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# Food Production and Consumption Trends in Sub-Saharan Africa: Prospects for the Transformation of the Agricultural Sector

Nicolas Depetris Chauvin, Francis Mulangu and Guido Porto <sup>1</sup>

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<sup>1</sup> Nicolas Depetris Chauvin, African Center for Economic Transformation, [ncdepetris@acetforafrica.org](mailto:ncdepetris@acetforafrica.org). Francis Mulangu, African Center for Economic Transformation. Guido Porto, Universidad Nacional de La Plata.

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**Abstract:** The objective of this paper is to contribute to the debate on the role of agriculture transformation in the development process and as an engine to reduce poverty and improve general wellbeing through better access to nutrients in Africa. To better inform the debate we review food production, consumption and trade trends in a large sample of Sub-Saharan countries combining both macroeconomic and microeconomic evidence. We selected for the analysis nineteen countries for which household survey data was available, namely Benin, Burkina Faso, Burundi, Cameroon, Cote d'Ivoire, Ethiopia, Gambia, Ghana, Guinea Bissau, Kenya, Madagascar, Malawi, Mali, Nigeria, Rwanda, Senegal, South Africa, Tanzania and Uganda. The data shows that dietary energy has been increasing in SSA but not steadily and not fast enough. The observed food production and consumption trends highlight the importance of pursuing a deep transformation of the agricultural sector in Sub Sahara Africa if incomes are to be risen and food security problems are to be mitigated.

**Keywords:** Food production; food consumption; agriculture; smallholders; Sub-Saharan Africa

**JEL Classification:** O13; Q18; N57

## 1. Introduction

Sub-Saharan Africa is the poorest region in the world. Average real per capita income in 2010 was \$688 (in constant 2000 US\$) compared to \$1717 in the rest of the developing world. Over the past 30 years, GDP growth per capita in SSA has averaged 0.16 percent per year. This failure of growth over the long term has resulted in high levels of poverty in the region. One finds the same picture of stagnation when one looks at the structures of African economies. In almost all of them production is dominated by the primary sector in either agriculture or minerals. In the primary sector, agriculture is marked by low productivity with little application of science and technology, and in the mining sector almost all the operations using modern technology are foreign-owned enclaves with little linkages with the rest of the economies. Foreign trade mirrors the production structure: exports are dominated by primary commodities incorporating little application of science and technology while the bulk of manufactures and knowledge-based services are imported. For the majority of African countries, the agricultural sector still provides a relatively large share of GDP but productivity in the sector has lagged considerably behind that of other continents and the potential that Africa can reach in the sector. While on average agriculture employs 65 percent of Africa's labor force it accounts for about 32 percent of gross domestic product, reflecting the relatively low productivity in the sector. For Africa therefore, the rural population has been unable to move out of poverty principally because they have not been able to transform their basic economic activity which is agriculture. Because of the importance of the sector to the livelihoods of the poor, the World Bank said in its 2008 World Development Report, devoted to Agriculture and Rural Development, that the sector must be placed at the center of the development agenda if the Millennium Development Goals of halving extreme poverty and hunger by 2015 are to be met.

The literature is replete with examples of productivity-led agricultural transformation playing an active role in economic transformation in general and making agriculture an important driver of growth. Several studies have found that agriculture has been the engine of growth in most developing countries with causality running from agricultural growth to economy-wide growth in most cases, and that even small variations in agricultural productivity have had strong implications for the rate and pattern of economy-wide growth. Evidence from developed countries, the Green Revolution in Asia and Latin America strongly suggests that agriculture can be an engine of growth early in the development process and also an important force for poverty reduction. While agricultural growth has been the precursor to the acceleration of industrial growth in a number of emerging economies such as China, Brazil, and India, for sub-Saharan Africa, current agricultural productivity is low and there have been numerous failures in getting agriculture moving.

Over the past 10 years, Sub-Saharan Africa (SSA) has experienced encouraging economic growth averaging about 4.5 per cent with some non-oil-exporting countries reaching an average of more than eight per cent. Despite this impressive economic performance, agricultural transformation has been slow and growth rather sluggish. Notably, productivity is still way below yield potentials, agricultural mechanization is weak and declining, and the state of the agribusiness industry is still nascent. Although there have been pockets of success stories in a few countries, it is fair to say that economic growth did not spill over to the agricultural sector. Accordingly to some authors, it is imperative to promote agricultural

transformation on the ground that industrialization is dependent on agricultural improvement. If an industrial economy produces no food, its expansion will increase the demand for food, raise the price of food relative to industrial goods, and so reduce profits (Timmer, 1988). According to these authors, the record economic growth experienced by many SSA countries will be ephemeral unless it is accompanied by effective agricultural transformation.

On the other hand, other economists (see for instance Dercon and El Beyrouty, 2009) and analysts put less emphasis, if not in the development of the agriculture sector, in what they consider an excessive focus on food production in SSA. According to them, there is an important wedge between food production and food consumption that can be seen in the fact that many of the agricultural based countries fail to provide sufficient food and nutrition for their population. They criticize the main message of the World Development Report of 2008 that investing in agriculture is a necessary condition for any development. While the commodity price boom is an indication that further investment is needed in agriculture, this does necessarily imply that agriculture is the way forward for Africa. Although it is true that in the aggregate the world cannot import food and increases in production are badly needed, it is not necessarily true at the country level. Countries (particularly small ones) can import food without much effect on relative prices, and, according to these authors, historically food self-sufficiency and agricultural supremacy has never proved to be the defining feature of growth across the world.

These competing views about the relevance of agriculture for growth and development imply different policy priorities for developing countries in general and for Africa in particular. However, this debate cannot be properly address without taking into account that Sub-Saharan Africa is a region with a multiplicity of realities. If food security and poverty reduction are desirable ends, it could be the case that for some African countries this may be achieved by policies and investments away from the agriculture sector. Nevertheless, this is certainly not the case for all African countries. The secular increase in commodity prices due to the increasing demand of emerging market economies has opened a window of opportunity to increase agriculture production and productivity, reduce poverty and improve food access conditions. The case for focusing on agricultural transformation in some African countries is therefore very compelling. As we will see below, performance of the agriculture sectors in Africa is still unsatisfactory and the sector has not been able to experience anywhere close to the results obtained under the green revolution in Asia. For the economic transformation and change in African economies therefore, agricultural productivity gains must be the basis for national economic growth and the instrument for mass poverty reduction and food security.

The objective of this paper is to contribute to the debate on the role of agriculture transformation in the development process and as an engine to reduce poverty and improve general wellbeing through better access to nutrients in Africa. As we mentioned above, the analysis to be meaningful cannot be done at the sub-continent level but looking at the particular reality of different countries and crops and livestock. Even more, in most cases the national averages hide contrasting subnational realities. Unfortunately, data availability and the scope of this paper do not allow us to further explore the discrepancies found in different regions of the countries under study. To better inform the debate we review food production, consumption and trade trends in a large sample of Sub-Saharan countries combining both macroeconomic and microeconomic evidence. The authors selected nineteen countries for

which household survey data was available, namely Benin, Burkina Faso, Burundi, Cameroon, Cote d'Ivoire, Ethiopia, Gambia, Ghana, Guinea Bissau, Kenya, Madagascar, Malawi, Mali, Nigeria, Rwanda, Senegal, South Africa, Tanzania and Uganda. In the macroeconomic data analysis the Democratic Republic of Congo was also included despite lacking a household survey.

Next section presents food production trends. We first present aggregate production data for food, livestock and fisheries in Sub Saharan Africa, followed by individual country analysis of food crop yields. This section also analyse yields in cash crops and compare it to other countries outside Africa. The purpose of this discussion is to inform the readers about the food dynamics in SSA, for that reason this discussion will be rather descriptive. We also study food consumption trends expressed in kilocalories (kcal) per capita per day. This is a key variable used for measuring and evaluating the evolution of the global and regional food situation. Analysis of FAOSTAT data shows that dietary energy has been increasing in SSA but not steadily and not fast enough. This section also reviews trends in food trade in the regional and at the country level showing which countries have food surpluses and which ones have food deficits. The section concludes with an assessment of the link between food production and protein supply at the country level.

Section 3 of this paper presents the microeconomic evidence of food production and consumption using household surveys. We use the data to answer four questions: (a) How much of their income households spend on food? (b) In what food items they spend their income? (c) How much income comes from agriculture sales? and (d) What are the sources of agriculture income? Given the wealth of information available coming from the household surveys, a separate annex was created where for each country we present tables on (a) Expenditure shares in food (both purchases and auto-consumption), manufactures, services and other expenditures, (b) Food expenditures classified in cereals (with some detail), fruits and vegetables (with some detail), legumes, oils and fats, fish, meat, other staple food, and other non-staple food., (c) Income shares classified in agriculture sales, wages, sales of good and services, and transfers, and (d) Agriculture income shares classified in cereals (with some detail), fruits and vegetables (with some detail), legumes, oils and fats, fish, meat, other staple food, and other non-staple food. All the data is presented for the whole population and for each quintile, and distinguishing between urban and rural households.

The last section of the paper will address the policy implications of the observed food production and consumption trends. In particular, we will highlight the importance of pursuing a deep transformation of the agricultural sector in Sub Sahara Africa if incomes are to be risen and food security problems are to be mitigated.

Before we continue with our analysis it is important to make an important clarification. Our emphasis in this paper on agricultural transformation and the subsequent increase in agricultural productivity does not mean that we do not recognize the complexity of the food security concept and the need of a multidimensional definition and approach. We see the increase in agricultural productivity probably as a necessary but not a sufficient condition to achieve long term food security in Sub Sahara Africa.

## 2. Food production, consumption, and trade and its implications on nutrition in Sub Saharan Africa

### *A. Introduction*

The purpose of this section is twofold. First, we will discuss the general food dynamics in SSA by country and by crop type and for that reason this discussion will be rather descriptive. We will look at production, consumption and trade at the SSA and individual country level considering food crops, livestock and fisheries. We also consider the main cash crops to draw a parallelism in the evolution of yields for both food and cash crops. Second, we will attempt to tell a story by drawing a link between food production, food consumption, and food nutrition. This analysis will help the readers identify the food group from which most African get their largest bang-for-the-buck in terms of protein supply. This analysis should be able to help policy makers in their policy intervention priorities for promoting higher nutrition levels in their countries.

### *B. Food production, consumption and trade dynamics*

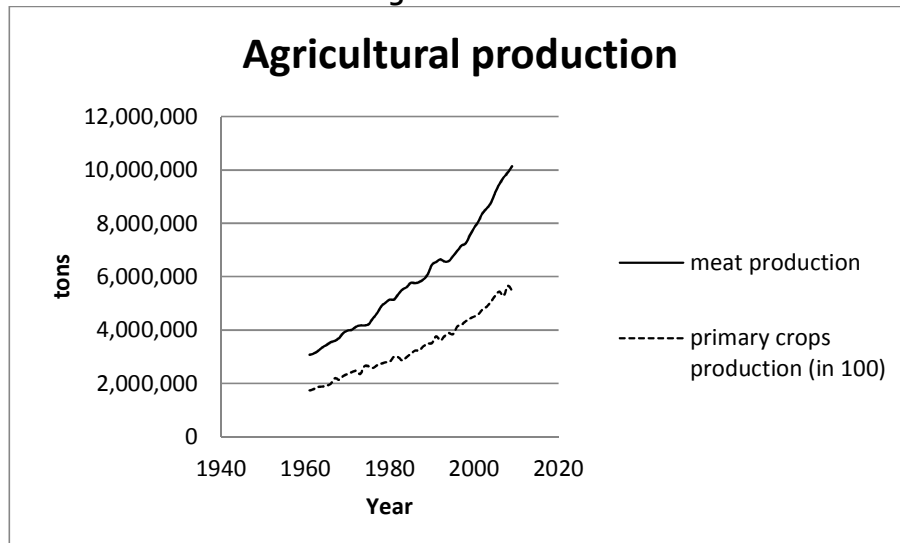
#### *1. Food Production*

##### *1. Food (including fishery) production in sub-Saharan Africa (SSA)*

##### *a. Primary crops and livestock*

The historical trend of primary crops (this includes all agricultural products except livestock and fishery) and livestock meat (meat from sheep, goats, poultry, beef, and buffalo) production is presented in figure 1 below. It shows that total food production (primary crops and meat) in SSA has been growing but at a very slow rate of less than one per cent per year. This is rather alarming considering the fact that food production growth rate is not statistically different from population growth rate which raises concerns about SSA ability to self-insure against food insecurity. Without both food imports and serious effort to boost food production, SSA would not be able to insure adequate food supply for the population.

Figure 1



Source: FAOSAT

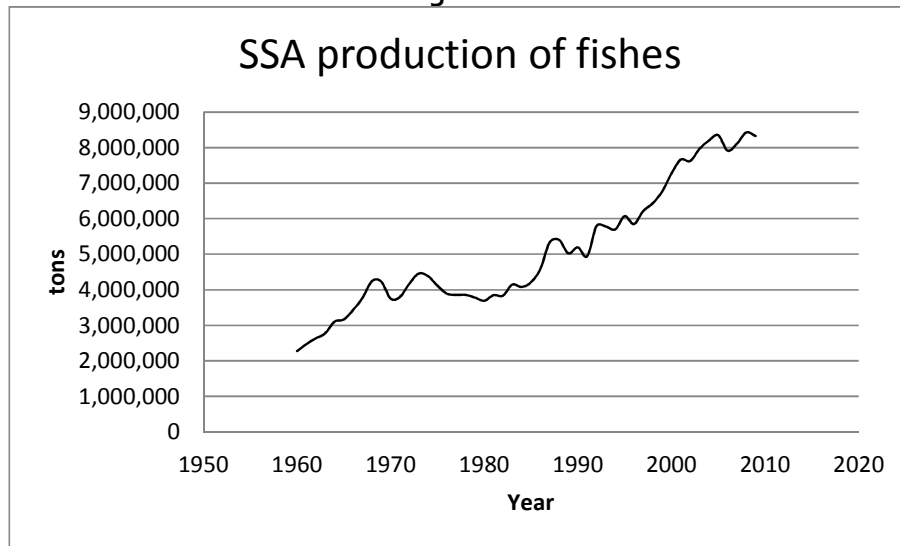
SSA has the necessary fertile land and labour to be food self-sufficient. However, there are two food production faces the scarcity of inputs such as adequate water and fertilizers. Agriculture in SSA is mostly rain-dependent, and this dependence makes it vulnerable to late rainfall onsets and precludes it from obtaining the best possible output. Small scale water storage devices are a possible solution to reduce SSA agriculture vulnerability to rainfall fluctuation. In addition to reducing crop vulnerability, these devices could encourage farmers to adopt high risk/high return agricultural practices that were once too risky because of water uncertainty. Also since food in SSA is mostly produced by smallholder farmers, inputs such as fertilisers are mostly not available. Fortunately, governments and development partners around the continent have put in place various rural development programs that seek to subsidise fertilizer costs in order to make them widely available.

Most of the meat produced in SSA comes from the pastoralist nomadic tribes of East and West Africa. However, the quality and quantity of livestock supply depends on the environment as these pastoral tribes use rudimentary methods that have been passed on from generations to generations. As the growing risks of climate change reduce the quantity of grassland every year, SSA is far from becoming meat self-sufficient.

#### *b. Fishery production*

It is estimated that the inland fisheries of Africa produce 2.1 million tonnes of fish, which represents 24% of the total global production from inland waters (FAO, 2004). In comparison to marine fisheries, inland fisheries production is relatively small, representing only 6% of global production. In Africa, marine fisheries production (4.7 million tonnes) is also much larger compared to inland fisheries (2.1 million tonnes) but in a smaller scale than at the global level.

Figure 2:



Source: FAOSAT

Inland fisheries in Africa are largely non-industrial (artisanal) in nature, including the sub-sectors of catching, processing, transportation, trade and gear manufacture, which are distinct occupations in some fisheries are more than others. There are exceptions, of course, and in particular, the fishery for Nile Perch in Lake Victoria – the largest in Africa – has a modern (industrial) processing and export sub-sector, which is supplied by a predominantly artisanal fishing fleet. In parts of Africa, fishing is a part-time activity for rural people who also tend to farm, keep animals and engage in other economic activities. Fishing is often well-integrated within the overall pattern of work for rural households and communities, with well-established patterns of input and time allocation. Many inland fisheries are also a part of local culture and tradition, and based on local knowledge of fish resources and migrations, the use of a variety of different fishing technologies to suit particular fishing opportunities and seasonal changes in flood regimes, for example (Nepad, 2005).

Fishery production has been growing at a faster rate than agriculture products as presented in figure 2 above. One reason behind this rapid growth is the increase demand for healthier diets alternative in developed countries and SSA is a good source of fish since most of it caught in SSA are exported. For some African countries, particularly in West-Africa and to lesser extent also countries along the Indian Ocean, fisheries contribute significantly to exports. It must be noted that this export oriented sector has raised concerns that fish trade leads to a decline in food security and a decrease in the availability of fish for the local population (Kent, 1997). But this claim has met resistance since some of the fish export generated foreign currencies can be used to pay import bills.

Most of the fishes for export are produced by commercial fisheries. However, the number of commercial fisheries in SSA is rather small. On the other hand, the majority of locally consumed fishes are supplied by smallholder farmers who in most cases use rudimentary fishing practices.



## *2. Food and fishery production in individual SSA countries*

### *a. Food Production*

Food production in SSA countries has been increasing for the most part as more and more forest lands are cleared for agriculture. But real progress is revealed via agricultural yields. For that reason, we focus our production discussion below on agricultural yields of the most important crops produced in SSA using the case of 20 SSA countries. We first present a brief agricultural profile of the selected countries. Next, we discuss the historical yield trends of cereal, fruits, oil crops, and tuber/root crops and present arguments to justify their dynamic behaviours. Last, we limit our analysis of export cash crops such as coffee, cocoa, and cotton to a few countries only as their production requires strict climatic settings which cannot be found everywhere in SSA.

