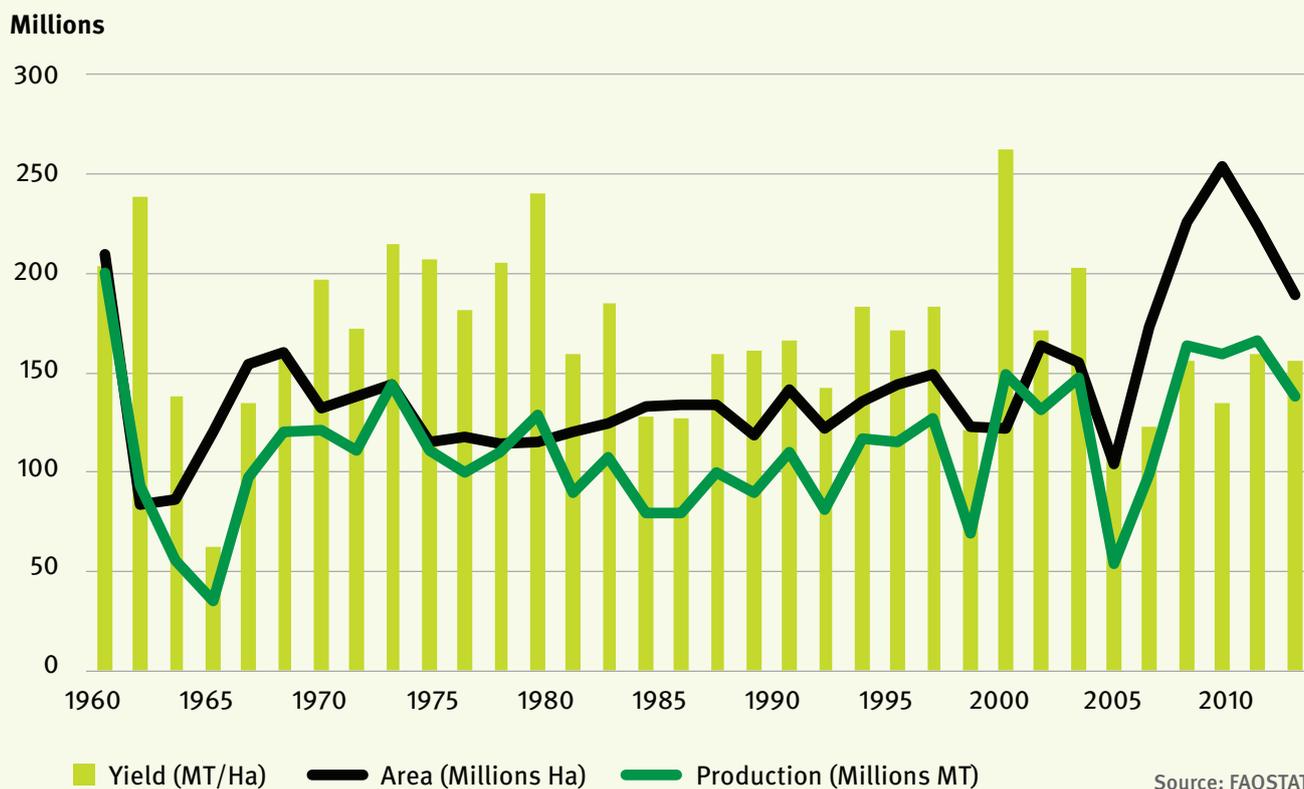


The relatively stagnant yield performance in maize in Kenya has been replicated in other crops such as sorghum, beans, and rice, as shown in Figures 11-13. More than anything else, increases in the area cultivated have driven production increases.

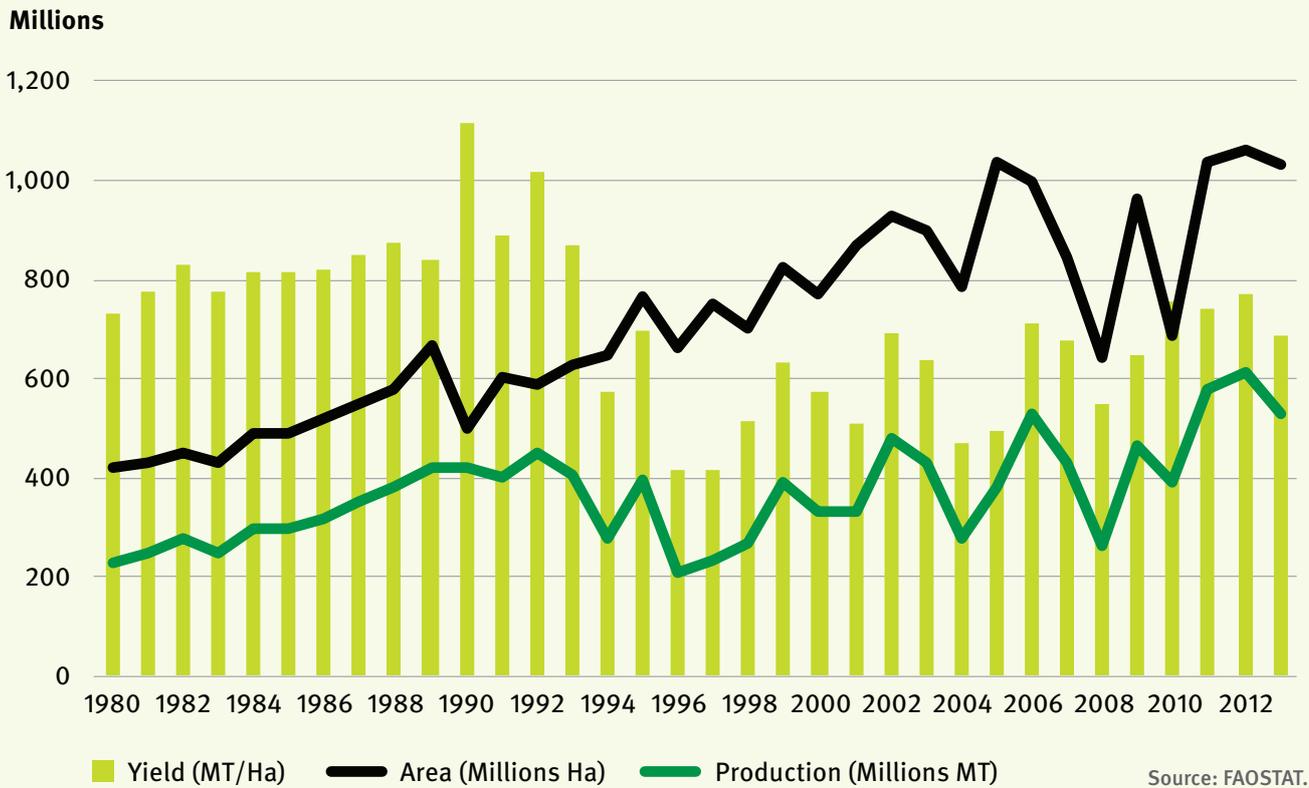
The overall impact of constantly increasing agricultural land in order to expand production volumes can be devastating for the environment

and for human safety. Deforestation, soil erosion, inefficient use of water, breakdowns in soil structure, loss of wetlands, loss of biodiversity, loss of grazing land, conflicts over land use, and the carbon footprint can all increase to dangerous levels over time.