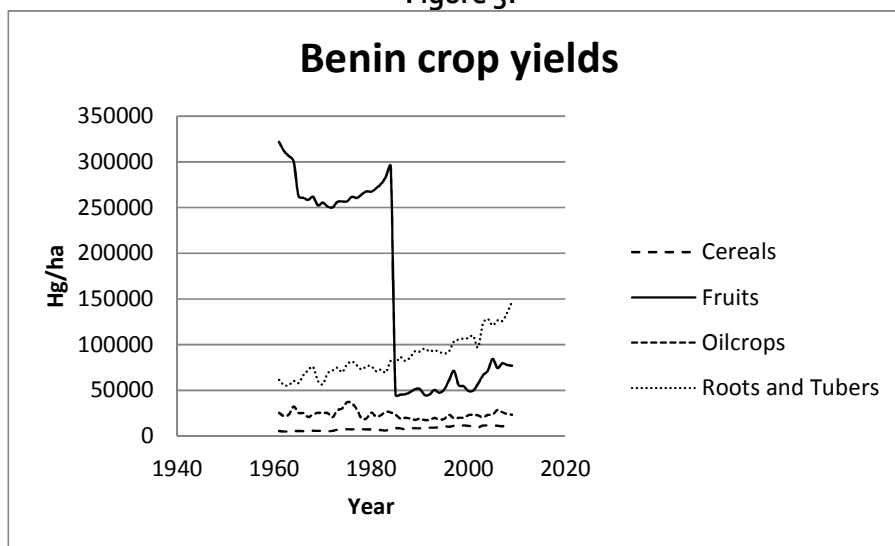
#### *Benin*

Benin is predominantly an agricultural country. About 55% of the economically active population was engaged in the agricultural sector in 2000, which accounted for 38% of GDP that year. Small, independent farmers produce 90% of agricultural output, but only about 17% of the total area is cultivated, much of it in the form of collective farms since 1975. The agricultural sector is plagued by a lack of infrastructure, poor utilization of rural credit, and inefficient and insufficient use of fertilizer, insecticides, and seeds. An estimated 20% of output is informally traded with Nigeria. The main food crops are cassava, yams, corn, sorghum, beans, rice, sweet potatoes, guavas, bananas, and coconuts. Production estimates for the main food crops for 1999 were yams, 1,771,000 tons; cassava, 2,377,000 tons; corn, 823,000 tons; sorghum, 154,000 tons; rice, 36,000 tons; dry beans, 94,000 tons; sweet potatoes, 67,000 tons; and millet, 34,000 tons.

Almost all the crops grown in Benin experienced yield growth over the past 40 years except fruit crops. In fact, cereal yields, fruits yields, oil crops yields, and tuber yields have been growing by an average growth rate of 2.0%, -3.0%, 0.0%, and 2.0%, respectively. Fruit yields sharply decreased in 1985 to 1/5 of what it was the year before. We suspect that smuggling of crops for export or the domestic black market results in this big underestimation of crop figures. Tuber/roots yields have gradually been increasing with minor transitory shock which did not affect its steady state. Oil crops yields have remain constant to some extent while cereal yields have been slowing increasing with no serious interruptive shocks.

Crop production in Benin is characterized by low input use for food crops and moderate input use for cotton production. Under these conditions any increase in production would require an increase of the cultivated area. Comparing the low yield on farmers field with the higher yield obtained under research conditions on farmers field, there is still a high production potential available in case that the production management would be optimal and inputs for food crops would be available and used (Akker, 2011).

Figure 3:



Source: FAOSTAT

### Burkina Faso

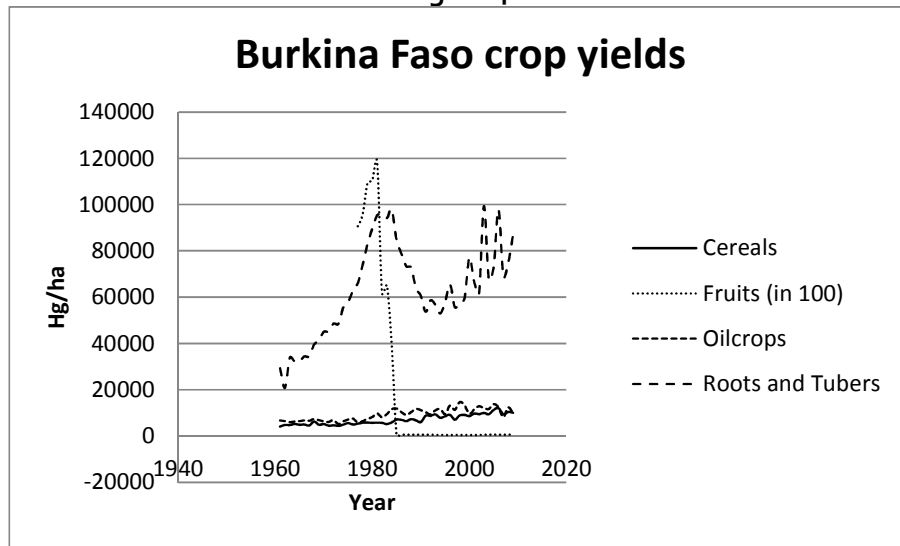
Aridity and erosion seriously hamper agricultural development, and most farming is concentrated in southern and south-western Burkina Faso. Leading food crops, with 1998 production amounts in metric tons, were cereal grains, including sorghum, millet, rice, and corn (2 million); and pulses (66,000 metric tons). The chief cash crop was cotton (343,106 metric tons), which accounts for a large share of the country's export income. The principal wealth of Burkina Faso is its livestock: 4.5 million cattle, 7.9 million goats, 6.2 million sheep, 586,600 pigs, 24,500 horses and asses, and 20.5 million poultry. Efforts were under way to rebuild the nation's livestock industry following severe losses due to the recurrent drought in the region known as the Sahel between the late 1960s and early 1980s.

In Burkina Faso, cereal yields, oil crop yields, and tuber/root yields have been growing by an average growth rate of 2%, 1%, and 2%, respectively. However, similarly to Benin, Burkina Faso fruit yields have been decreasing by an average rate of 14%. Looking deeper into the data, we can see that fruit yields sharply decreased in 1984 and had never been able to recover since then. Tuber/roots yields experienced a sharp decrease in the mid 1980's, but was able to recover in the early 2000's despite a number of transitory fluctuations. Cereal and oil crop yields have experience a steady growth rate with minimum interruptions. However, grown in the Sahel region, these crops yields have experience multiple transitory shocks associated with desert-like conditions.

The harsh weather conditions of Burkina Faso are less suitable for agriculture. The only crop that thrive the best in Burkina Faso is cotton. In fact, Burkina Faso is SSA largest cotton seed producer, followed by Nigeria. Unfortunately, cotton seed is largely exported as Burkina Faso

apparel industry took a downward spiral in the early 2000's never recovered despite qualifying for African Growth and Opportunity Act (AGOA)'s special apparel benefits.

Figure 4:



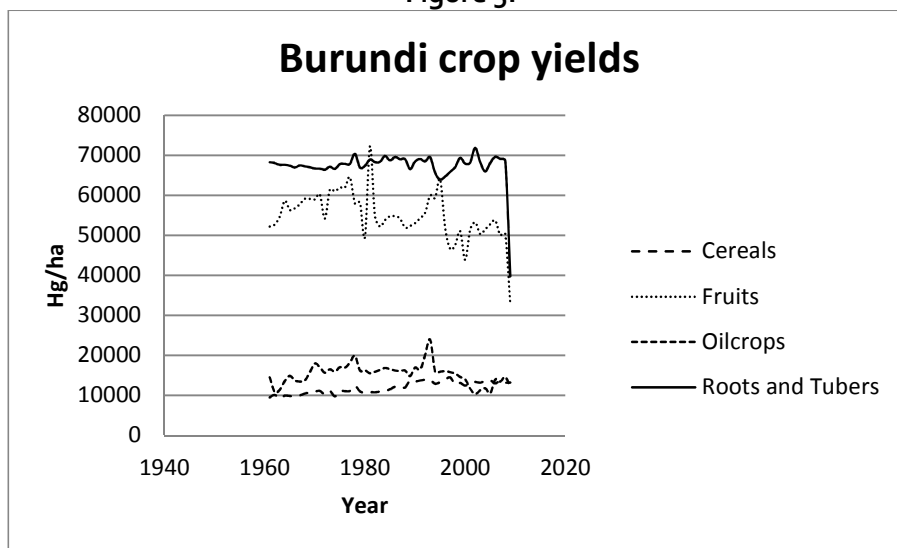
Source: FAOSTAT

### Burundi

About 90% of the population of Burundi depends on agriculture for a living. Most agriculture consists of subsistence farming, with only about 15% of the total production marketed. An estimated 1,100,000 hectares (2,718,000 acres), or about 43% of the total land area, is arable or under permanent crops; about 74,000 hectares (182,800 acres) are irrigated. The average farm family plot is 0.8 hectares (two acres). Agriculture accounted for 50% of the GDP in 2001. Coffee and tea exports comprise the majority of foreign earnings; coffee alone accounted for 54% of exports of goods in 2001. Principal crops for local consumption are cassava, beans, bananas, sweet potatoes, corn, and sorghum. Production in 1999 included bananas, 1,511,000 tons; cassava, 617,000 tons; sweet potatoes, 734,000 tons; beans, 227,000 tons; sorghum, 60,000 tons; corn, 129,000 tons; peanuts, 10,000 tons; and potatoes, 24,000 tons.

Crop yields in Burundi have poorly performed over the past years. Cereal yields have been increasing by an average rate of 1%, fruit yields have been decreasing by -1%, oil crop yields remained constant at an average growth rate of 0.0%, and tuber/root crops decreased by 1%. Tuber/roots growth rate in particular have mostly been affected by the sharp decline in 2009. Fruit yields experience a sharp increase in early 1980's early 2000's. But, it experienced a sharp decline in 2009. Oil crops yields experience a series of sharp increase in the 1970's, 1980's, and late 1990's. However, they were rather transitory. Finally, cereal yields started to improve in the late 1990's. The civil unrests that plagued the country slightly affected yields, but they were able to quickly recover shortly after that.

Figure 5:



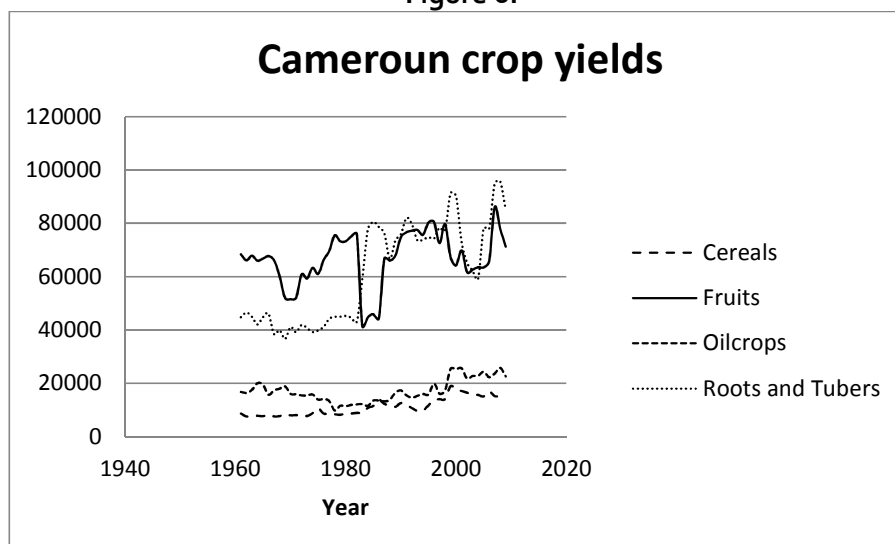
Source: FAOSTAT

### Cameroun

Agriculture was the main source of growth and foreign exchange in Cameroun until 1978 when oil production replaced it as the cornerstone of growth for the formal economy. In 2001, agriculture contributed 43% to GDP. Agricultural development and productivity declined from neglect during the oil boom years of the early 1980s. Agriculture was the principal occupation of 62% of the economically active population in 1999, although only about 15% of the land was arable. The most important cash crops are cocoa, coffee, cotton, bananas, rubber, palm oil and kernels, and peanuts. The main food crops are plantains, cassava, corn, millet, and sugarcane. Palm oil production has shown signs of strength, but the product is not marketed internationally. Cameroon bananas are sold internationally, and the sector was reorganized and privatized in 1987.

In Cameroun, cereal yields, oil crop yields, and tuber/root yields have been growing by an average growth rate of 1% of the past 40 years. At the same time, fruit yield averaged to a 0.0% growth rate. Fruit yields remained constant because of the share decreased it experienced in the mid-1980 and two minor ones in both the mid-1970 and early 2000's. Tuber/roots yields experienced a sharp increase in the early 1980's which help Burundi maintain a high yield level. However, it experienced a shock in the early 2000's for which it was able to quickly recover. Oil crops yields experienced a sharp decrease in the early 1980's, but recovered and maintain it until now. Cereal yield on the other had has been growing at a constant rate with a few transitory fluctuations.

Figure 6:



Source: FAOSTAT

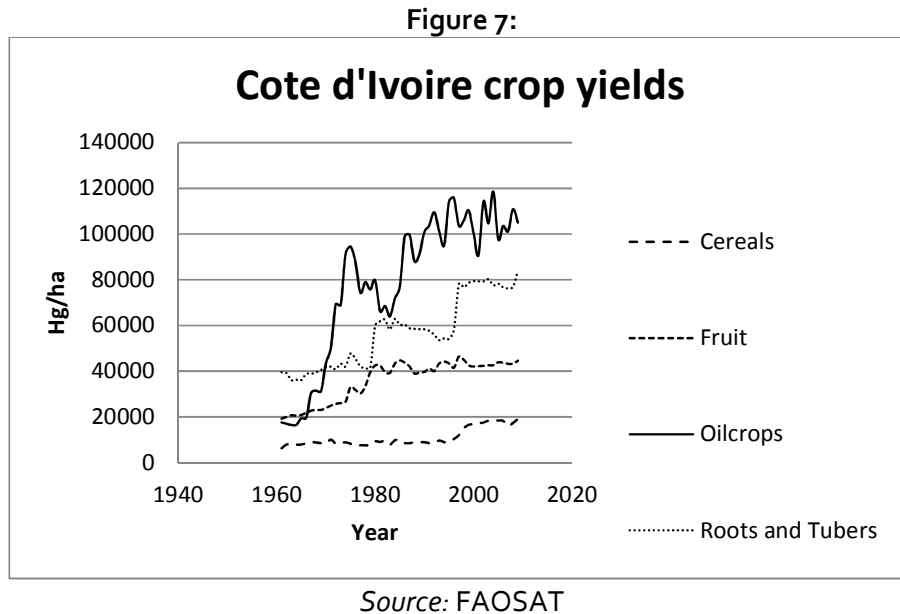
### Cote d'Ivoire

The main food crops (with their 1999 production in tons) are yams, 2,923,000; cassava, 1,623,000; rice, 1,162,000; plantains, 1,405,000; and corn, 571,000. Sweet potatoes, peanuts, and in the northern districts, millet, sorghum, and hungry rice (fonio) are also grown. Vegetable and melon production in 1999 amounted to 534,000 tons, consisting mostly of eggplant, fresh tomatoes, cabbage, okra, peppers, and shallots. The government sought during the 1970s to reduce or eliminate rice imports, but in 2001, about 1.9 million tons were imported. The economic decline during the 1980s coupled with high population growth has necessitated the modernization of agricultural production, with less dependence on coffee and cocoa. When cocoa and coffee prices were booming from the late 1960s until the early 1980s, the government profited by paying the farmers only a fraction of the money earned from the export of the crops.

As presented in figure 7 below, Cote d'Ivoire has experience impressive yield growth rate across all crop groups. Cereal yield, fruits yield, oil crops yields, and tuber yields have been growing at an average annual growth rate of 2.53%, 1.77%, 3.80%, and 1.58%, respectively. Oil crops yield experienced a rapid growth rate between 1961 and the late 1970's. In the 1980's oil crops yields dropped but quickly recovered in the late 1980's and started to grow up to now. Tuber yields experienced two periods of sharp increase which were followed by long periods of zero growth. These are more likely consequences of programs or policies shocks that changed the steady state yield level of tubers. Fruits and cereal yields have experienced a rather smooth growth rate with minimum sharp turns. Fruit yield had a small upward bump in the early 1980's and cereal yield in the early 2000's.

Cote d'Ivoire has had a very impressive food production growth considering the fact that it could have allocated all of its resources to the production of cocoa, its most lucrative source of export revenues. One reason for these positive outcomes is good political will toward promoting agriculture since the early 1960's. From independence to the 1990s, policies and

structures were developed to maximize the export potential of Côte d'Ivoire's agricultural commodities. Although controversial today, tropical forests were cleared to provide more room for plantations. In addition, land tenure policies encouraged the development of land into plantation agriculture, low wage agricultural labourers were used from neighbouring African countries, and plantation mechanization was gradually being introduced (Ladipo, 1990).



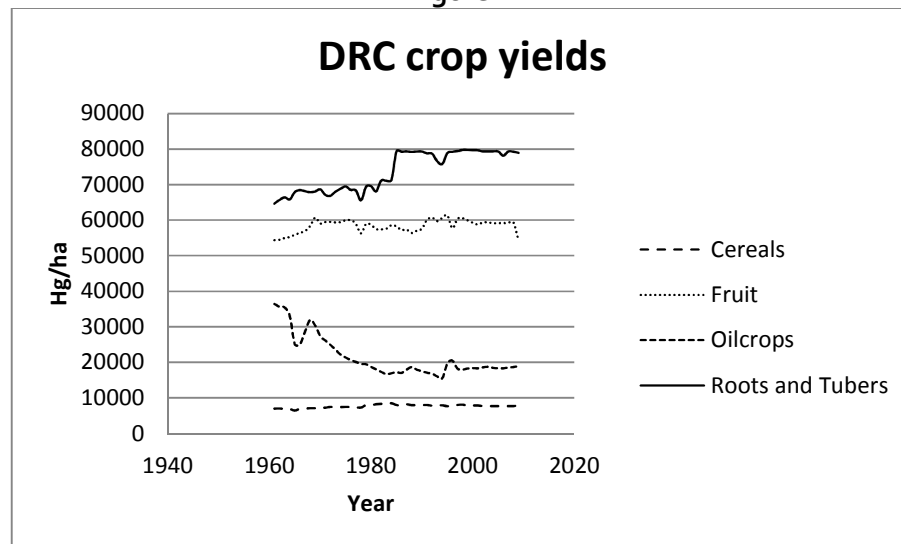
### *Democratic Republic of Congo*

The agricultural sector in DRC supports two-thirds of the population. Agricultural production has stagnated since independence. The principal crops are cassava, yams, plantains, rice, and maize. The country is not drought-prone but is handicapped by a poor internal transportation system, which impedes the development of an effective national urban food-supply system. Land under annual or perennial crops constitutes only 3.5% of the total land area. Agriculture is divided into two basic sectors: subsistence, which employs the vast majority of the work force, and commercial, which is export-oriented and conducted on plantations. Subsistence farming involves four million families on plots averaging 1.6 ha, usually a little larger in Savannah areas than in the rain forest. Subsistence farmers produce mainly cassava, corn, tubers, and sorghum. In 1999, food-crop production included cassava, 16,500,000 tons; sugarcane, 1,750,000 tons; corn, 1,100,000 tons; peanuts, 395,000 tons; and rice, 350,000 tons. In 1999, plantains totalled 1,800,000 tons; sweet potatoes, 370,000 tons; bananas, 315,000 tons; yams, 255,000 tons; and pineapples, 200,000 tons. Domestic food production is insufficient to meet the country's needs, and many basic food products have to be imported.