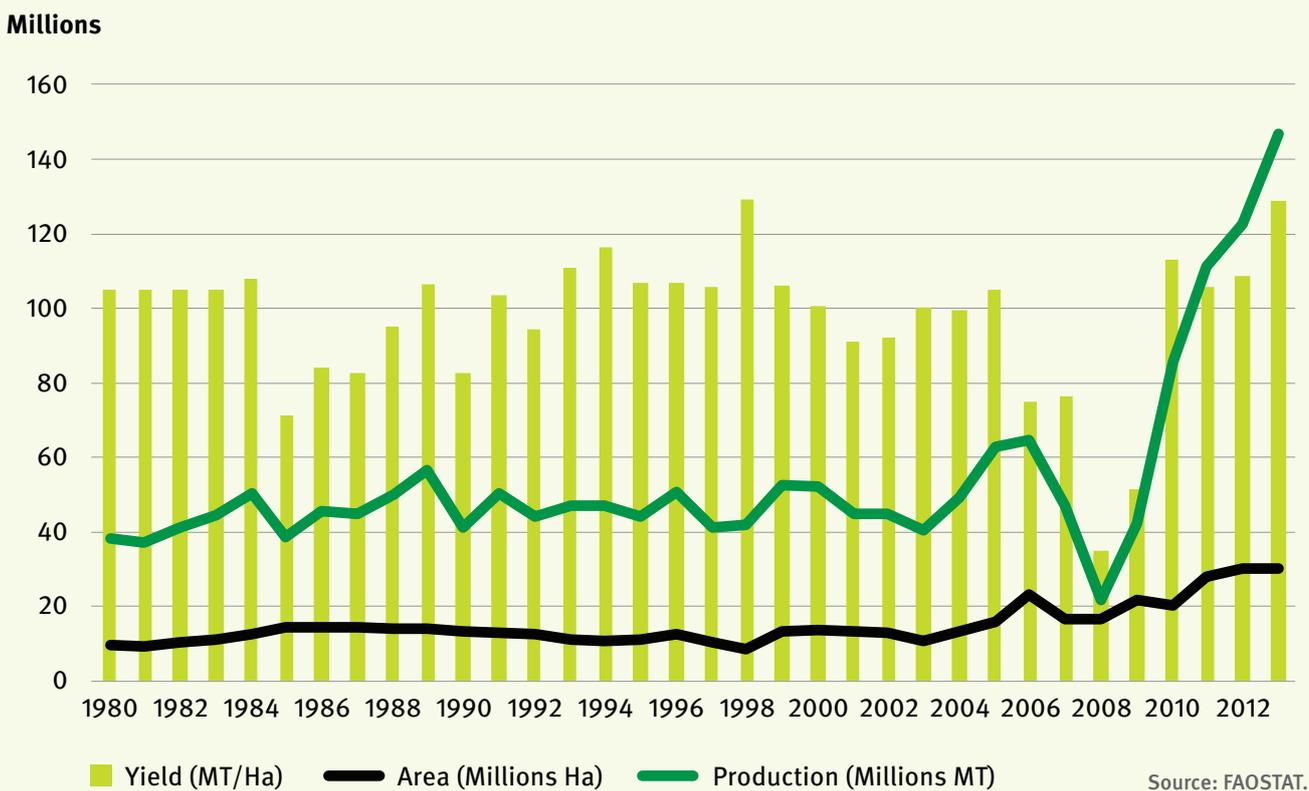
**FIGURE 11: Sorghum: area, production, and yields in Kenya, 1980-2013**



**FIGURE 12: Beans: area, production, and yields in Kenya, 1980-2013**



**FIGURE 13 Rice: area, production, and yields in Kenya, 1980-2013**



## TREND #4

# Low Production and Usage of Certified Non-Maize Seed

An important factor – perhaps the most important factor – contributing to low crop productivity is the seed that Kenyan farmers are planting. All too frequently, the seed they plant is recycled or poor quality and inherently low-yielding. This puts Kenya at a global disadvantage, as farmers in many other parts of the world have access to improved seeds bred for qualities such as high yield, and disease and pest resistance. Further, Kenyan farmers frequently plant varieties that are not well suited to their particular agro-ecological conditions, such as altitude or water availability. Agro-ecologically speaking, the seed is out of position.

A new online internet portal for Kenya's seed industry, the Seed Sector Platform Kenya ([seedsectorplatformkenya.com](http://seedsectorplatformkenya.com)), offers valuable possibilities for data analysis, particularly through SeedWorks, a searchable database of Kenya's released crop varieties. SeedWorks lists a total of 482 improved varieties of 19 staple crops. Of these,

maize accounts for 258 varieties (53 percent). The remainder is made up of 34 bean varieties, 29 wheat varieties, 24 sweet potato varieties, and 23 sorghum varieties, with all other crops listed as having between 1-19 released varieties each.

As shown in Figure 14a, in 2014, the volume of locally produced and imported maize seed certified by Kenya Plant Health Inspectorate Service (KEPHIS) was 31,121 metric tons, or 88 percent of the total. In contrast, the volume of beans, sorghum, and cowpea—Kenya's next three major food security crops as defined by FAO—certified by KEPHIS was only 878 metric tons, or 2.5 percent of the total. On one hand, the relative prioritization of maize in seed production both reflects and also reinforces Kenyans' view that "without maize, there is no food." On the other hand, the low usage of certified seed for non-maize crops contributes to their low yields, low production volumes, lack of crop diversification, and food insecurity.

**FIGURE 14a: Maize and non-maize seed certified by KEPHIS, in metric tons, 2012-2014****Note: red numbers indicate volumes equal or less than the prior year**

Crops	2012		2013		2014	
	Local	Imports	Local	Imports	Local	Imports
Cassava	0	0	0	0	0	0
Chickpea	0	0	2	0	0	0
Climbing Beans	0	0	0	75	5	56
Bush Beans	816	495	486	592	415	39
Cowpea	173	0	504	0	183	0
Dolichos Beans	4	0	6	0	5	0
Finger Millet	148	0	0	0	1	0
Foxtail Millet	0	0	0	0	0	0
Green Grams	226	0	188	0	251	0
Groundnuts	0	0	0	0	0	0
Irish Potato	740	22	757	66	560	100
Maize	36,578	4,176	31,188	4,061	28,364	2,757
Millet	107	0	0	0	0	0
Pearl Millet	0	0	98	0	67	0
Pigeon Peas	4	0	2	0	7	0
Rice	129	0	256	0	300	0
Sorghum	2,222	120	524	9	239	2
Soya Beans	0	0	0	0	0	0
Sweet Potato	0	0	0	0	0	0
Wheat	3,378	0	4,780	0	1,902	0
<b>TOTAL</b>	<b>44,525</b>	<b>4,813</b>	<b>38,791</b>	<b>4,803</b>	<b>32,299</b>	<b>2,954</b>

Source: KEPHIS Annual Reports.

Perhaps most importantly, the data shows that overall total levels of certified crop seed, both imported and locally produced, dropped 11.6 percent from 2012 to 2013 and then a further 19.1 percent from 2013 to 2014 (see Figure 14b).

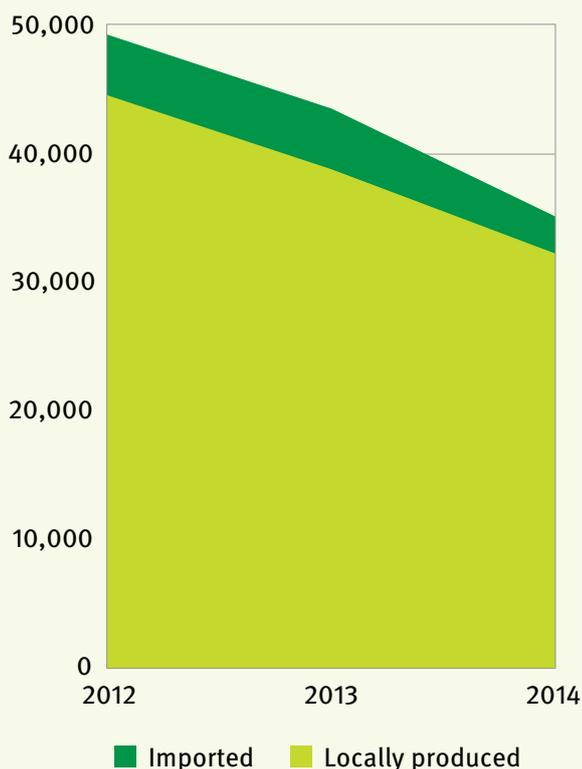
As shown in Figure 15, experts estimate that the percentage of Kenya’s land that was cultivated using improved, certified seed in 2013 was 78 percent for maize, 3 percent for beans, 16 percent for sorghum, and 13 percent for cowpea. In total, just 53 percent of the area under production was planted with certified seed for these top four food security crops.

Despite the fact that an estimated 78 percent of the maize crop land is planted with certified seed, yields are still dropping and maize deficits growing. Many factors, both seed-related and non-

seed-related, contribute to this. The seed-related factors include: overall seed quality; prevalence of counterfeit certified seed; seed planted out of position; the age of the varieties planted by farmers; access to appropriate varieties by smallholder farmers; and the emergence of new, perhaps climate change induced, diseases such as Maize Lethal Necrosis Disease, which impact maize yields. The non-seed-related factors include access to and appropriate use of the correct fertilizer, as well as management practices and rainfall.