Agriculture production in DRC has been highly neglected. Despite the favourable agro-ecological condition for the production of crops such as palm oil, DRC crop yields have either marginally grown or simply decreased. Specifically, cereal yields, fruit yields, oil crop yields,

and tuber yield grew by an average annual growth rate of 0.25%, 0.00%, -1.35%, and 0.42%, respectively. Specifically, tubers and root yields experienced a sharp upward shock that increase yield permanently up to presently. Fruit yields have been kept constant over time, which explains the near zero growth rate discussed earlier. Oil crops yields have started to decrease since the early 1970's. It experienced a small increase in the early 2000's but it was not enough to get back to the high yields of the 1960's. Cereal yields did not experience any major change.

Figure 8:



Source: FAOSAT

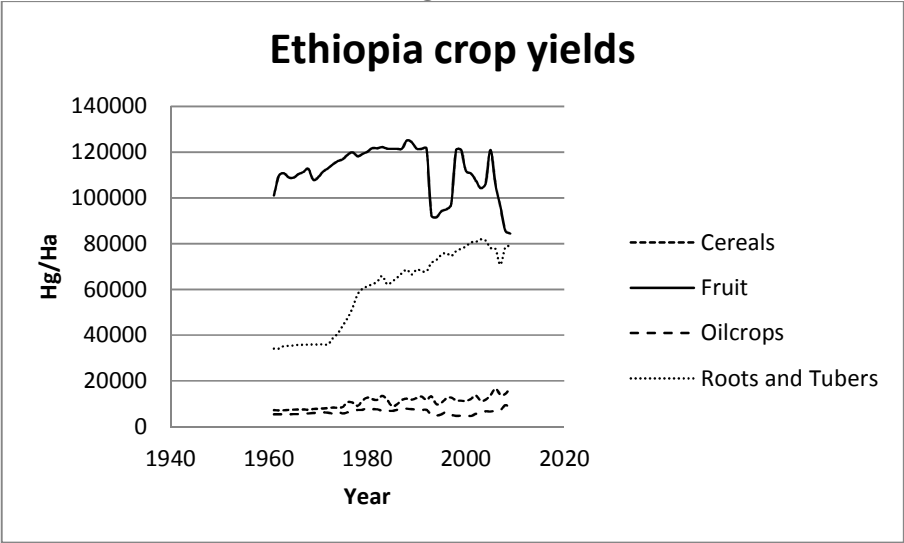
The neglect of agriculture in DRC could be associated to the country's focus on the extraction of precious minerals. The relatively higher prices of minerals such as copper redirected both budget allocations and labour supply toward the mining industry. In addition, the weak road infrastructures have made it difficult for food to reach the mass population living populous cities. This market failure situation has discouraged farmers from investing intensely in agriculture.

### Ethiopia

Ethiopia has experienced positive growth rate in cereal, oil crops, and tuber between 1961 and 2008, and a decrease in fruit yields growth rate. Specifically, cereal yields, oil crop yields, tuber yields, and fruit yields grew by an average annual growth rate of 1.79% -0.37% 0.95% 1.77%, respectively. Cereal yields have had multiple fluctuations over the past years. Fortunately, the fertile volcanic soils of Ethiopia did not allow the fluctuations to last. Fruits yields experienced a sharp decrease in the late 1990's and late 2000's. These sharp drops are more likely associated to severe drought conditions. Oil crops yields started to increase in the late 1970's, but yields had sharply decreased in the 1990's and was able to recover to current all-time high yields. Finally, Tuber and root crops started to increase in the late 1970's and kept an upward move up to now.

Increase in drought conditions led a shift from the production of cash crops such as fruits to the production of food crops. As the incident of drought worsen, cash crops production in Ethiopia could further decrease because of weather stress and agricultural neglect.

Figure 9:



Source: FAOSTAT

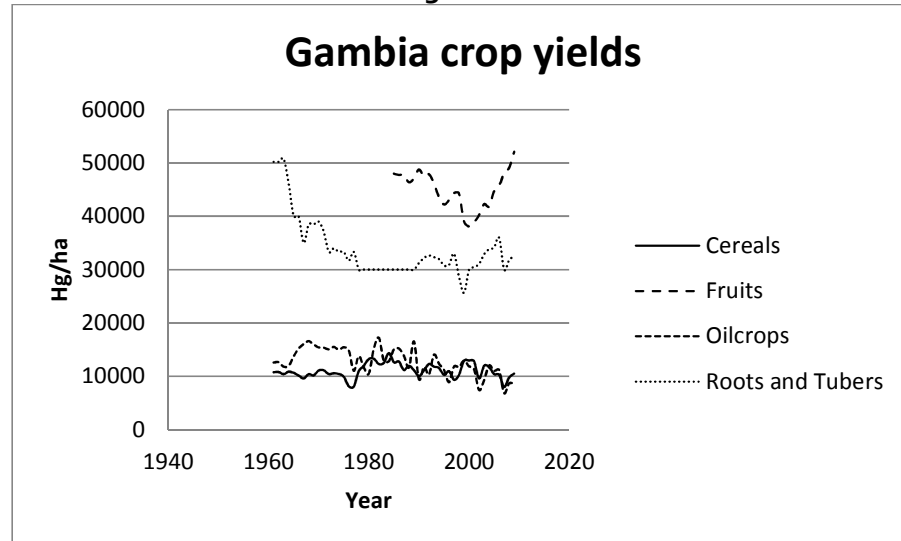
### The Gambia

In Gambia, the soil is mostly poor and sandy, except in the riverine swamps. On upland soils the main food crops, besides groundnuts, are millet, cassava, corn, and beans. Most landholdings range between five and nine hectares (12 and 22 acres). Agriculture supports about 80% of the active population, and contributed about 40% of GDP in 2001. Irregular and inadequate rainfall has adversely affected crop production in recent years.

Gambia's agricultural sector has very poorly performed over the past 40 years. Cereal yields, fruit yields, oil crop yields, and tuber/root yields have grown by either 0.0% or -1%. Fruit yields experienced its sharpest decline in the early 2000's but was able to quickly recover. Unlike most SSA country, Gambia's tuber/root yield did not recover from the sharp decline experienced it experience in the early 1970's. Cereal and oil crop yields have been decreasing with multiple transitory fluctuations.



Figure 10:



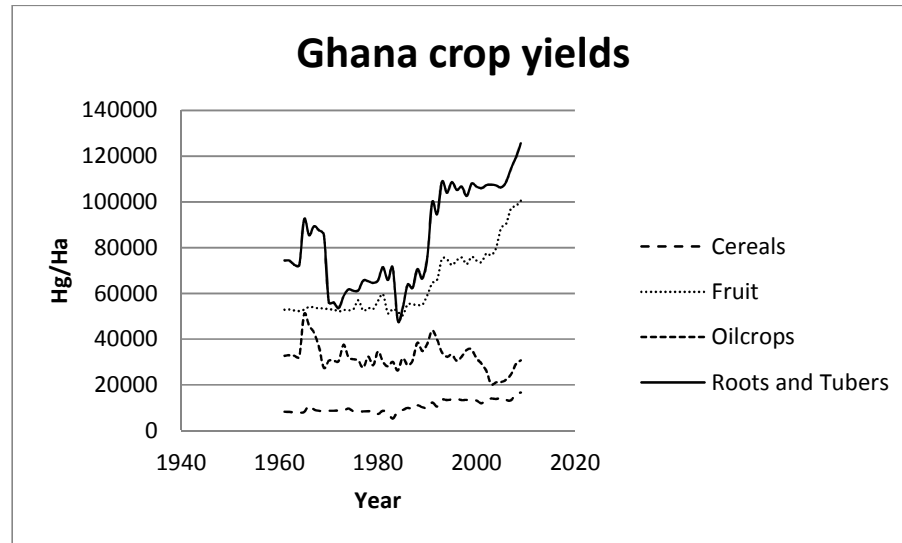
Source: FAOSTAT

## Ghana

Agriculture, especially cocoa, forms the basis of Ghana's economy, accounting for 36% of GDP in 2001. Cocoa exports in 2001 contributed 16% (\$246.7 million) to total exports. About 23% of the total area, or 5,300,000 ha (13,096,000 acres), was cultivated in 1998. About 85% of all agricultural land holders in Ghana are small scale operators who primarily farm with hand tools.

Cereal yields, fruits yields, oil crops, and tuber yields have been growing in Ghana by an average annual growth rate of 1.5%, 1.35%, 0.13%, and 1.10% respectively. Tuber and root yields experienced two sharp drops in Ghana. The first occurred in early 1970's, and the second in early 1980's. Fortunately, yields have recovered and continued an upward trend to an all-time high. Fruits yields started to grow in the late 1980's, but the real breakthrough came about in the late 2000's as Ghana heavily invested in fruit export lead by pineapple. Oil crop yields have experienced two sharp drops. The first occurred in the early 1970's and the second more recently in the early 2000's. Between those periods, I experienced multiple fluctuations with a high increase during the 1990's. If it were not for the sharp drop in yields of 1983, cereal yields in Ghana would have had a perfect uninterrupted upward growth. But Ghana quickly recovered from the drop and kept up with the growth rate.

Figure 11:



Source: FAOSTAT

Tuber yield growth is mostly associated to the improved cassava variety introduced by the International Institute of Tropical Agriculture (IITA) that is more resistant to drought conditions. However, oil crop yield have been decreasing as discussed earlier. This is partly due to the aging palm oil trees as palm oil is the major oil crop with an average yield of 6 ton/ha. As a high yield palm oil tree, *Tenera*, is replacing the traditional variety, oil crop yields are anticipated to increase in the future. The drop in cereal yields is mostly attributed to the major drought Ghana experienced in 1983.

### Ghana success story

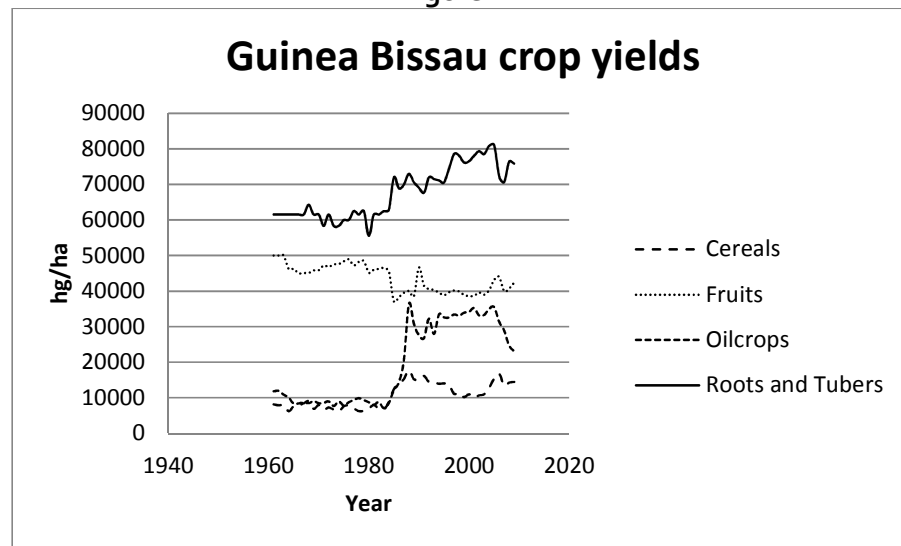
Among the 24 countries considered in a study recently conducted by the Overseas Development Institute (ODI), Ghana made commendable progress in the agricultural sector by maintaining an average agricultural GDP growth rate of about five per cent per annum during the past 25 years. Staple crop production has been increasing faster than population growth, making Ghana largely self-sufficient in terms of staples. While productivity was on the rise, poverty has been declining. Undernourishment, child malnutrition, and the proportion of infants underweight have been drastically falling as well. This combination of productivity growth and improvement in social conditions in both rural and urban areas allowed Ghana to be in the front row of meeting the Millennium Development Goals (MDG1) before the 2015 deadline. ODI credits these progresses to the passing and persistent maintenance of important agricultural reforms that ushered a favourable environment for private investment. Specifically, the restructuring of the cocoa marketing board (COCOBOD), reform of taxation system, and increase expenditure in agricultural research are the major drivers of these progresses.

### *Guinea Bissau*

The agricultural sector of Guinea Bissau employs 83% of the labour force and contributes 56% of the GDP. Only 12% of the total land area is under permanent or seasonal cultivation. The country is divided into three major regions according to the water requirements of the major crops. On the coast and in river estuaries is the palm-tree (coconut) zone; rice is the predominant crop of the intermediary marshy areas; and peanuts are grown in the sandy areas of the interior. Rice is the major staple crop; corn, millet, and sorghum are also produced and consumed very widely. In the 1950s, Guinea-Bissau exported about 40,000 tons of rice per year; since 1962, rice has been imported, as frequent droughts often cause crop failure.

In Guinea Bissau, cereal yields, fruit yields, oil crop yields, and tuber/roots yields have been growing by an average growth rate of 1%, 0.0%, 1%, and 0.0% respectively. Tuber/root growth started to grow in the early 1980's. It experienced a slight drop in mid-200, but is quickly recovering from it. Oil crops yields as well started to increase in mid-1980. However, it started to decline since the early 2000's. Fruit yields have been decreasing since the mid-1980. Cereal yields grew fast in the 1980's, but took a short drop in the early 2000's but seem to be able to recover from it.

Figure 12:

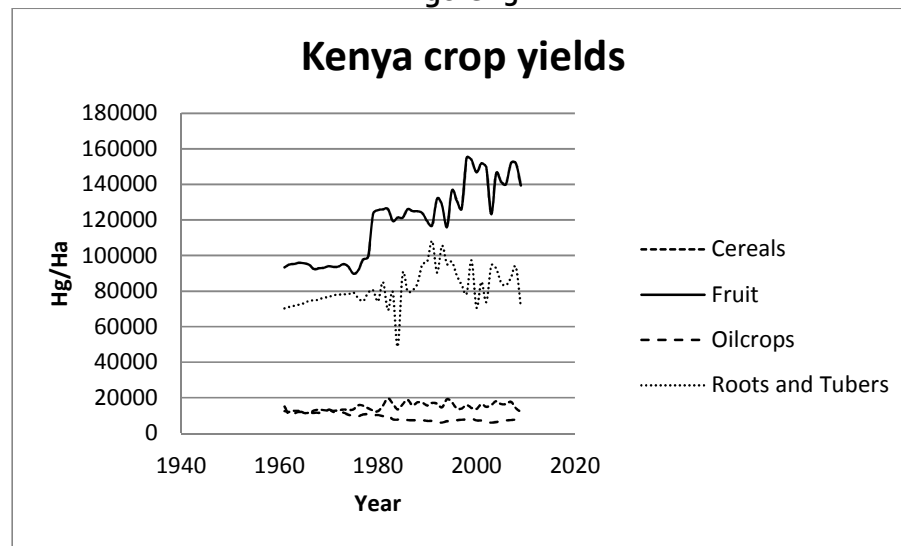


Source: FAOSTAT

## Kenya

Agriculture remains the most important economic activity in Kenya, although less than 8% of the land is used for crop and feed production. Less than 20% of the land is suitable for cultivation, of which only 12% is classified as high potential (adequate rainfall) agricultural land and about 8% is medium potential land. The rest of the land is arid or semiarid. About 80% of the work force engages in agriculture or food processing. Farming in Kenya is typically carried out by small producers who usually cultivate no more than two hectares (about five acres) using limited technology. These small farms, operated by about three million farming families, account for 75% of total production. Although there are still important European-owned coffee, tea, and sisal plantations, an increasing number of peasant farmers grow cash crops.

Figure 13:



Source: FAOSTAT

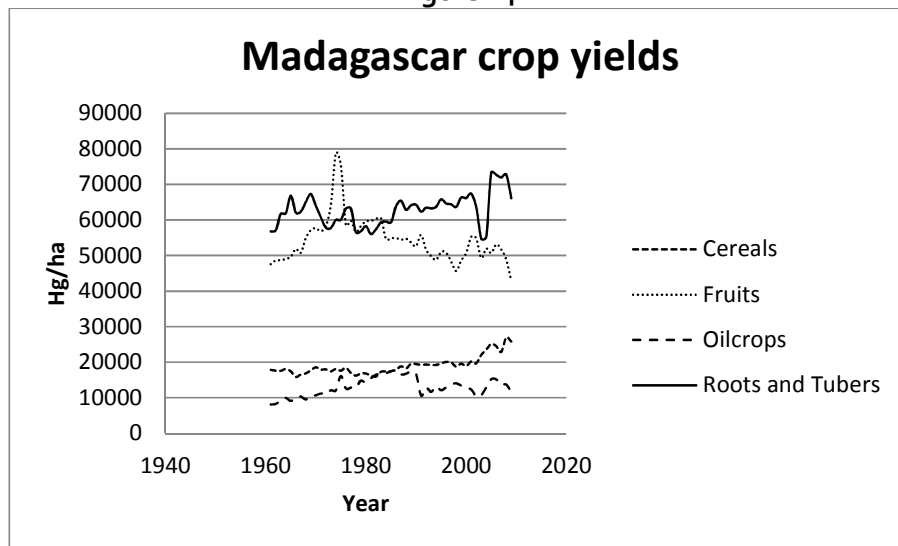
Kenya's crop yields have been growing by a very marginal growth rate over the past years. In fact, cereal yields, fruit yields, oil crops yields, and tuber yields have been growing by an average annual growth rate of -0.07%, 0.84%, -1.46%, and 0.04% respectively. Fruits yields increased sharply both in the late 1970's and early 2000's. Tuber and root yields sharply dropped in the late 1980's, but quickly recovered after that. Although cereal and oil crop yields have on average had a decreasing growth rate, yields have fluctuated over the years with no major changes.

Drought conditions are the major cause of the poor performance of cereal and oil crop yields as Kenya is accustomed to experiencing droughts every five to seven years. Unlike many other SSA countries, Kenya has a comparative advantage in the manufacturing of processed agricultural products. For that reason, it has directed most of its resource toward ameliorating that sector to the detriment of the food production sector.

### Madagascar

Although Madagascar's economy is essentially agricultural, much of the land is unsuitable for cultivation because of its mountainous terrain and inadequate or irregular rainfall. Only about 5% of the land area is cultivated at any one time. Despite these figures, agriculture accounts for 30% of GDP and employs about 75% of the work force. Large-scale plantations dominate the production of sisal, sugarcane, tobacco, bananas, and cotton, but, overall, Malagasy agriculture is dependent mainly on small-scale subsistence farmers cultivating an average of 2.47 acres of land.