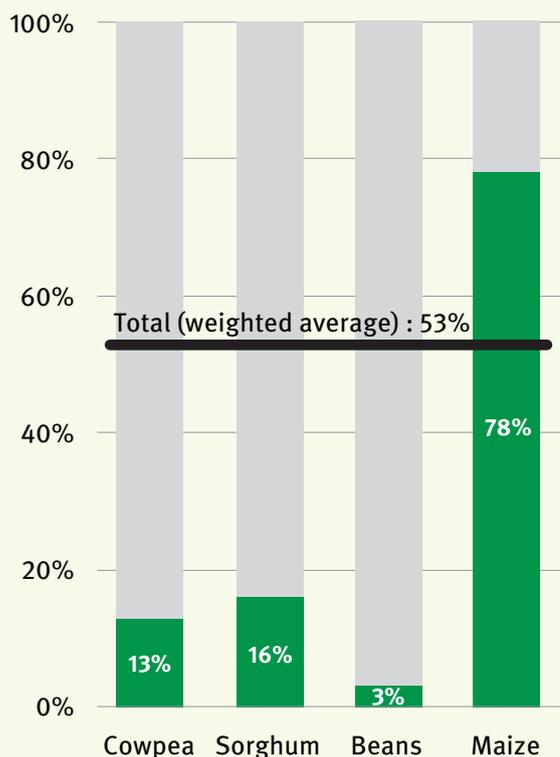
The major question arising from this data is whether this low usage of non-maize certified seed is driven by lack of supply or lack of demand. Field experience indicates that it is the former, as few seed companies currently report significant volumes of carryover stocks of non-maize seed.

**FIGURE 14b: Total seed certified by KEPHIS, in metric tons, 2012-2014**



Source: REMPAL Kenya Seed Sector Study, 2014.

**FIGURE 15: Portion of land in Kenya planted to a specific crop with certified seed**



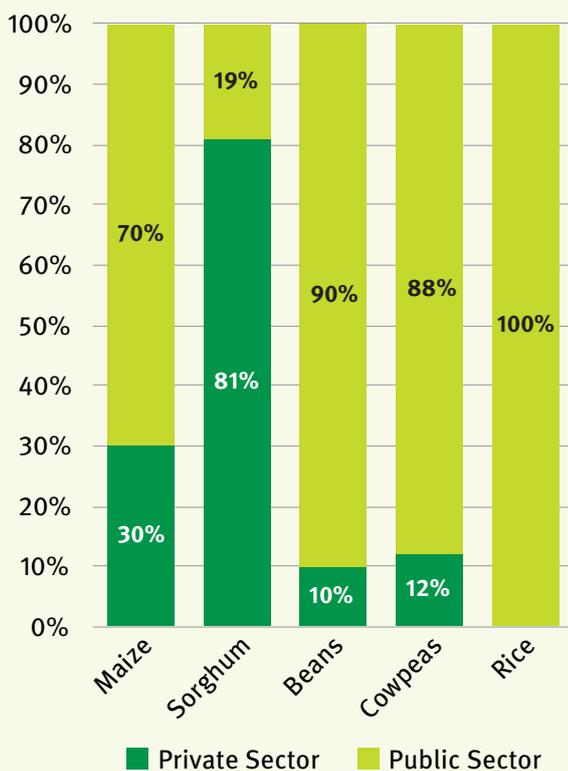
Source: REMPAL Kenya Seed Sector Study, 2014.

## TREND #5

# Government Involvement and Private Sector Reluctance

Among sub-Saharan Africa's top 15 economies, only Kenya, Angola, and Ethiopia have government-dominated seed sectors. Kenya has at least 11 parastatals registered as crop seed companies. Figure 16 shows the market share held by the public and private sectors across a sample of crops. Only in the case of sorghum does the private sector have a larger share of the crop seed market, but sorghum is currently a very small subsector. The most extreme situation is that of rice; in 2013, 100 percent of the market share went to the public sector.

**FIGURE 16: Crop seed market share in Kenya, 2013**

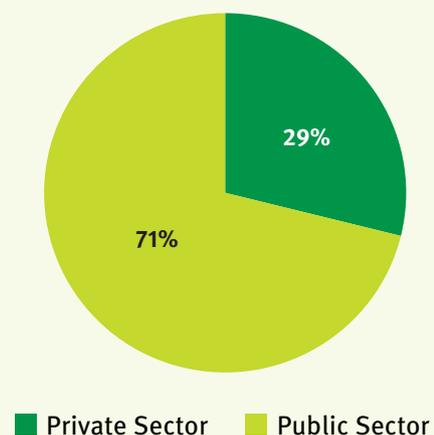


Source: REMPAL study - Market Inquiry of the Seed Industry in Kenya, August 2014.