Figure 14:



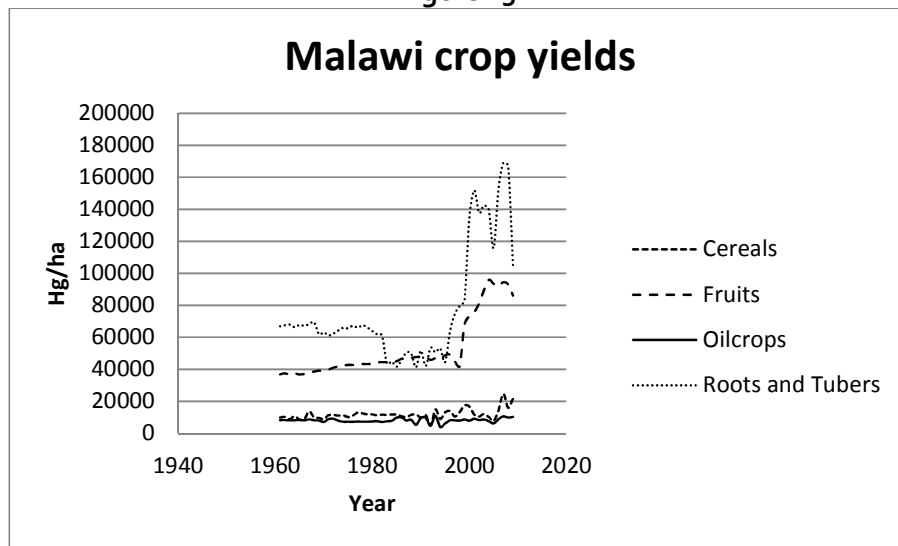
Source: FAOSTAT

In Madagascar, cereal yields, fruit yields, oil crop yields, and tuber/root yields have been increase by an average growth rate of 1%, 0%, 1%, and 1%, respectively. Tuber/root yields experienced a small decline in mid-2000, but quickly recovered from it. However, fruit yields have been declining after experience a sharp rise in the 1970's. Oil crops on the other hand declined in the 1990's but did not recover from it. Finally, cereal yields have been steadily increasing.

### Malawi

The agricultural sector is drought-prone and experienced severe droughts in 1979–81, 1992, and 1994. About 77% of the total land area of Malawi is under customary tenure—that is, subject to land allocation by village headmen based on traditional rights of succession by descent. Estate farming occupies about 23% of the cultivated land and provides about 90% of export earnings. In all, about 21% of Malawi's total land area is arable. Malawi is self-sufficient in food production (except during droughts), but the population increased more rapidly than the food supply in the 1980s

Figure 15:



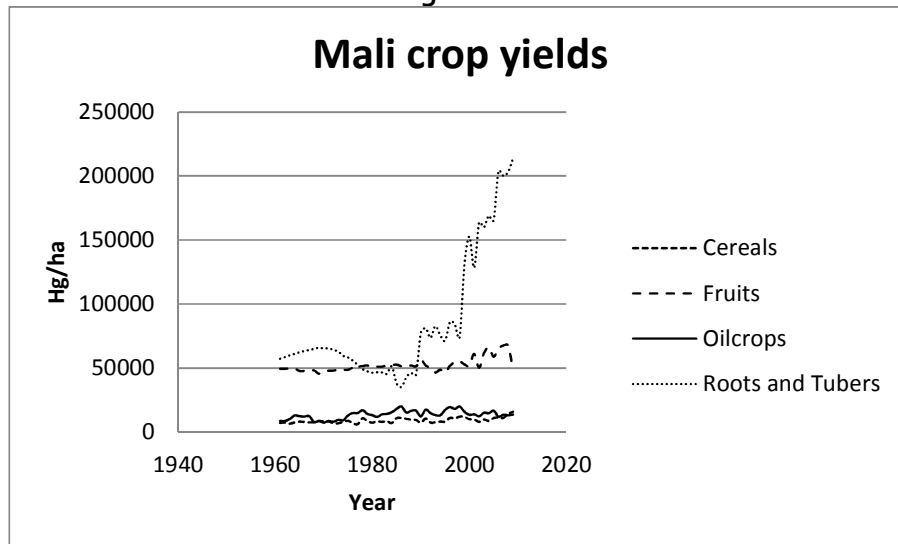
Source: FAOSTAT

Cereal yields, fruit yields, oil crop yields, and tuber/roots yields have been growing at 2%, 2%, 0%, and 1%, respectively. Tuber/roots and fruit yields experienced a sharp increase in the late 1990's. Cereal yields had drop in the mid-2000 but quickly recover from it while oil crop yields remained constant with multiple transitory fluctuations. Malawi is famous for its successful fertilizer subsidy program which was instituted in 2005. The program has been administered via a series of coupon-vouchers that enable households to purchase fertilizer, hybrid seed, and/or pesticides at greatly reduced prices. Although it received many criticisms, most evaluations claim that the program was successful (Oxfam, 2010)

## Mali

Only the southern part of Mali is suited to farming, and less than 2% of Mali's area is cultivated. Agriculture accounted for about 45% of GDP, 21% of exports, and over 80% of the active labour force in 2001. Millet, rice, and corn are the basic food crops. Millet and sorghum are cultivated mainly in the areas around Ségou, Bandiagara, and Nioro. Paddy rice is cultivated on irrigated farms in the area around Mopti, Ségou, and Niafounké. Cereals are produced for subsistence by 90% of farmers. Peanuts are grown in the Sudanese zone, as are cotton, fruits, vegetables, and henna. The shea tree nut, which grows wild, is exploited by Malians for its oil.

Figure 16:



Source: FAOSTAT

Cereal yields, fruit yields, oil crop yields, and tuber/root yields have been growth by a constant annual rate of 2%, 0%, 1%, and 3%, respectively. Tuber/root yields started to grow at a fast rate since the mid-1990, and seem to continue to upward move. Fruits yields have kept a constant growth rate with no major interruptions. Cereal yields are at its highest level right now. However, over the years it experienced multiple fluctuations as the region if prone to droughts. Oil crops yields have also experience multiple fluctuations. But unlike cereal yields, oil crop yields are not better than before.

### Nigeria

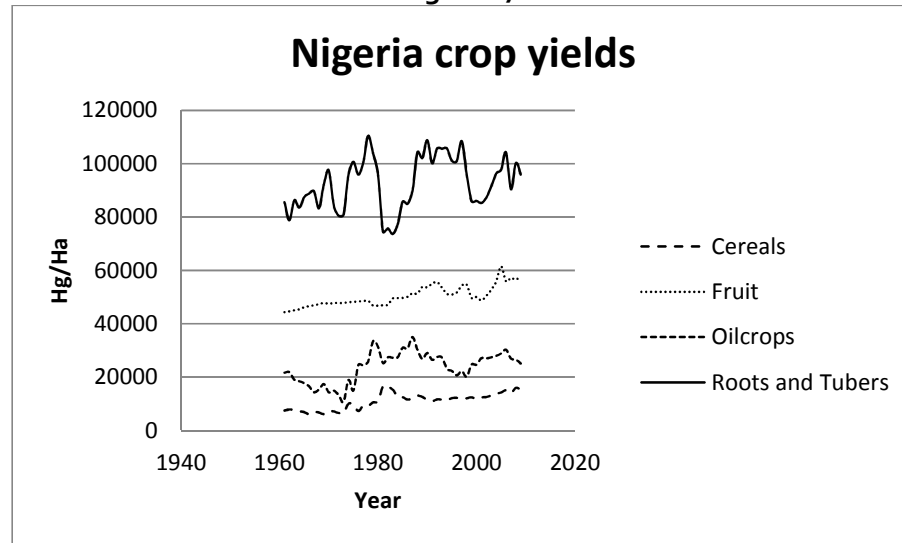
In terms of employment, agriculture is by far the most important sector of Nigeria's economy, engaging about 70% of the labour force. Agricultural holdings are generally small and scattered; farming is often of the subsistence variety, characterized by simple tools and shifting cultivation. These small farms produce about 80% of the total food. About 30.7 million hectares (76 million acres), or 33% of Nigeria's land area, are under cultivation. Nigeria's diverse climate, from the tropical areas of the coast to the arid zone of the north, make it possible to produce virtually all agricultural products that can be grown in the tropical and semitropical areas of the world. The economic benefits of large-scale agriculture are recognized, and the government favours the formation of cooperative societies and settlements to encourage industrial agriculture. Large-scale agriculture, however, is not common. Despite an abundant water supply, a favourable climate, and wide areas of arable land, productivity is restricted owing to low soil fertility in many areas and inefficient methods of cultivation. Agriculture contributed 32% to GDP in 2001.

Average crop yields growth rate for cereal, fruits, oil crops, and tuber in Nigeria is 1.51%, 0.56%, 0.31%, and 0.24%, respectively. Although tuber and roots yields have experience an average positive growth rate, they have experience multiple sharp drops in late 1970's, early



1990's, and in the early 2000's. Fruit yields have kept an upward trend with a small drop in the early 2000's. Oil crops experienced a sharp increase in the late 1970's while cereal yields have been growing despite a small drop in the early 1980's.

Figure 17:



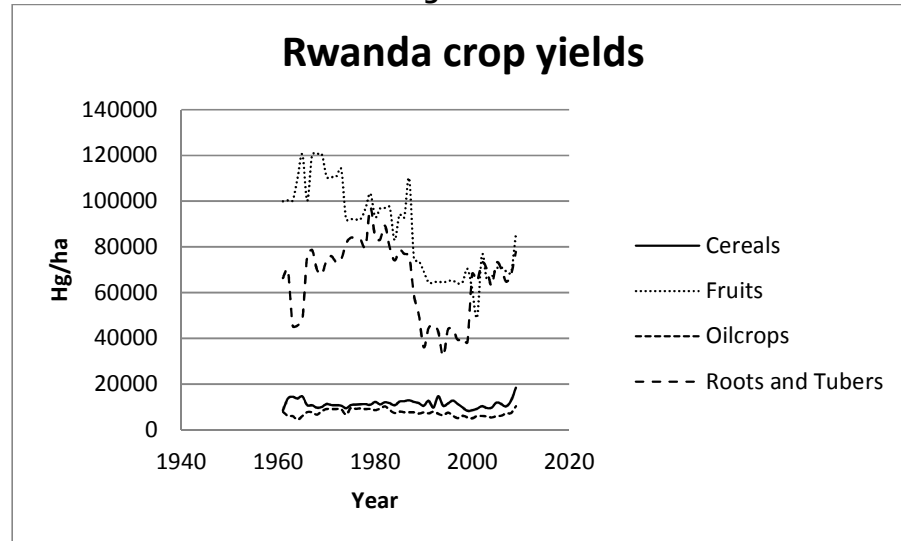
Source: FOASTAT

Nigeria is SSA's largest palm oil producer. However, the semi-wild state of its palm oil plantation precludes Nigeria from reaching higher yields. In addition, just like the case of DRC, petroleum oil has diverted the Nigeria policies' attention away from agriculture.

### Rwanda

In 1999, about 91% of Rwanda's economically active population earned their living, directly or indirectly, from agriculture. Except for heavily eroded regions, the soil has good humus content and is fertile, especially in the alluvial valleys and in the volcanic soils of the northwest. About 1.1 million hectares (2.8 million acres) are under cultivation. Subsistence agriculture predominates, and the basic agricultural unit is the small family farm of about one hectare.

Figure 18:



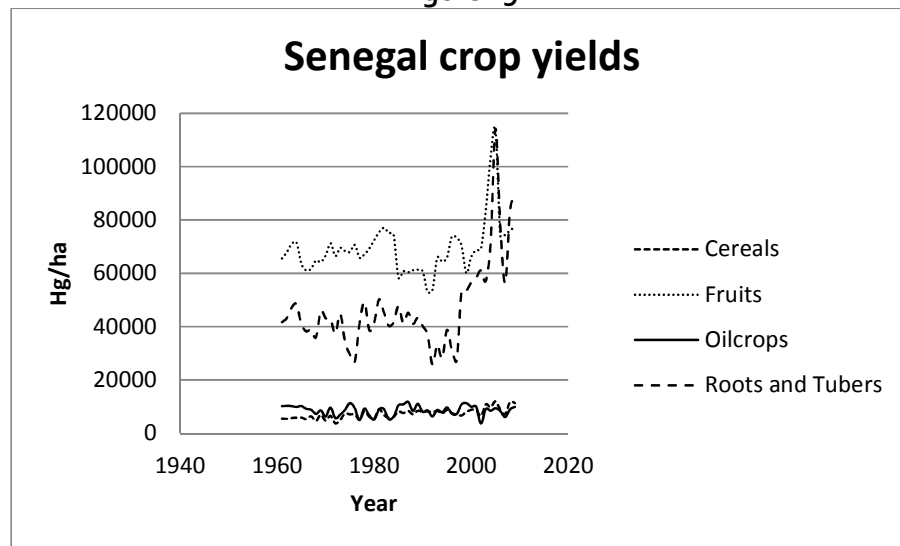
Source: FAOSTAT

Cereal yields, fruit yields, oil crops yields, and tuber/root yields in Rwanda have been growing by an average annual rate of 2%, 0%, 1%, and 0%, respectively. The majority of cereal yield increase in Rwanda occurred after 2000. An aggressive agricultural modernization program help improve cereal yields. Fruit yields had been decreasing in the 1990's, but it seems to be regaining steam since 2000 as well. Oil crop yields had always been weak in Rwanda, but its positive performance is mostly attributed to the fertile soil. Finally tuber/root yields experience a sharp decline in the 1990's which is mostly attributed to the civil unrests. But it seems to be regaining its high yields levels.

### Senegal

Most of Senegal lies within the drought-prone Sahel region, with irregular rainfall and generally poor soils. With only about 5% of the land irrigated the heavy reliance on rain fed cultivation results in large fluctuations in production. About 70% of the working population is involved in farming. Agriculture (including forestry, livestock, and fisheries) accounts for 18% of GDP. Most Senegalese farms are small (1.5–2.4 hectares/3.7–5.9 acres), and about 60% are in the so-called Peanut Basin, east of Dakar. Much of the agricultural land is still tribally owned. Only about 11% of Senegal's total land area is cultivated; millet took up 40% of the cultivated land in 1999; peanuts, 36%.

Figure 19:



Source: FAOSTAT

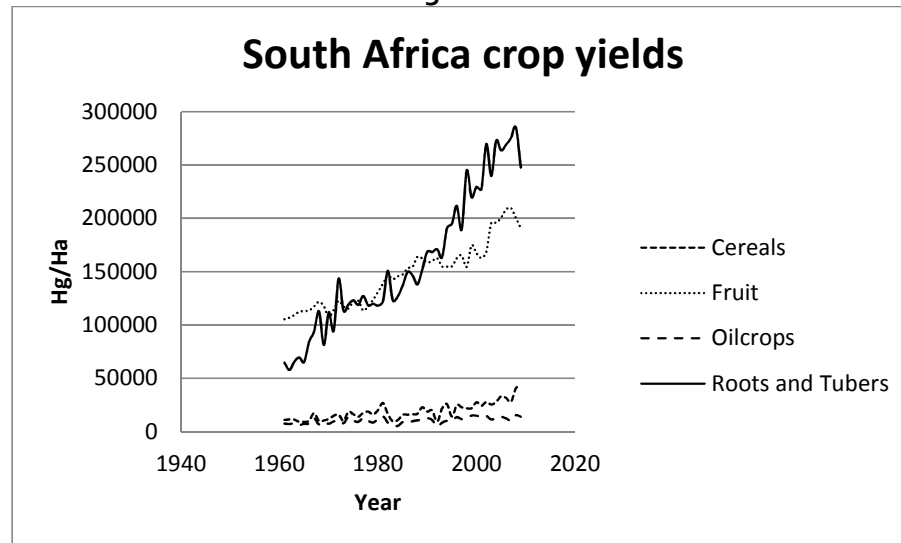
Only cereal and tuber/root yields in Senegal have a growth rate of more than one per cent. Specifically, cereal yields, fruit yields, oil crop yields, and tuber/root yields grew by 2%, 0%, 0%, and 2%, respectively. Tuber/root yields and fruit yields experience a sharp increase in the early 2000's, but almost half of that increase disappeared a few years after. Cereal yields and oil crop yields experienced multiple fluctuations over the years. However cereal yields have kept an upward move while oil crop remained constant.

### South Africa

Over 80% of the total land area is available for farming, but only 13% is cultivated. Many areas suffer from erratic rainfall and soil erosion; cultivated land is not expected to exceed 15% in the future because of these adversities. Only 8.6% of cultivated land was irrigated in 1998. The worst drought of this century in southern Africa resulted in near to total crop failure in 1991–92. Many farmers subsequently abandoned the countryside for urban areas. After many years of dry weather, South Africa had abundant rainfall in the 1995/96 growing season. Except for rice, tea, coffee, and cocoa, the country is typically self-sufficient in essential food production. The average annual growth rate of agricultural output was 0.6% during 1990–2000. Agriculture contributed an estimated 3% to GDP in 2001.

South Africa's cereal yields, fruits yields, oil crop yields, and tuber yields have grown by an annual rate of 2.94%, 1.24%, 1.30%, and 2.84%, respectively. Fruits and tuber/roots yields have been growing at a fast rate in South Africa. Despite the transitory change in yields, long term yields have kept a sharp upward trend with no significant breaks. This is also the case with oil crops and cereals yields. They have been growing at an encouraging growth rate with no major interruptions.

Figure 20:



Source: FAOSTAT

Fruit yields have grown rapidly to support South Africa mature fruit processing industry. Tuber yields have been driven by increase in potatoes yields as it is the leading tuber crop produced in South Africa. South Africa is Africa's third largest potatoes producer. Its favourable climatic condition allows it to have a thriving potatoes sector with the highest yields in the continent. South Africa's successful agricultural sector is also attributed to the strong political will that established agriculture as a quintessential driver of economic expansion.

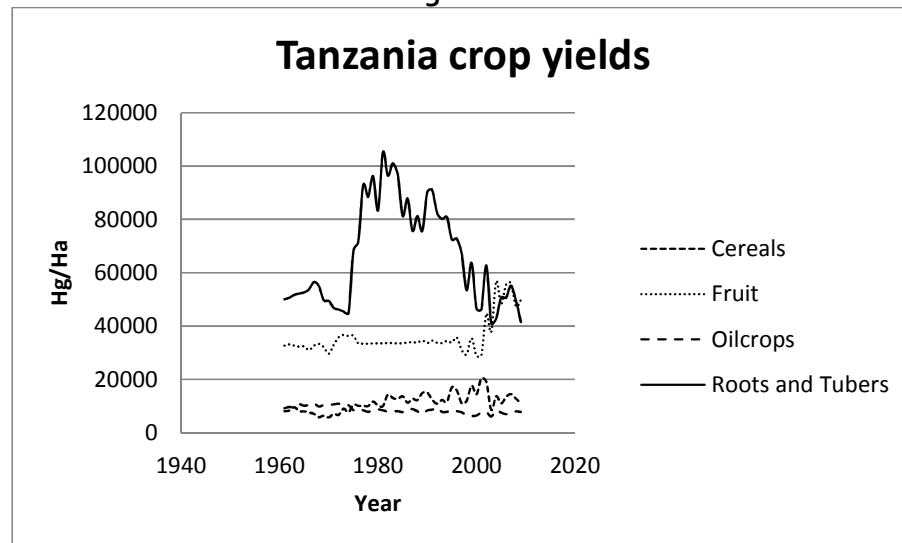
### Tanzania

Agriculture in Tanzania is dominated by smallholder farmers (peasants) cultivating an average farm sizes of between 0.9 hectares and 3.0 hectares each. About 70 per cent of Tanzania's crop area is cultivated by hand hoe, 20 per cent by ox plough and 10 per cent by tractor. It is rain fed agriculture. Food crop production dominates the agriculture economy. 5.1 million hectares are cultivated annually, of which 85 per cent is under food crops. Women constitute the main part of agricultural labour force. The major constraint facing the agriculture sector is the falling labour and land productivity due to application of poor technology, dependence on unreliable and irregular weather conditions. Both crops and livestock are adversely affected by periodical droughts. Irrigation holds the key to stabilizing agricultural production in Tanzania to improve food security, increase farmers productivity and incomes, and also to produce higher valued crops such as vegetables and even flowers.

In Tanzania, cereal and fruit yields have been growing at a marginal annual growth rate of 0.67% and 0.88% respectively. However, oil crops and tuber yields have grown by a negative growth rate of 0.35% and 0.39%, respectively. Cereal yields had been experiencing an uninterrupted upward until a major drop came in the early 2000's. Fruit yields sharply increased in the early 2000's as the Tanzanian horticulture industry expanded. Unlike most SSA countries, tuber/roots yields have been declining since the mid-1980. This downward trend seems to announce the end of the effects of a positive shock that trigger a rather rapid growth of tuber/root yields in the late 1970's as current yields have reach the all-time low levels

of that period. Last oil crop yields did not experience any sharp change as it has been decreasing at a smooth rate.

Figure 21:



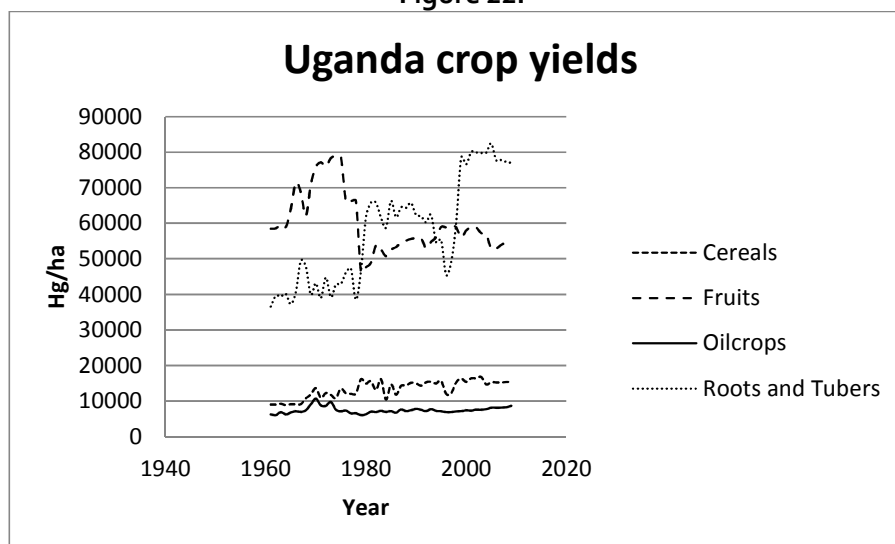
Source: FAOSTAT

The majority of oil crop comes from sunflowers seed which are mainly produced in the Kilimanjaro region. However, over the past years the Kilimanjaro region has been experiencing late rainfall onsets which in turn have affected sunflower yields. Tubers and roots have been decreasing since the early 1980's due to weather stress as well. Fortunately, interventions from the IITA allowed Tanzania to start a yield recovery process.

### Uganda

Uganda's main food crops have been plantains, cassava, sweet potatoes, millet, sorghum, corn, beans, and groundnuts. Major cash crops have been coffee, cotton, tea, and tobacco; although in the 1980s many farmers sold food crops to meet short-term expenses. The production of cotton, tea, and tobacco virtually collapsed during the late 1970s and early 1980s. In the late 1980s, the government attempted to encourage diversification in commercial agriculture that would lead to a variety of non-traditional exports. Coffee continued to be Uganda's most important cash crop throughout the 1980s. The government estimated that farmers planted approximately 191,700 hectares of *robusta* coffee, most of this in southeastern Uganda, and about 33,000 hectares of *arabica* coffee in high-altitude areas of southeastern and southwestern Uganda.

Figure 22:



Source: FAOSTAT

Cereal yields, fruit yields, oil crop yields, and tuber/root yields have been growing by an average annual growth rate of 1%, 0%, 1%, and 2%. Tuber/root yields experience two sharp increases in early 1980 and early 2000. Fruit yields on the other hand experienced a sharp decline in early 1980, but were not able to recover from it. Oil crop yield had a sharp increase in 1970, but this positive event never reoccurred again. Cereal yields have kept a steady upward trend with minimal disruptions.

### *b. Fishery production*

While SSA fishery production has been growing at an average annual growth rate of three per cents, fishery production has been growing at a rate of five per cents in Ghana, Kenya, and Nigeria; one per cents, two per cents, three per cents, negative one per cents, and less than zero per cents in Ethiopia, DRC, Tanzania, South Africa, and Cote d'Ivoire, respectively.

Table 1: Fishery

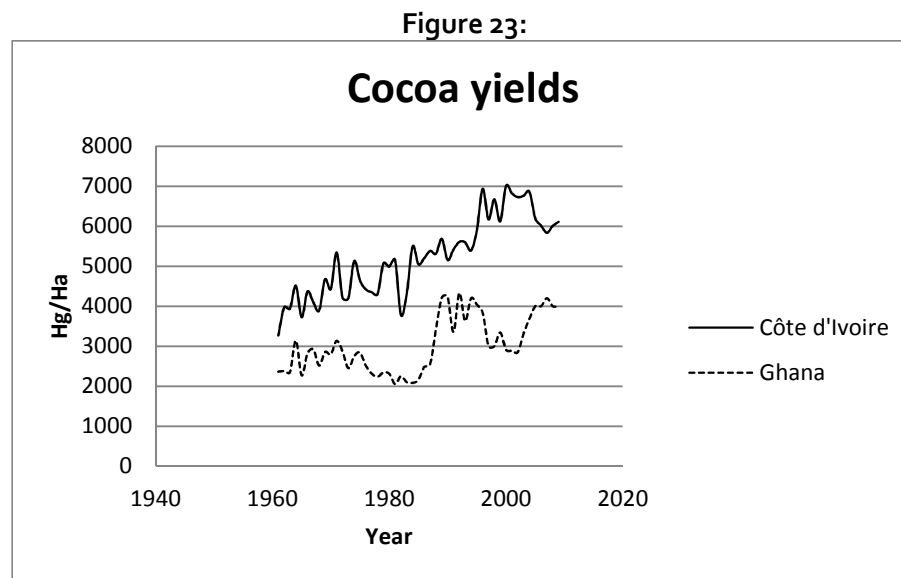
Country	SSA	DRC	Cote d'Ivoire	Ethiopia	Ghana	Kenya	Nigeria	South Africa	Tanzania
Growth rate	3%	2%	0%	1%	5%	5%	5%	-1%	3%

Source: FAOSTAT

A combination of coastal distance, traditional diets, and availability of substitutes such as meat products is the reason for the uneven fishery industry growth rate among SSA countries. However, high future fish consumption is expected in SSA as the higher income level will allow African consumers to diversify their diets.

### *c. Major cash crops production*

Speciality crops such as coffee and cocoa are important sources of income for some SSA countries. For example, cocoa alone constitutes more than 50 per cents of agricultural income in both Ghana and Cote d'Ivoire, the world's two largest cocoa producers. In figure 11 below, we present cocoa yields in both Ghana and Cote d'Ivoire. Although Cote d'Ivoire displays persistent higher cocoa yield, Ghana's cocoa is known to be of higher quality.



Source: FAOSTAT

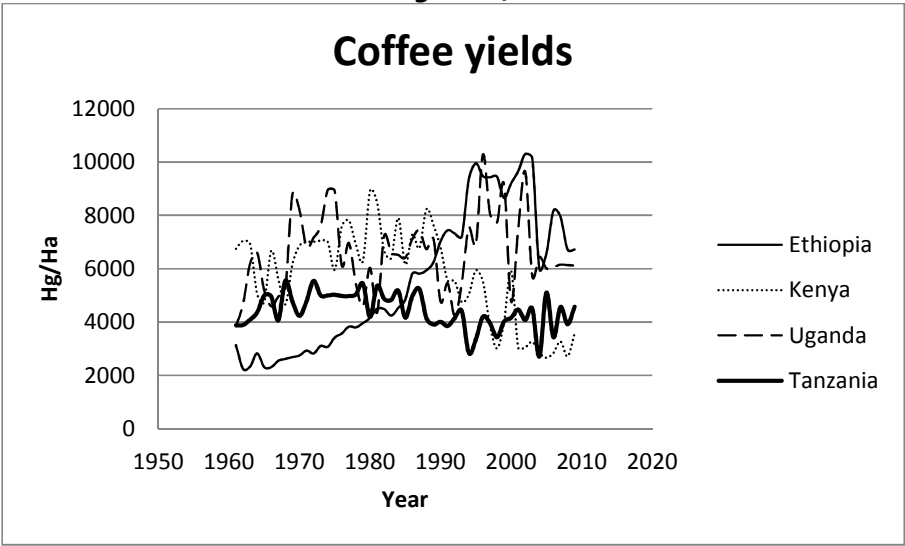
Coffee is also a major cash crop in the mountainous countries of East Africa. Ethiopia and Kenya are one of the major coffee producers in SSA. The graph below shows that Kenya coffee yields have been decreasing since the early 1990's while Ethiopia coffee yields have increased. Ethiopia coffee yield increase could be associated with the change in political regime, which ushered a more democratic government which had a clear vision for promoting coffee production. Second, the trademarking of Ethiopia's coffee which resulted to a law suit from Starbucks® and was later withdrawn increased its price and its production efficiency.

On the other hand Kenya coffee yield decreased mainly because of poor rainfall. The highly volatile rainy season decrease agricultural water supply and rendered Kenyan coffee susceptible to coffee borne diseases (CBD). Further, coffee farms in Kenya are under pressure from real estate developers. As the price of land skyrocketed due to increase urban population and housing demand, many farmers have either neglected coffee production or sold their land to real estate developers.

Further, coffee yield decrease in Tanzania because of climate change risks. In Tanzania, coffee is mostly cultivated by smallholder farmers in the Kilimanjaro region. Recent late rainfall started which most researcher associate to climate change dramatically affected coffee yields in the region. Uganda coffee yields have been growing on average by 1% per annum. Unlike Kenya and Tanzania, Uganda diversified its coffee production to both Arabica and Robusta.

This diversification precluded Uganda coffee yield to decrease because Robusta varieties are less sensitive to change in weather patterns.

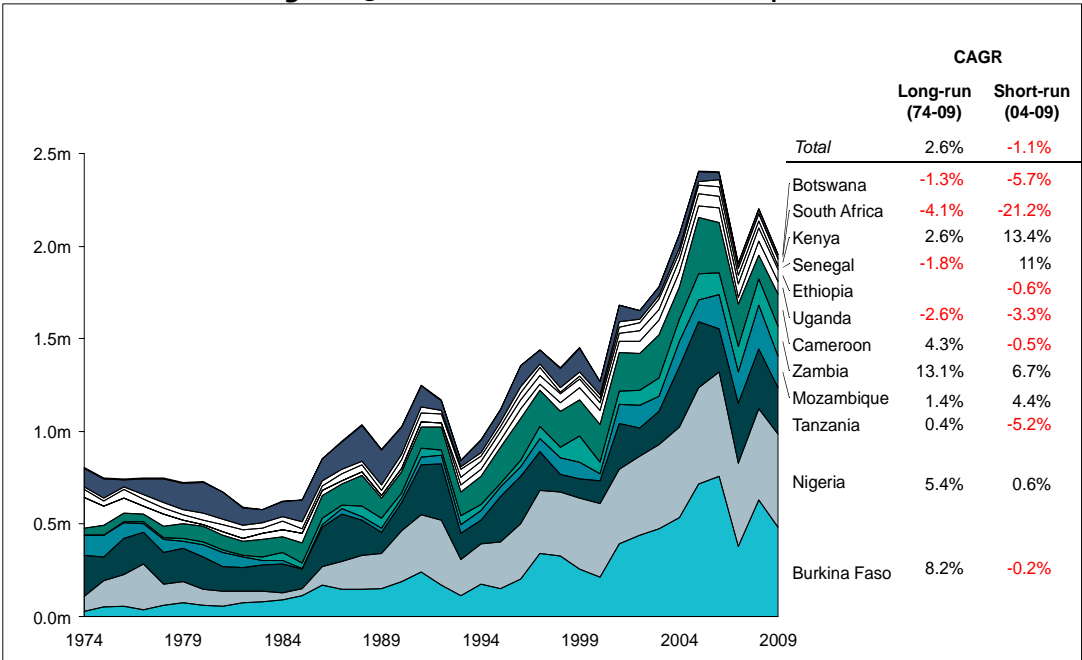
Figure 24:



Source: FAOSTAT

Burkina Faso is the largest cotton seed producer in SSA followed by Nigeria, and Tanzania respectively. However, cotton production in Kenya and Zambia has been growing the fastest. Many associate this growth to AGOA admission as it guaranteed access to US market with negligible trade restrictions.

Figure 25: Recent trends in seed cotton production



Source: ACET



#### *d. Comparing SSA yields against World's best crop producers*

In table 2, we present a comparative analysis of cereals yields, fruits yields, tuber/roots yields, oil crops yields, cocoa yields, coffee yields, and cotton seed yields between SSA largest producer and world's largest producer.

**Table 2: Crop yields comparison (in hg/ha)**

	Cereal	Fruits	Oil crops	Tuber/roots	Cocoa	Coffee	Cotton
SSA's largest producer yield	15,280 (Nigeria)	190,713 (South Africa)	25,073 (Nigeria)	247,623 (South Africa)	6,108 (Cote d'Ivoire)	6,721 (Ethiopia)	11,910 (Burkina Faso)
World's largest producer yield	54,497 (China)	102,246 (China)	334,644 (Indonesia)	173,351 (China)	6,108 (Cote d'Ivoire)	12,192 (Brazil)	38,634 (China)

Source: FAOSTAT

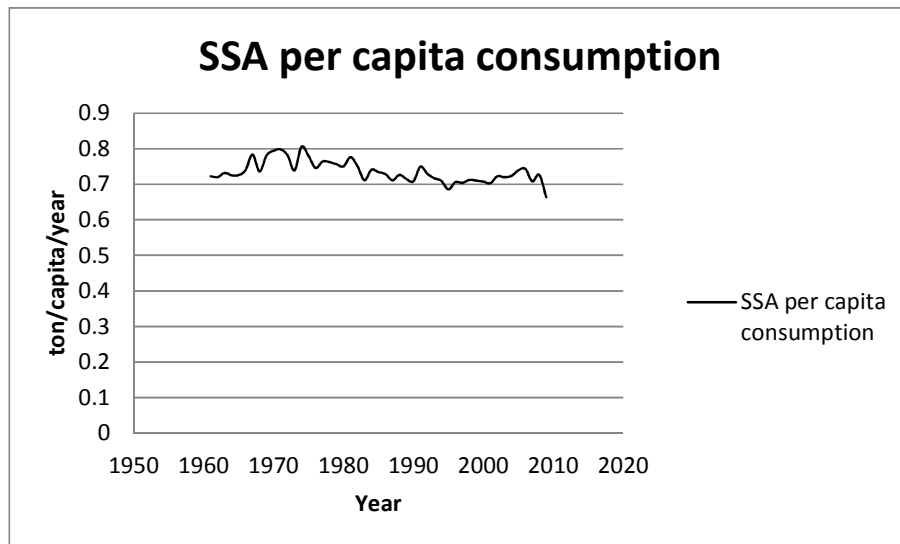
In table 2 above, we compared cereal yields in both the world's largest cereal producer and SSA largest cereal producer. The table shows that cereal yield in Nigeria is about 1/3 of cereal yields in China. The same comparison was done for fruits, oil crops, tuber/roots, cocoa, coffee, and cotton. The table shows that Fruit yields are almost twice larger in South Africa, Africa's largest producer compared to China, world's largest producer. For the case of oil crops, oil crop yields in Indonesia is about 15 times larger compared to Nigeria. For the case of tuber/roots, yields in South Africa are about 1.5 times the yields in China. Cote d'Ivoire is both word and SSA largest cocoa producer with an average yield of 6,108 hg/ha. Coffee yield in Ethiopia is about half of coffee yield in Brazil, the world largest green coffee producer. Finally, cotton seed yield in Burkina Faso is about 1/3 of yields in China.

## II. Food Consumption

### 1. Food consumption in sub-Saharan Africa

We approximated food consumption below by subtracting food exports from the sum of food production, food imports, and food aid. In figure 26 below we present per capita food consumption in SSA.

Figure 26:



Source: Author's estimates

Average per capita food consumption ranges between 0.7 and 0.8 tons of food per year. Recently, it decreased to less than 0.7 tons. This is because population has been growing at a faster rate compared to food production. Food consumption in SSA has recently been supported by imported food. We found average growth rate of imported food to be five per cents while average growth rate in food production and food export to be two and one per cents, respectively. Without food imports, SSA per capita consumption would have been about four per cents lower.

### 2. Food consumption in individual SSA countries

Food consumption expressed in kilocalories (kcal) per capita per day is a key variable used for measuring and evaluating the evolution of the global and regional food situation (FAO, 2003). A more appropriate term for this variable would be "national average apparent food consumption" since the data come from national Food Balance Sheets rather than from food consumption surveys. Analysis of FAOSTAT data shows that dietary energy measured in kcals per capita per day, henceforth food consumption, has been increasing in SSA. However food consumption has not been steadily increasing. In the period between 1981 and 1991, consumption decreased in SSA and this decrease could be attributed to the continent wide economic crisis that economists call the lost decade of Africa.

**Table 3: Total food consumption (kcal/capita/day)**

Location	1961-1971	1971-1981	1981-1991	1991-2001	2001-2007
SSA	2201.32	2210.82	2206.72	2236.89	2310.26
Cote d'Ivoire	2557.44	2696.73	2605.80	2433.52	2493.21
DRC	2282.81	2219.92	2186.48	1788.65	1570.95
Ethiopia	1748.97	1603.88	1626.74	1670.10	1915.49
Ghana	2102.13	1933.96	1927.43	2483.26	2783.98
Kenya	2291.84	2334.55	2129.88	2026.83	2033.87
Nigeria	1900.89	1779.06	1961.11	2532.21	2638.89
South Africa	2748.51	2858.69	2860.49	2838.27	2957.96
Tanzania	1733.24	2087.46	2212.02	1965.95	1981.46
Benin	1909.03	1920.56	2054.03	2319.10	2479.38
Burkina Faso	1710.69	1690.92	2113.60	2522.72	2646.42
Burundi	2115.15	2057.77	1892.61	1716.07	1685.40
Cameroon	2055.67	2238.91	2040.74	2060.59	2240.88
Gambia	2390.06	1934.87	2373.52	2283.54	2302.15
Guinea Bissau	1783.83	1913.37	2203.48	2219.08	2251.50
Madagascar	2519.67	2545.81	2350.91	2103.93	2092.43
Malawi	2209.19	2345.11	2036.57	1981.62	2094.39
Mali	1692.84	1617.23	1992.26	2251.50	2523.39
Rwanda	1991.74	2179.15	2037.59	1827.36	2025.80
Senegal	2440.90	2194.54	2221.27	2147.85	2255.88
Uganda	2322.98	2268.48	2203.77	2237.99	2279.20

Source: FAOSTAT

This trend has not, however, been equal across the continent. While per capita food consumption (measured in kilocalories) in SSA has been increasing by an average rate of one per cent per decade, it has been decreasing in Kenya, Cote D'Ivoire, and DRC by three, one, and nine per cents respectively. Conversely, food consumption has been increasing in Ethiopia, Ghana, Nigeria, South Africa, and Tanzania by an average rate of two, seven, nine, two, and three per cents per decade, respectively. Further, total food consumption in Benin, Burkina Faso, Burundi, Cameroon, Gambia, Guinea Bissau, Madagascar, Malawi, Mali, Rwanda, Senegal and Uganda has been growing by an average growth rate per decade of 6.75%, 11.52%, -5.52%, 2.18%, -0.93%, 5.99%, -4.54%, -1.33%, 10.49%, 0.42%, -1.95%, and -0.47%, respectively.