In aggregate, as seen in Figure 17, the public sector has bred and owns 71 percent of the crop varieties, while the private sector has bred and owns 29 percent. Variety ownership by the public sector is not necessarily a problem as long as there are vibrant licensing and breeder or basic seed provision programs in place and functioning. These are challenges in Kenya, particularly provision of breeder or basic seed for non-maize crops.

These figures suggest a low level of private sector research, development, and investment, and stand in marked contrast to many other countries that have more developed seed sectors than Kenya, including South Africa. Unlike seed companies in developed countries, it is rare for Kenya's private sector seed companies to invest in significant quality control systems, breeding programs, staff training and development, and

**FIGURE 17: Crop seed variety ownership in Kenya**



Source: Analysis of Seed Sector Platform KENYA, SeedWorks database (seedsectorplatformkenya.com)

customer care systems. Concurrently, it is difficult for seed companies to attract both debt and equity financing, particularly at reasonable rates. Potential investors often point to the high level of government competition in the seed sector for this state of affairs. They note the reluctance of financiers and often parent companies to invest in a system characterized by government both regulating and competing against the private sector.

Kenya Seed Company, the dominant parastatal in the crop seed sector, has done an admirable job of working to bring crop seed to Kenya's farmers, reliably and on an affordable basis. It has played an important role since its founding in 1956. However, evidence suggests that the challenges are now larger than government parastatals can solve, and that – over time – innovation, agility, financing, market and regulatory discipline, and competition for customers on a level playing field are all in Kenyan farmers' best interests.

A new index, The African Seed Access Index (TASAI), conducted pilot studies in four countries in sub-Saharan Africa to rank the health of the crop seed sectors. A key measure TASAI used to rank sector competitiveness is called the Herfindahl-Hirshmann Index (H-H Index). Using this methodology, a total monopoly market would score 10,000 (100 percent x 100 percent). The H-H Index considers any sector with a score greater than 3,500 to be a poor competitive environment, and any sector with a score greater than 5,000 to be an extremely poor competitive environment.

For maize, the most important crop in all four pilot countries, only Kenya scored in the extremely poor category, with an H-H Index score of 6,300. The other pilot countries were in the range of good (Uganda) or fair (South Africa and Zimbabwe).

## TREND #6

# Kenya's Increasing Food Deficit

With Kenya's population projected to reach 66.3 million in 2030, the deficit in maize production will also grow substantially, all other things being equal (see Figure 1).

Over the past 50 years, maize yields in Kenya have increased only marginally, and since the early 1980s, they have decreased. As shown earlier, it is the increase in land under cultivation that has driven production increases, but assuming that this trend can continue is risky, and possibly not environmentally sound. Based on these factors, we explore the impact on the maize deficit in three scenarios (see Figure 18). All three scenarios assume that the area under maize cultivation remains at 2 million hectares annually, and population growth is 2.7 percent.

In the first scenario, maize production stagnates; annual maize production is assumed to continue around current levels, or 2.8 million metric tons per year. In this case, the deficit increases from about 1 million metric tons in 2014-2015 to about 3.0 million metric tons in 2030. If the deficit is filled completely by imports at the average price per metric ton for maize imported in 2011 (US\$343), the total import cost will exceed US\$1 billion by 2030, without considering the impact of inflation.

A second, optimistic scenario, assumes that maize yields increase by 50 percent over the period 2015-2030 (a compounded annual growth rate of 2.6 percent per year). These gains could come from a sustained increase in the use of certified seed and other inputs as well as improved agronomic

practices. Under this scenario, production of maize increases from 2.8 million metric tons in 2014 to 4.2 million metric tons in 2030. The deficit in 2030 (to be met from imports) is 1.6 million metric tons valued at over US\$500 million, without considering the impact of inflation.