**Table 4: Cereal consumption (kcal/capita/day)**

Location	1961-1971	1971-1981	1981-1991	1991-2001	2001-2007
SSA	985.03	974.62	992.56	1023.85	1075.02
Cote d'Ivoire	773.10	869.24	927.82	826.10	811.71
DRC	287.60	336.56	350.95	309.39	350.62
Ethiopia	1168.31	1031.89	1044.73	1122.55	1275.21
Ghana	513.01	519.82	562.43	722.87	828.13
Kenya	1250.61	1283.52	1062.68	994.72	996.65
Nigeria	862.74	768.44	966.16	1139.58	1175.06
South Africa	1524.76	1539.50	1526.22	1549.72	1588.67
Tanzania	623.46	909.08	1044.91	959.61	940.01
Benin	693.82	657.66	812.04	895.59	973.32
Burkina Faso	1237.00	1217.27	1510.48	1841.59	1910.65
Burundi	314.98	337.03	324.60	270.13	291.40
Cameroon	866.09	836.71	735.05	794.92	904.13
Gambia	1512.15	1207.09	1394.31	1219.53	1245.73
Guinea Bissau	919.46	1081.54	1346.06	1352.73	1346.56
Madagascar	1473.33	1455.90	1290.89	1120.99	1240.77
Malawi	1539.94	1546.96	1402.67	1267.49	1228.38
Mali	1144.92	1074.21	1427.18	1545.26	1695.05
Rwanda	384.31	369.51	352.99	302.28	341.01
Senegal	1507.18	1438.41	1451.72	1271.03	1367.69
Uganda	577.25	500.61	395.98	470.66	510.60

Source: FAOSTAT

Average cereal consumption in SSA is about 1075 kcal/capita/day. Cereal consumption is the highest in South Africa at 1545 kcal/capita/day and the lowest in DRC at 327 kcal/capita/day. However, cereal consumption has been growing throughout the continent at an average rate of two per cents with Ghana growing the fastest at a decade rate of 13 per cents. Further, cereal consumption in Benin, Burkina Faso, Burundi, Cameroon, Gambia, Guinea Bissau, Madagascar, Malawi, Mali, Rwanda, Senegal and Uganda has been growing by an average growth rate of 8.83%, 11.48%, -1.93%, 1.08%, -4.73%, 10.01%, -4.20%, -5.49%, 10.31%, -2.94%, -2.40%, -3.02% per decade, respectively.

**Table 5: Vegetable consumption (kcal/capita/day)**

Location	1961-1971	1971-1981	1981-1991	1991-2001	2001-2007
SSA	27.55	26.96	25.62	25.57	26.00
Cote d'Ivoire	35.18	37.41	43.27	38.67	36.42
DRC	34.67	32.69	26.36	17.63	15.47
Ethiopia	6.32	6.90	6.57	8.68	11.69
Ghana	18.66	25.06	16.17	21.29	24.00
Kenya	17.32	15.87	16.71	30.52	28.56
Nigeria	38.58	34.42	33.27	38.86	42.67
South Africa	36.73	37.41	36.75	34.68	33.55
Tanzania	33.87	31.42	27.32	20.86	18.04
Benin	14.14	18.49	25.95	32.48	32.29
Burkina Faso	14.85	13.24	15.43	14.35	11.60
Burundi	18.34	19.10	19.87	20.16	18.80
Cameroon	24.41	27.64	25.66	34.05	43.94
Gambia	8.83	7.42	12.31	22.95	23.14
Guinea Bissau	14.48	14.99	10.72	10.54	10.08
Madagascar	21.90	19.94	17.04	13.83	11.37
Malawi	17.99	19.04	16.69	13.64	14.10
Mali	17.27	19.69	28.68	29.76	28.98
Rwanda	16.78	16.35	10.71	12.20	14.16
Senegal	14.84	14.01	15.08	26.59	39.40
Uganda	13.47	12.84	13.74	14.06	12.89

Source: FAOSTAT

Vegetables are not widely consumed in SSA. It only accounts for 1.18% of total caloric supply in SSA. Its consumption has been decreasing in the past 40 years. This decrease is mostly associated to preference toward heavy starch such as cassava and yam which quickly satisfy hunger and supply the necessary energy. This preference has more likely increased over time because of the increasing incidence of droughts associated with climate change. Further, vegetable consumption in Benin, Burkina Faso, Burundi, Cameroon, Gambia, Guinea Bissau, Madagascar, Malawi, Mali, Rwanda, Senegal and Uganda has been growing by an average growth rate of 22.94%, -5.98%, 0.62%, 15.83%, 27.24%, -8.66%, -15.11%, -5.91%, 13.82%, -4.15%, 27.65%, -1.09% per decade, respectively.

Calories supplied by meat consumption in SSA have been increasing by an average rate of more than one per cent per decade. This increase is mostly associated with the higher income levels that allowed consumers to afford income elastic commodities such as meat. However, in countries such as Cote d'Ivoire, DRC, Ethiopia, and Kenya, meat consumption has decreased sharply. This decrease is mostly associated to drought condition which decreased livestock weights and increase their mortality in countries such as Ethiopia and Northern Kenya and civil war in Cote d'Ivoire and DRC which affected local meat supply. Further, meat consumption in Benin, Burkina Faso, Burundi, Cameroon, Gambia, Guinea Bissau, Madagascar, Malawi, Mali, Rwanda, Senegal and Uganda has been growing by an average growth rate of 6.27%, 19.93%,

6.40%, 5.25%, -12.87%, -0.66%, -13.94%, 5.52%, 4.64%, 10.90%, -5.26%, 5.14% per decade, respectively.

**Table 6: Meat consumption (kcal/capita/day)**

Location	1961-1971	1971-1981	1981-1991	1991-2001	2001-2007
SSA	89.04	89.80	90.03	86.71	93.26
Cote d'Ivoire	87.75	86.36	72.85	49.61	43.86
DRC	41.73	32.77	29.20	21.64	18.01
Ethiopia	79.83	59.12	51.82	40.23	43.97
Ghana	40.38	37.46	40.85	37.71	40.47
Kenya	83.42	82.64	77.82	67.68	77.64
Nigeria	29.73	34.55	38.67	36.66	38.54
South Africa	208.42	218.83	218.30	210.60	238.15
Tanzania	50.07	50.13	52.77	51.25	50.07
Benin	40.99	45.64	49.45	47.10	52.28
Burkina Faso	40.73	34.14	51.63	72.23	84.26
Burundi	17.77	25.72	25.56	21.14	22.78
Cameroon	51.03	59.25	65.88	62.57	62.63
Gambia	60.92	55.38	43.16	30.33	35.11
Guinea Bissau	97.77	99.52	100.64	99.99	95.22
Madagascar	140.31	127.67	127.00	106.88	76.96
Malawi	28.05	31.16	30.03	31.69	34.78
Mali	70.91	67.53	75.06	67.78	85.02
Rwanda	17.28	20.87	20.77	21.73	26.13
Senegal	74.71	58.91	58.70	55.12	60.19
Uganda	56.90	59.23	58.27	70.91	69.52

Source: FAOSTAT

Fish constitute the lowest source of calories in SSA. It contributes to less than one per cents of total calories consumed in SSA. Ghana is one of the largest fish consumers in SSA because of its proximity to both the ocean and fresh water and the lack of substitutes due to its fledging cattle industry. Fish consumption contributes to more than two per cents of total calorie intakes and has been growing by an average rate of 10 per cents in Ghana per decade. Further, fish consumption in Benin, Burkina Faso, Burundi, Cameroon, Gambia, Guinea Bissau, Madagascar, Malawi, Mali, Rwanda, Senegal and Uganda has been growing by an average growth rate of -8.94%, 7.63%, -16.32%, 7.54%, 14.58%, -12.67%, -1.33%, -12.32%, 0.09%, 50.65%, 8.44%, -0.13% per decade, respectively.

**Table 7: Fish consumption (kcal/capita/day)**

Location	1961-1971	1971-1981	1981-1991	1991-2001	2001-2007
SSA	13.90	17.37	17.19	14.69	14.98
Cote d'Ivoire	30.2	35.19	34.2	26.41	26.9
DRC	17.37	15.67	14.26	11.81	10.45
Ethiopia	0.41	0.21	0.17	0.31	0.29
Ghana	41.03	64.76	50.08	60.24	59.23
Kenya	4.99	5.2	10.61	10.01	5.96
Nigeria	6.78	16.7	13.9	12.88	15.71
South Africa	17.12	22.43	17.29	14.54	15.25
Tanzania	17.01	22.35	25.22	19.24	15.32
Benin	23.07	25.07	18.89	16.34	15.87
Burkina Faso	2.57	2.56	3.25	3.90	3.45
Burundi	7.36	6.85	5.02	4.90	3.61
Cameroon	19.66	18.33	21.55	20.33	26.29
Gambia	30.27	28.86	34.08	44.51	52.19
Guinea Bissau	4.32	5.87	5.57	6.95	2.51
Madagascar	14.54	12.57	13.87	13.81	13.78
Malawi	14.21	21.85	16.33	9.86	8.40
Mali	15.60	14.60	14.37	16.68	15.66
Rwanda	0.44	0.53	0.68	1.53	2.26
Senegal	35.84	39.95	45.30	58.17	49.56
Uganda	20.17	29.69	23.88	16.84	20.07

Source: FAOSTAT

Table 8 below presents kilocalories consumption between SSA and the world's top consumers. Total kilocalories consumption in SSA is about 60% of Austria, the world's top kilocalories consumer based on FAO estimates of 2007. SSA cereal consumption, vegetable consumption, meat consumption, and fish consumption is about one half, one seventh, one seventh, and one twenty fifth of the world's top consumer, respectively.

**Table 8: Food consumption comparison (kcal/capita/day)**

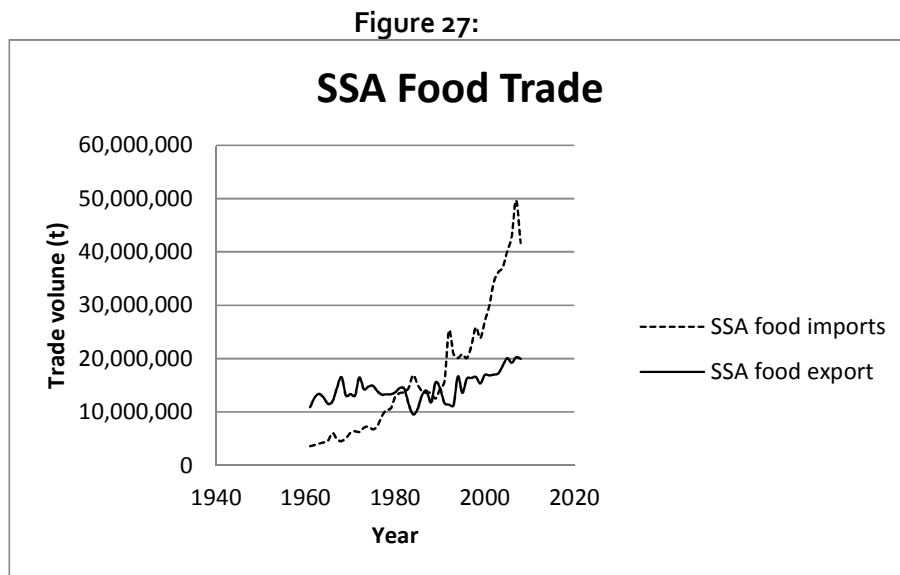
	Total	Cereal	Vegetable	Meat	Fish
World's top consumer	3818.8 (Austria)	2022.88 (Egypt)	177.68 (China)	754.8 (Luxembourg)	368.14 (Maldives)
SSA	2370.27	1109.74	25.35	99.76	15.00

Source: FAOSTAT

### III. Food Trade

#### 1. Food trade in Sub-Saharan Africa

Figure 27 below gives an example of what economists have been calling the lost decade of the 1980's. It is during that period that SSA completely lost steam of its growth march and as consequence started to experience food trade deficits. The figure shows volumes<sup>2</sup> of food trade between SSA and the world. This trade gap has been growing by an annual growth rate of 14% between 1983 and 1993, 8% between 1993 and 2003, and 2% between 2003 and 2008. Fortunately, this decreasing food trade deficit growth rate implies that SSA is slowly regaining food self-sufficiency.



Source: FAOSTAT

Figure 28 below shows intra-SSA food trade between 1995 and 2010. Food imports and exports within SSA experienced a severe drop in 2000 and 2001. In 2002 trade started to climb back again until now but it is still below 1995 levels. The graph presented in figure 29 shows that SSA had a food trade surplus since 1995 until 2005. Higher income level in SSA increased demand for income elastic food items that are mostly manufactured outside of SSA what led SSA to experience a food trade deficit in the last five years.

When comparing the outcomes of figures 28 and 29, we can see that regional integration in SSA has been weakening. SSA is trading less and less food within the continent. For example, in 1995 SSA imported and exported 46 per cents and 31 per cents of its food from and to other SSA countries. In 2010, it decreased to 17 per cents and 19 per cents respectively. As income levels increase in SSA, the demand for processed agricultural food also increase. Unfortunately, the majority of processed food is produced outside of SSA, leading SSA countries to import more and more food outside of SSA.

<sup>2</sup> This data cannot be directly compared with the ones in figures 28 and 29 as FAO and UNCTAD differ in their definition of what constitutes food trade.

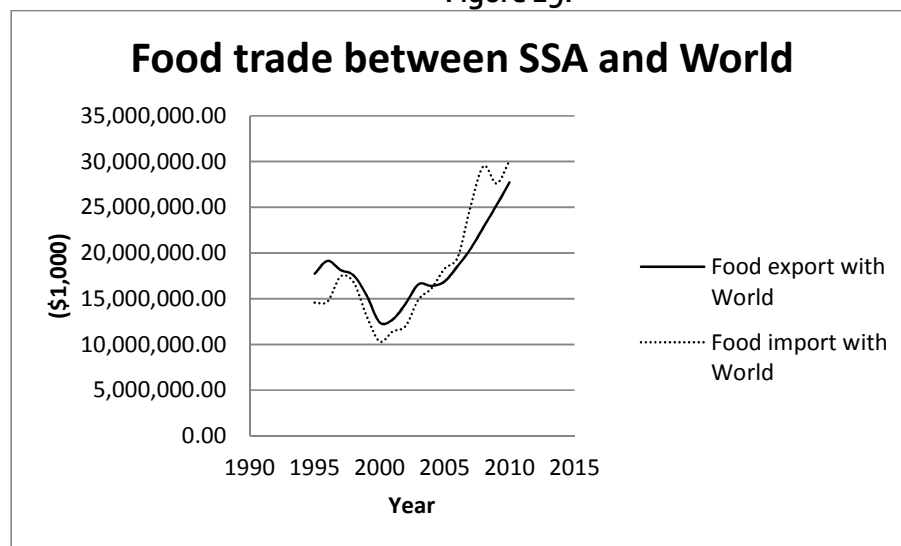


Figure 28:



Source: UNCTAD

Figure 29:

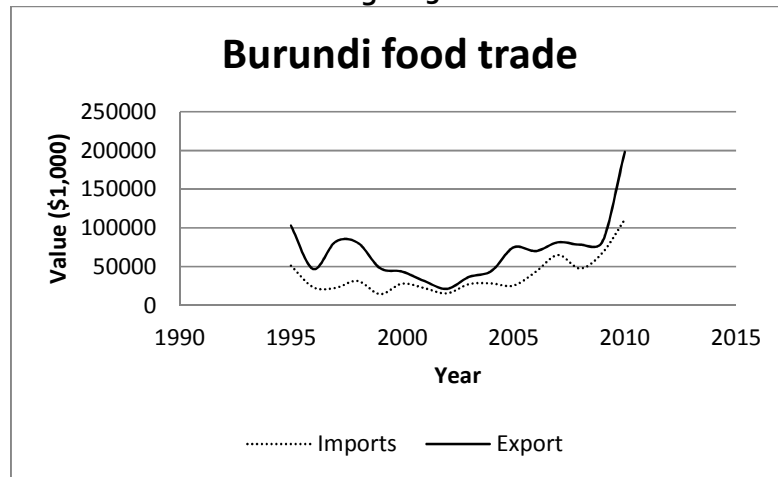


Source: UNCTAD

## 2. Food trade in individual SSA countries

Between 1995 and 2010, Burundi has been a net food exporter. Food trade balance has been growing by an average rate of 47 per cents during that period. Food trade balance almost became negative in early 2000's as food exports took a dive. But it was able to recover from it shortly after.

Figure 30:



Source: UNCTAD

Benin is a net food importer. Food trade deficit has been growing by an average rate of 19 per cents per annum. Particularly after 1995, food trade deficit increased sharply as food imports had its largest increase.

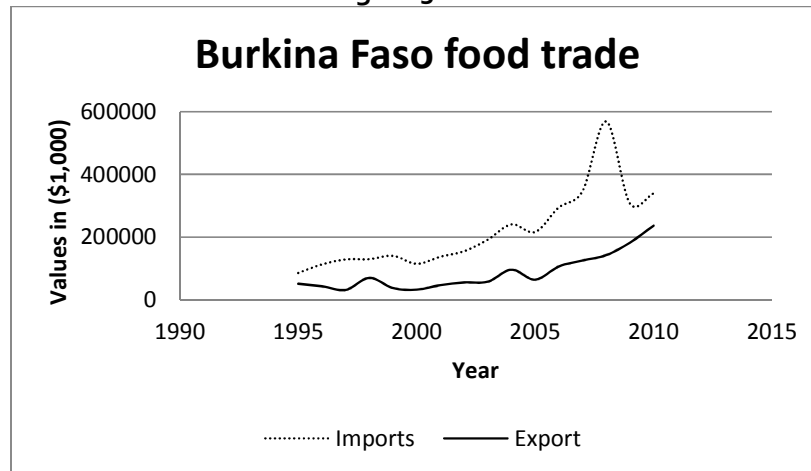
Figure 31:



Source: UNCTAD

The arid climatic conditions of Burkina Faso made it a natural net food importer. Food trade deficit has been growing by an average annual rate of 17 per cents between 1995 and 2010. In 2008 food trade deficit was the largest as the food crisis lead Burkina Faso to import more food.

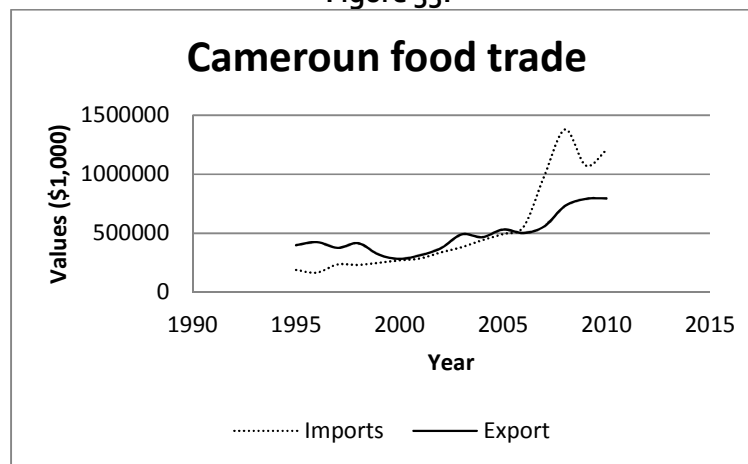
Figure 32:



Source: UNCTAD

Cameroun has been a net food exporter until 2005 when food import sharply increased. Prior to the switch, food trade surplus had been growing by an average rate of - 4 per cents. After it became a net food importer, food trade deficit has been growing by a rate of more than 100 per cents.

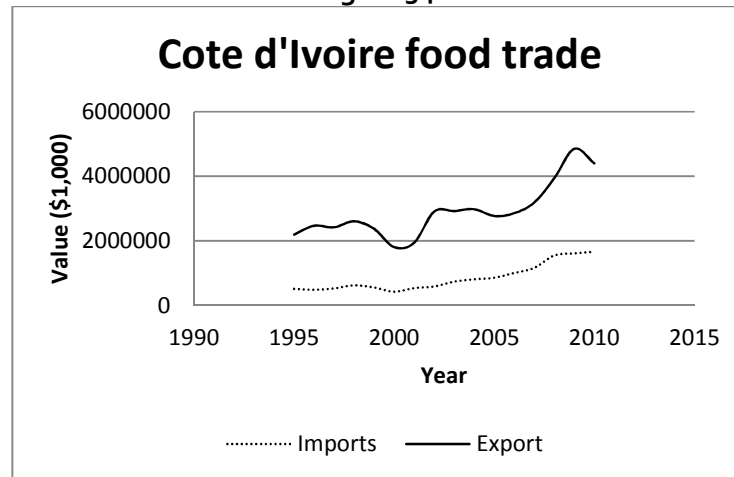
Figure 33:



Source: UNCTAD

Cote d'Ivoire is a net food exporter. It has been enjoying a strong food trade surplus for a long time and that has been growing by an annual rate of 5.5 per cents. The civil war had a negative impact on food exports that took a drop in the early 2000's. But it was able to quickly recover a few years later until recently when they were affected by the new conflict.

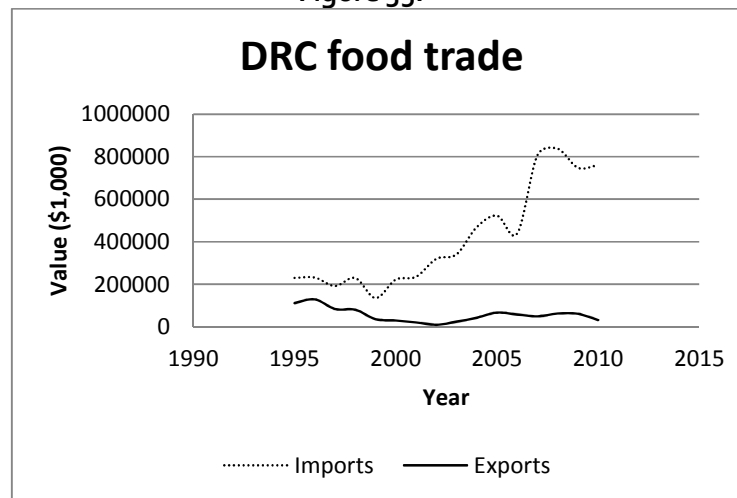
Figure 34:



Source: UNCTAD

DRC is a heavy net food importer. Food trade deficit has been growing by an average annual rate of 18 per cents per year. This is the case because food imports have been growing as the country was not able to produce food due to the civil unrests.

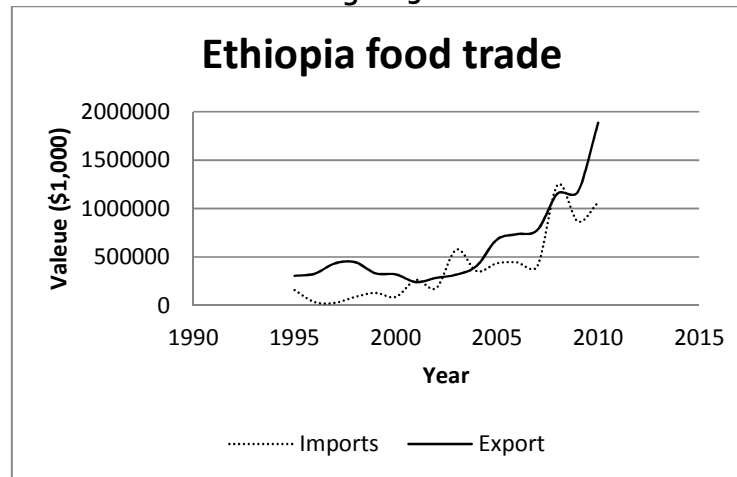
Figure 35:



Source: UNCTAD

Ethiopia trade balance has been fluctuating. This is the case because of its vulnerability to droughts. Drought condition lead the sharp increase in imports both in the early 2000's and late 2000's as illustrated in figure 35.

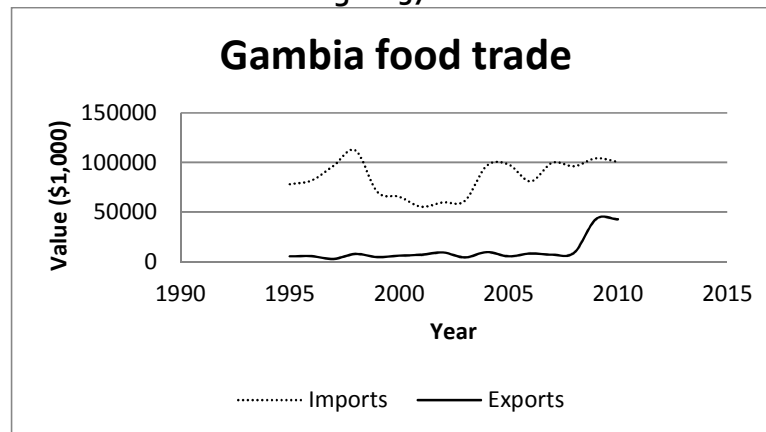
Figure 36:



Source: UNCTAD

Gambia is a net food importer. Food trade deficit has been growing by an annual average rate of 1 per cents. Food import had its largest decrease in the early 2000's as It neighbour Senegal was experiencing civil unrest in the Cassamance region. Food export however started to grow more rapidly since the early 2000's.

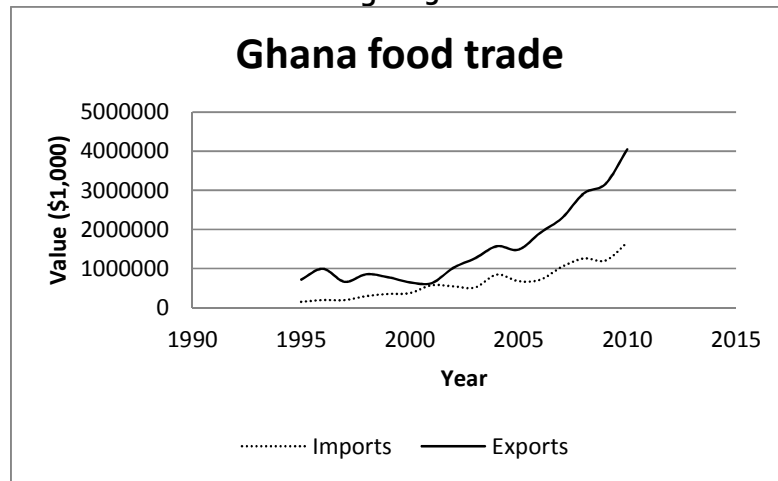
Figure 37:



Source: UNCTAD

Ghana is a net food exporter. Food trade surplus has been growing by an average rate of 55 per cent between 1995 and 2010. The introduction of improved cassava varieties and increase in rice production allowed Ghana to increase its food exports to neighbouring West African countries.

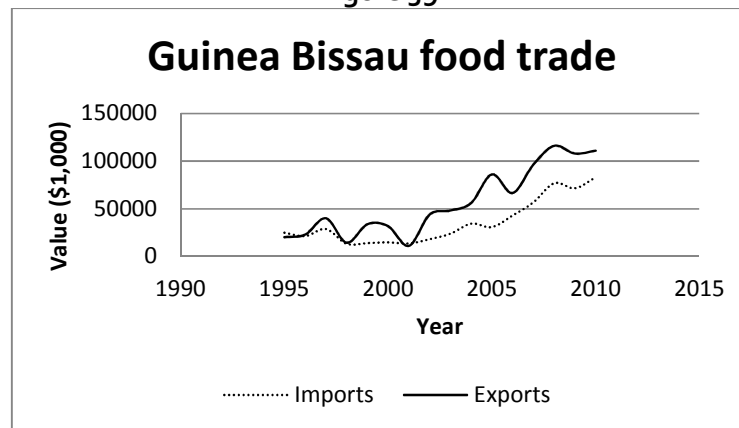
Figure 38:



Source: UNCTAD

Guinea Bissau is a net food exporter. Although food trade deficit took a negative turn in 2001, it was able to maintain a strong trade surplus. Food exports and imports have both been growing rapidly since 2000.

Figure 39:



Source: UNCTAD

Kenya is a net food exporter. Food trade balance has been growing by an average rate of four per cent per year. Kenya is susceptible to reoccurring droughts. They are the major drivers of food imports in Kenya.

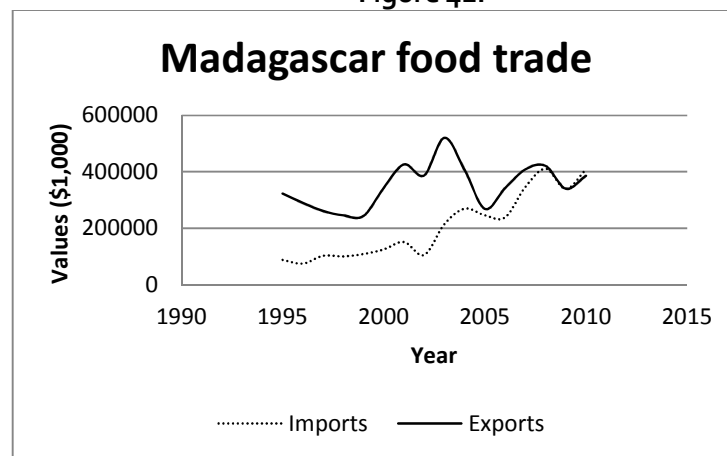
Figure 40:



Source: UNCTAD

Madagascar is a net food exporter. However, food import has been catching up rapidly over the past five years. For the first time in the past 15 years, it has experience a net food trade deficit. One reason for this could be attributed to the political turmoil that weakened Madagascar's ability to export foods.

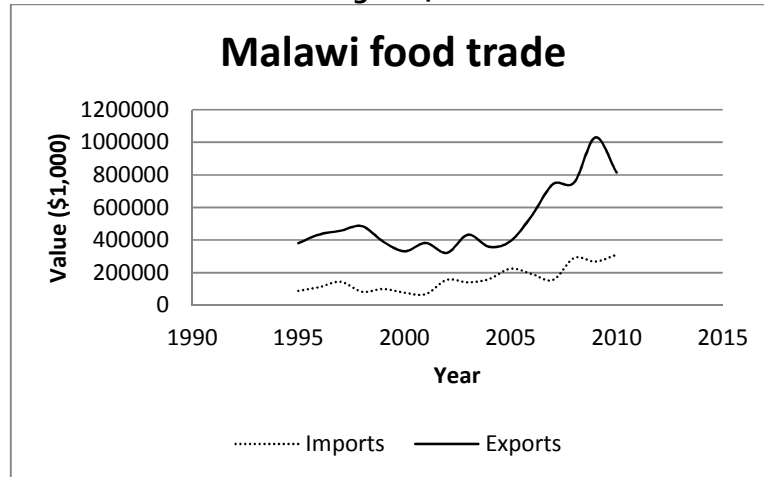
Figure 41:



Source: UNCTAD

Food trade balance in Malawi has been positive and growing by an annual rate of 12 per cents. Most of the positive food growth recorded in Malawi is attributed to its fertilizer subsidy program initiated in the early 2000's. Since then, food export increased even more rapidly.

Figure 42:



Source: UNCTAD

The arid conditions that dominate Mali's environment have precluded it from being a net food exporter. Food trade deficit became worst after the 2000's as food imports started to increase rapidly. Food trade deficit has been growing by a rate of 15 per cents per year.

Figure 43:



Source: UNCTAD

Nigeria's became a net food importer in the late 1970's after petroleum oil became a main component of its exports. In fact, it is fair to believe that food export took a dive after that period because Nigeria suffered and is still suffering from the Dutch disease which made its export relatively more expensive. Over the past 15 years, food trade deficit has been growing by an average rate of 17.5 per cents per annum. This is mostly attributed to the past growing food imports.



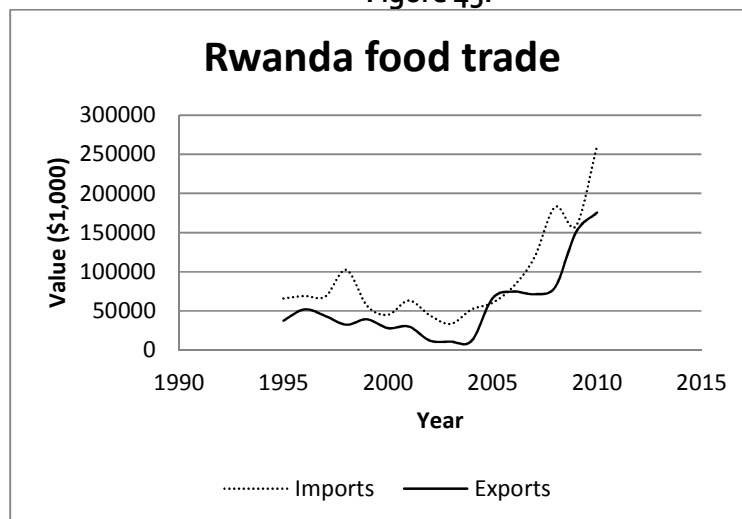
Figure 44:



Source: UNCTAD

Rwanda's trade balance has been fluctuating a lot until the early 1990's. The civil unrest affected Rwanda's ability to produce adequate quantity of food such that food import rapidly increased while food exports decreased. However, Rwanda is quickly shrinking its food trade balance. The aggressive government program to reduce the country dependence from imports helped Rwanda record a positive trade balance in 2005.

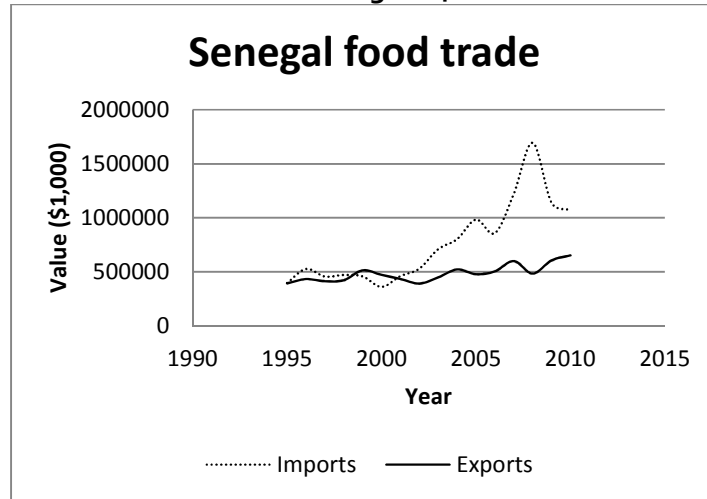
Figure 45:



Source: UNCTAD

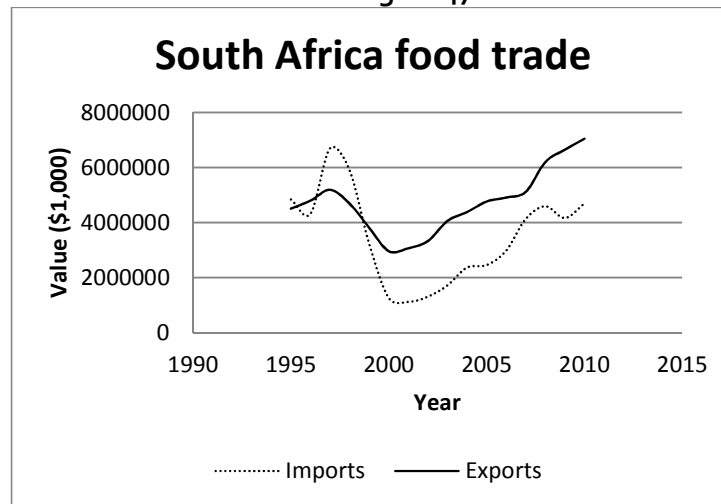
Senegal has been a net food exporter until the late 1970's. Between 1980, and today, food trade balance has been rapidly increasing as food imports are increasing and food exports is rather slowly increasing. After sharply increasing in 2005, food import felt back in 2009, and dramatically reduced food trade deficit.

Figure 46:



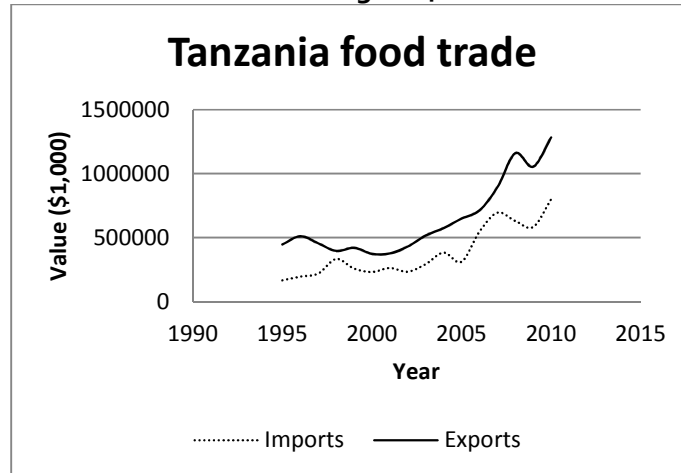
On average, South Africa is a net food exporter. Although its trade balance experience multiple fluctuation over the past 15 years, its relatively efficient agricultural sector allowed it to be food self-sufficient. Food trade surplus has been growing by an average rate of 19 per cents since 1999.