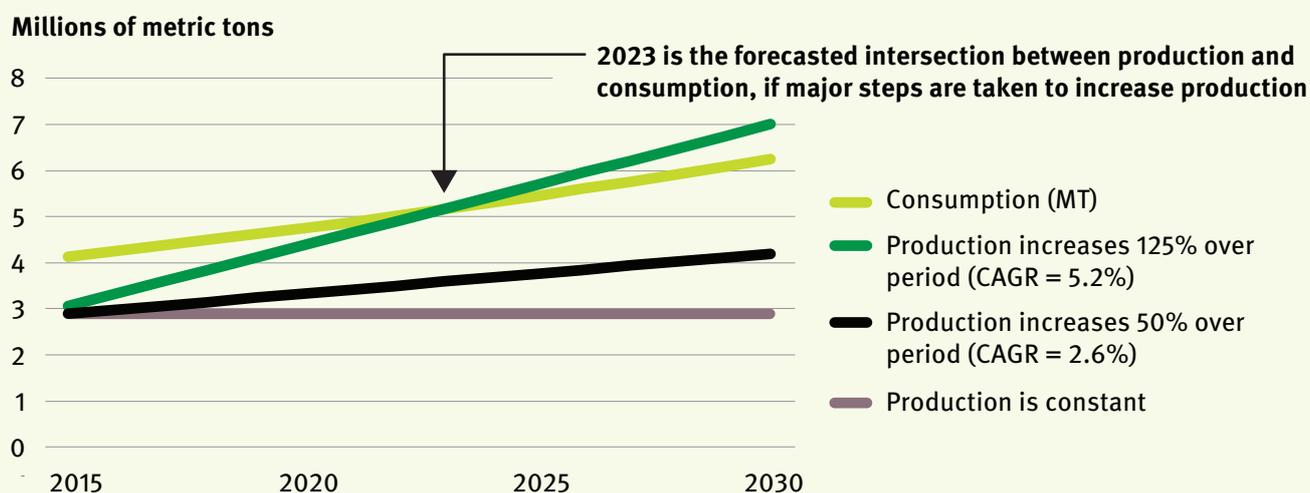
An even more optimistic, potentially break-even, scenario assumes maize production can increase by 125 percent by 2030, a compounded annual growth rate of 5.9 percent. This scenario shows that production will match consumption by 2023, and surpluses will be generated from that year forward (see Figure 19). The surpluses can grow to significant amounts – as projected by the scenario they will amount to 800,000 metric tons in 2030, valued at US\$274 million – again, but this time in a positive sense, without considering the impact of inflation.

Production volume growth rates of 5.9 percent annually may seem highly unrealistic. However, given Kenya's current low yields relative to global averages, the presence of two seasons in much of the country, and the many levers that can be pulled to increase maize yields, this aspirational target may make sense. These levers include fertilizer access and usage, post-harvest storage, improved uptake of new modern varieties, improved seed quality, better management practices, increased public and private sector investment in extension and farmer training, increased crop rotation, and increased smallholder farmer uptake of certified maize seed, particularly hybrid.

**FIGURE 18: Estimated national maize consumption and three production scenarios, in metric tons, 2014-2030**

	Consumption (millions of MT)	Status quo scenario: Production constant (millions of MT)	Optimistic scenario: Production increase 50% (millions of MT)	Aggressive break-even scenario: Production increase 125% (millions of MT)
2014	4.0	2.8	2.8	2.8
2015	4.1	2.8	2.9	3.1
2016	4.2	2.8	3.0	3.3
2017	4.4	2.8	3.1	3.6
2018	4.5	2.8	3.2	3.9
2019	4.6	2.8	3.3	4.1
2020	4.7	2.8	3.3	4.4
2021	4.9	2.8	3.4	4.6
2022	5.0	2.8	3.5	4.9
2023	5.2	2.8	3.6	5.2
2024	5.3	2.8	3.7	5.4
2025	5.4	2.8	3.8	5.7
2026	5.6	2.8	3.9	6.0
2027	5.8	2.8	3.9	6.2
2028	5.9	2.8	4.0	6.5
2029	6.1	2.8	4.1	6.7
2030	6.3	2.8	4.2	7.0

Source: Author's computation based on assumptions about trends in population growth, maize production, and constant per capita consumption.

**FIGURE 19: Three maize production scenarios**

Source: Author's computation based on assumptions about trends in population growth, maize production, and constant per capita consumption.

# Conclusion

Kenya currently bears significant economic burdens due to rising food production deficits and imports.

Key among these burdens are:

- Hunger, poor nutrition, and food security are present in over 40 percent of the population;
- Impact of the large and rising food import bill on the economy, including on foreign exchange rates;
- Increasing exposure to the risk of rising global food prices;
- Exportation of jobs and investment capital to import both raw and processed food;
- Slow growth and innovation by private crop seed sector players;
- Slow growth and innovation by food processors due to lack of raw inputs; and
- Environmental challenges, such as deforestation, due to over-dependence on increasing land under cultivation to drive production increases.

While improving Kenya's crop seed sector is not the only solution to these challenges, it is an essential part of the solution and arguably the best place to

start. The overall picture is not a good one, however; certified crop seed levels have dropped almost 30 percent in the last two years. The data regarding key trends in the crop seed sector is incontrovertible, particularly for non-maize seed. All too often, farmers do not have good and reliable access to the best, and best performing, planting material.

The debate can no longer focus on whether or not there is a challenge in the crop seed sector. If Kenya is to move forward to further establish itself as a strong, stable regional power in East Africa, the debate must quickly turn to what action must be taken in the crop seed sector, not whether or not action must be taken.

Ultimately, solutions in the crop seed sector will need to be bolstered by solutions in fertilizer, extension, finance, and more. There is work to be done.

Part II of this analysis, due in early 2016, will explore the causes of the current situation, the costs of inaction, and the most promising solutions based on best practices in other crop seed sectors.

# Endnotes

- 1 “Hunger” is used synonymously with chronic undernourishment. FAO defines “undernourishment” as “a state, lasting for at least one year, of inability to acquire enough food, defined as a level of food intake insufficient to meet dietary energy requirements. For the purposes of this report, hunger was defined as being synonymous with chronic undernourishment.” In contrast, “undernutrition” is defined as “the outcome of undernourishment, and/or poor absorption and/or poor biological use of nutrients consumed as a result of repeated infectious disease. It includes being underweight for one’s age, too short for one’s age (stunted), dangerously thin for one’s height (wasted) and deficient in vitamins and minerals (micronutrient malnutrition). Source: FAO. *The State of Food Insecurity in the World*. 2014.
- 2 Rosen, Stacey and Shahla Shapouri. “A Positive Path for Food Security in Sub-Saharan Africa: Options and Challenges.” USDA Economic Research Service. September 1, 2010. <http://www.ers.usda.gov/amber-waves/2010-september/a-positive-path-for-food-security-in-sub-saharan-africa-options-and-challenges.aspx#.Vjd1mK6rRE6>
- 3 FAO. Elimination of Food Insecurity in the Horn of Africa: Summary Report..FAO Corporate Document Repository. No date. <http://www.fao.org/docrep/003/x8530e/x8530e02.htm>
- 4 World Bank. World Development Indicators 2003. Development Data Group. Washington, D.C.
- 5 Rakotoarisoa, Manitra A., Massimo Iafrate, and Marianna Paschali. *Why has Africa become a Net Food Importer? Explaining Africa Agricultural and Food Trade Deficits*. FAO. Rome. 2011.
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- 8 Nyoro J. K., Mary W. Kiiru and T. S. Jayne. *Evolution of Kenya’s Maize Marketing systems in the Post Liberalization Era..1999*. <http://www.aec.msu.edu/agecon/fs2/kenya/index.htm>
- 9 See Figure 1.4 in State of Kenya’s Economy. World Bank. Edition No. 5. December, 2011.
- 10 World Population Review. <http://worldpopulationreview.com/countries/kenya-population/>
- 11 World Bank. Kenya Agricultural Sector Review. Draft Discussion Note. *Food and Agriculture Global Practice Africa Region*. March 15, 2015.
- 12 Kimri, Lilian, Nicholas Sitko, T.S. Jayne, et al. “A Farm Gate-to-Consumer Value Chain Analysis of Kenya’s Maize Marketing System.” MSU International Development Working Paper. No. 111. January 2011.
- 13 Odendo M., H. De Groote, and O.M. Odongo. “Assessment of Farmers’ Preferences and Constraints to Maize Production in Moist Mid-altitude Zone of Western Kenya.” Presented at 5th International Conference of the African Crop Science Society. Lagos, Nigeria. October 21-26, 2001.
- 14 USDA. *Kenya Exporter Guide*. 2013.
- 15 Ihucha, Adam. “Food for Thought: Dar Eyes China Market for its Surplus Maize” *The East African* 4-10 April 2015.
- 16 Imports of goods and services represent the value of all goods and other market services received from the rest of the world. They are defined as the value of goods, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personnel, and government services; they exclude compensation of employees and investment income and transfer payments.
- 17 World Bank. *The State of Kenya’s Economy*. Edition No.5. December 2011.
- 18 FAO Global Information and Early Warning System. “Country Briefs-Kenya.” 1 June 2015. <http://www.fao.org/giews/countrybrief/country.jsp?code=KEN>.



# **Food Security & Crop Seed in Kenya**

**Challenging Trends We Cannot Afford to Ignore**