Figure 47:



Tanzania is a net food exporter country. The volcanic soil of Mt. Kilimanjaro allowed the country to supply food for both the country and the eastern African region. However, food imports have been growing rapidly over the past years. Population growth coupled with heavy rain fluctuation of the second rainy season affected Tanzania's food self-sufficiency. Some scientist blame it to climate change as these rainfall fluctuation are correlated to the rapid melting glaciers of Mt. Kilimanjaro (Aggrawal *et al*, 2004). But, this did not affect its positive food trade balance which kept an average annual growth rate of 21 per cents.

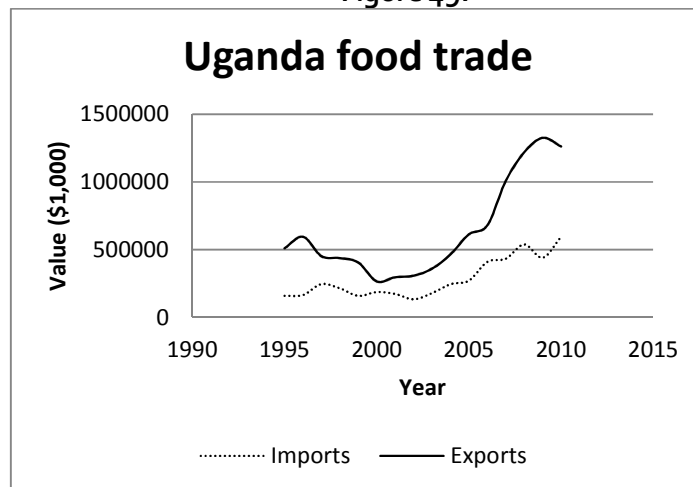
Figure 48:



Source: UNCTAD

Uganda has been a net food exporter for the past 15 years. Food exports had a sharp decrease in the early 2000's, but were able to get back up again. Food trade balance has been growing by an average rate of 14 per cents over the past 15 years.

Figure 49:



Source: UNCTAD

We want to categorise SSA countries by the extent to which they are net food importers or exporters. To do it, we compared average trade balance to Gross Domestic Product (GDP) for the different SSA countries over the past 10 years. Based on the proportion of trade balance to GDP, the countries were categorised as Strong Net Food Exporter (if trade balance more is than 10% of GDP), Moderate Net Food Exporter (if trade balance more is between 5-10% of GDP), Weak Net Food Exporter (if trade balance more is between 0-5% of GDP), Weak Net Food Importer (if trade balance more is between negative 0-5% of GDP), Moderate Net Food Importer (if trade balance more is between negative 5-10% of GDP), and Strong Net Food Importer (if trade balance more is more than negative 10% of GDP).

**Table 8:**

Country	Categories
Benin	Moderate Net Food Importer (between negative 5-10% of GDP)
Burkina Faso	Weak Net Food Importer (between negative 0-5% of GDP)
Burundi	Weak Net Food Exporter (between 0-5% of GDP)
Cameroon	Weak Net Food Importer (between negative 0-5% of GDP)
Côte d'Ivoire	Strong Net Food Exporter (more than 10% of GDP)
Dem. Rep. of the Congo	Moderate Net Food Importer (between negative 5-10% of GDP)
Ethiopia	Weak Net Food Exporter (between 0-5% of GDP)
Gambia	Strong Net Food Importer (more than negative 10% of GDP)
Ghana	Strong Net Food Exporter (more than 10% of GDP)
Guinea-Bissau	Strong Net Food Exporter (more than 10% of GDP)
Kenya	Weak Net Food Exporter (between 0-5% of GDP)
Madagascar	Weak Net Food Exporter (between 0-5% of GDP)
Malawi	Strong Net Food Exporter (more than 10% of GDP)
Mali	Moderate Net Food Importer (between negative 5-10% of GDP)
Nigeria	Weak Net Food Importer (between negative 0-5% of GDP)
Rwanda	Weak Net Food Importer (between negative 0-5% of GDP)
Senegal	Moderate Net Food Importer (between negative 5-10% of GDP)
South Africa	Weak Net Food Exporter (between 0-5% of GDP)
Uganda	Weak Net Food Exporter (between 0-5% of GDP)
United Republic of Tanzania	Weak Net Food Exporter (between 0-5% of GDP)

Source: UNCTAD & WDI

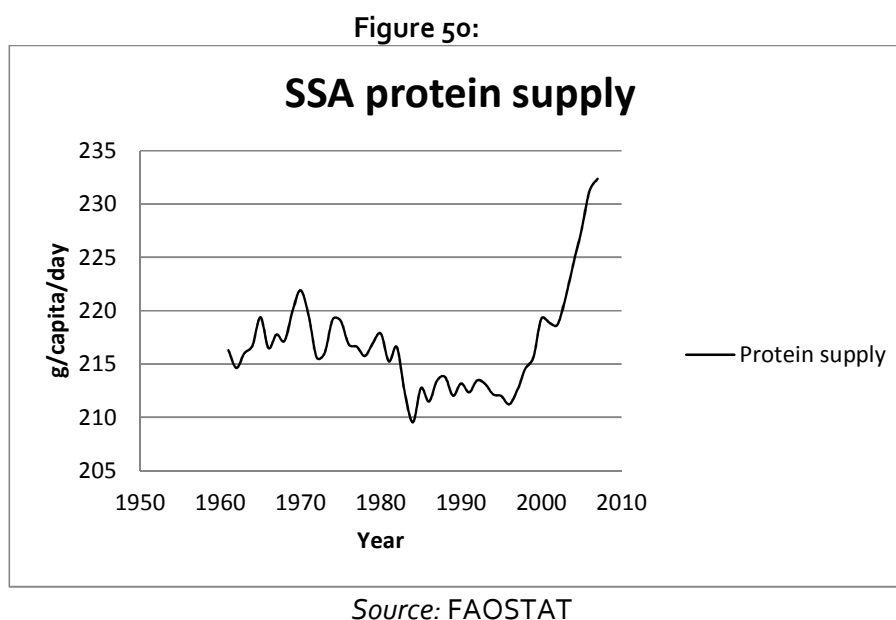
The Weak Net Food Importing countries are Burkina Faso, Cameroun, Nigeria, and Rwanda. The Weak Net Food Exporting countries are Burundi, Ethiopia, Kenya, Madagascar, South Africa, Uganda, and Tanzania. The only Strong Net Food importing country is Gambia. The Strong Net Food Exporting countries are Cote d'Ivoire, Ghana, Guinea Bissau, and Malawi. The Moderate Net Food Importing countries are Benin, DRC, Malawi, and Senegal.

### C. Linking food production to nutrition

The previous subsection provided a descriptive discussion regarding the food production, consumption, and trade in SSA over the past 50 years. The present section will use the food production trends discussed to explain the nutritional patterns observed in SSA and the different countries. Second, we will use econometric models to link nutritional patterns to country level and continent level food production, land, and income.

#### 1. Protein supply in sub-Saharan Africa

Undernourishment and malnourishment are two of the main consequences of food scarcity. These two unfortunate situations are very prevalent in SSA. The present sub-section attempts to present the dynamics of protein supply in SSA.



Protein supply has been increasing more rapidly since 2000. In fact, annual protein supply growth rate between 2000 and 2007 has been 0.83% while between 1961 and 2007 it was 0.16% annually. This growth could be associated in increase in income levels in SSA which now allows SSA countries to consume a more diverse diet compared to twenty years ago.

#### 2. Protein supply in individual SSA countries

South Africa has the highest level of per capita protein supply while DRC has the lowest. Further, Burkina Faso protein supply has been growing the fastest. One reason for this is that it is catching up since it started off with a low base. On the other hand, Burundi and DRC's protein supplies have been decreasing over the past 40 years. Long period of civil war which deprived households from accessing the necessary protein quantity affected DRC and Burundi's ability to supply sufficient protein level for the people.

**Table 9:**

Country	Average protein supply (g/capita/year)	Long-run CAGR (1961-2007)
Benin	49.87	0.66%
Burkina Faso	64.30	1.09%
Burundi	60.99	-0.96%
Cameroon	53.46	0.14%
Gambia	53.69	-0.20%
Guinea-Bissau	40.98	0.58%
Madagascar	56.83	-0.52%
Malawi	60.55	-0.14%
Mali	56.48	0.79%
Rwanda	49.19	0.20%
Senegal	63.29	-0.18%
Uganda	53.08	-0.25%
Cote d'Ivoire	54.44	-0.03%
DRC	32.40	-0.91%
Ethiopia	52.00	-0.16%
Ghana	47.58	0.68%
Kenya	62.46	-0.35%
Nigeria	48.06	0.72%
South Africa	74.25	0.30%
Tanzania	49.17	0.34%

Source: FAOSTAT

Finally, we compared both protein supply and CAGR of protein in SSA and the world's top protein supplier based on FAO 2007 estimates and found that SSA average protein supply is about half of total protein supply for Iceland. In addition, protein supply in Iceland has been growing by an average annual growth rate of 0.27% while in SSA it has been growing by a rate of 0.09%.

### 3. Why is protein supply so low in SSA?

To identify the determinants of protein supply in SSA, we estimate an econometric model such that protein supply is regressed against cereal yield, fruit/vegetal yields, meat production, and other control factors. We rank the contribution of each of the independent variables to protein supply and determine how they differ by country.

We first de-trended the variables in order to remove any possible serial correlations. We then estimated an OLS model for each country to identify the determinants of protein supply. Using the data from all the countries, we tested the linearity of the relationship between protein supply and the variables discussed earlier. We found that the relationship between protein supply and meat production, and fruit yields is non-linear. On the other hand, the relationship between protein supply and cereal yield, and root yield is linear. We then estimated the elasticities of the various dependent variables. The results further tell us that the increasing protein levels SSA has been experiencing since the early 2000's is mostly attributed to cereal yield increase. Among the variables used, SSA gets its largest bang-for-the-buck in terms of protein levels from cereal yield. Specifically, a 1% increase in cereal yield will lead to a 1.01%

increase protein supply. The second most influential determinant of protein supply is meat production. However, on a country-to-country basis, this ranking may not hold true. That is why we undertake a similar exercise for each country and present the results below.

The results presented in table 10 below discuss the determinants of protein supply. We estimate the elasticities of each determinant in order to identify the determinants that have the largest bang-for-the-buck<sup>3</sup> in order to help prioritize policy intervention for food security. It can be derived from the results presented in table 10 that Benin, Burkina Faso, Kenya, Malawi, and South Africa have the largest bang-for-the-buck in fruit yield are. Cameroon, Guinea Bissau, Cote D'Ivoire, Gambia, Nigeria, Senegal, Tanzania, Uganda, and DRC have the largest bang-for-the-buck in meat. Burundi, Madagascar, and Ethiopia have the largest bang-for-the-buck in cereal yield. Ghana, Mali, and Rwanda have the largest bang-for-the-buck in root yields.

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<sup>3</sup> It is important to keep in mind that bang-for-the-buck for a product here does not mean that the country receive most of their protein supply from that product. It means that that product has the largest effect on protein supply compared to the other products.

**Table 10:**

	Average		Benin		Burkina Faso		Burundi		Cameroon	
<b>Variable</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>
Cereal yield	1.01	2.54	0.08	0.27	-1.18	-3.65	0.75	2.78	0.25	0.70
Meat	0.20	1.71	0.14	1.35	-1.05	-2.78	0.20	1.30	1.70	3.86
Fruits yield	0.09	6.73	0.69	3.67	2.69	4.60	0.05	5.37	0.00	1.78
Roots yield	-0.24	-4.12	0.30	1.46	-0.01	-1.92	-0.03	-0.24	-0.66	-7.73
Land	0.03	2.32	0.00	0.15	0.14	2.71	0.11	2.06	-0.16	-0.74
GDP per capita	0.23	0.41	-0.07	-1.30	-0.19	-0.62	-0.01	-0.74	-0.03	-0.85
Cereal yield squared	-0.15	-0.52	-0.01	-0.64	0.01	0.03	0.03	0.50	0.01	0.14
Meat yield squared	0.09	1.88	-0.08	-1.36	-0.51	-1.94	0.00	1.05	-0.57	-1.60
Fruits yield squared	0.00	1.61	0.01	0.16	0.40	3.41	-0.31	-2.38	0.01	0.75
Roots yield squared	-0.08	-1.12	0.01	0.97	0.01	1.16	0.24	1.51	-0.44	-4.43
GDP per capita squared	-0.18	-0.80	-0.08	-1.44	-0.71	-2.20	-0.04	-0.83	0.00	0.62

	G-Bissau		Kenya		Madagascar		Malawi		Mali	
<b>Variable</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>
Cereal yield	0.59	2.12	0.14	0.58	0.81	6.09	0.43	1.19	-0.49	-2.20
Meat	1.88	7.48	0.04	0.20	0.55	5.65	-0.20	-4.61	0.41	4.37
Fruits yield	-0.13	-0.57	0.48	4.46	0.20	1.38	-0.21	-0.39	-0.04	-1.01
Roots yield	-0.73	-1.89	0.05	2.49	-0.11	-2.22	1.02	2.57	1.30	3.05
Land	0.01	1.82	0.19	0.87	-0.09	-0.97	0.03	0.78	-0.16	-1.68
GDP per capita	-0.01	-1.61	0.15	0.44	-0.07	-0.86	0.03	1.91	0.03	0.28
Cereal yield squared	0.02	0.83	-0.02	-1.13	0.25	4.35	0.53	0.73	0.08	0.38
Meat yield squared	-0.38	-7.18	0.02	0.61	-0.01	-2.22	0.29	0.83	0.00	0.10
Fruits yield squared	0.07	0.35	-0.04	3.07	0.01	0.09	-1.65	-1.77	-0.06	-1.36
Roots yield squared	0.00	0.10	0.12	3.43	-0.41	-3.08	0.87	1.42	0.38	2.62
GDP per capita squared	-0.09	-1.23	-0.06	-0.12	-0.13	-2.29	0.00	0.05	-0.04	-0.35



	Cote d'Ivoire		Ethiopia		Gambia		Ghana		Nigeria	
<b>Variable</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>
Cereal yield	0.69	0.45	-0.38	-0.06	-0.21	-0.46	-1.77	-2.65	-0.01	-0.08
Meat	-7.56	-2.28	-8.74	-1.39	0.43	0.20	-0.03	-1.36	0.68	3.18
Fruits yield	2.58	0.70	19.33	1.02	-0.36	-0.57	-2.19	-2.20	0.05	0.19
Roots yield	-3.72	-1.39	21.65	1.01	-0.95	-1.27	2.37	1.47	0.26	1.78
Land	-0.11	-0.17	0.82	0.67	0.07	1.17	0.03	0.15	0.01	0.23
GDP per capita	0.61	0.29	2.34	1.71	-0.08	-0.69	-0.21	-1.67	0.03	-0.46
Cereal yield squared	0.42	0.54	7.21	1.79	0.40	0.71	-0.10	-1.10	0.00	0.03
Meat yield squared	12.43	2.97	-1.82	-0.20	3.36	1.97	-0.02	-1.00	-0.07	-1.79
Fruits yield squared	-2.84	-0.57	15.58	1.42	0.42	0.49	-0.43	-1.31	0.00	0.10
Roots yield squared	0.83	0.33	-54.44	-0.85	-0.61	-1.70	3.74	2.53	-0.04	-0.80
GDP per capita squared	0.23	0.09	0.80	1.40	0.14	0.66	0.19	0.52	0.10	1.82

	Rwanda		Senegal		South Africa		Tanzania		Uganda	
<b>Variable</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>	<b>dy/dx</b>	<b>t-test</b>
Cereal yield	-0.02	-0.48	-0.11	-1.16	0.01	0.08	-1.30	-0.43	-0.82	-1.41
Meat	0.28	2.03	5.21	2.49	0.71	2.45	1.73	1.92	-0.10	-0.93
Fruits yield	0.09	0.35	0.52	1.14	-0.13	-2.92	1.69	1.77	0.67	6.73
Roots yield	0.75	4.30	-2.79	-1.93	0.31	1.16	0.03	3.73	0.61	0.96
Land	0.10	2.29	0.34	0.40	0.27	1.66	0.84	1.04	0.13	1.79
GDP per capita	-0.06	-1.25	0.18	0.68	-0.83	-2.06	-2.03	-2.13	0.00	0.13
Cereal yield squared	0.14	1.11	-0.19	-0.99	0.14	1.59	1.77	0.55	0.15	0.46
Meat yield squared	-0.21	-2.05	3.19	1.83	-0.09	-0.66	1.77	2.16	-0.70	-1.91
Fruits yield squared	-0.07	-1.15	-0.02	-0.34	0.81	3.29	-0.32	-0.72	0.01	0.70
Roots yield squared	-0.03	-0.86	-0.57	-1.64	0.25	2.77	-0.26	-1.97	0.40	1.95
GDP per capita squared	0.04	1.03	0.45	2.03	-0.47	-1.72	-0.02	-1.31	-0.28	-1.83

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	DRC	
Variable	dy/dx	t-test
Cereal yield	-0.01	-0.05
Meat	1.90	3.53
Fruits yield	0.04	0.26
Roots yield	-0.49	-0.74
Land	0.05	0.66
GDP per capita	0.08	0.73
Cereal yield squared	0.02	0.71
Meat yield squared	0.06	1.61
Fruits yield squared	-0.33	-2.06
Roots yield squared	0.33	1.09
GDP per capita squared	-0.05	-0.69

**Table 11**

<b>Fruits</b>	<b>Meat</b>	<b>Cereal</b>	<b>Roots</b>
Benin	Cameroon	Burundi	Ghana
Burkina Faso	Guinea Bissau	Madagascar	Malawi
Kenya	Cote D'Ivoire	Ethiopia	Rwanda
Malawi	Gambia		
South Africa	Nigeria		
	Senegal		
	Tanzania		
	Uganda		
	DRC		

*Source: Author's estimates*

Based on our analysis conducted above, we found that one could effectively address the low protein levels in SSA by putting in place policies that promote high cereal yield and meat production. However, on a country to county basis, these priorities will differ as we have shown in table 11.

### 3. Patterns of Food Production and Consumption: Household Surveys Evidence

In the previous sections we presented and discussed data on production and consumption trends for a series of Sub-Saharan countries. This data was presented at the aggregate level and therefore it did not take into account distributional issues within each country. In this section we use household survey data to discuss the importance of food both as a source of income and as expenditure for the households. We cover all the countries for which we presented individual data in the previous sections except for the Democratic Republic of Congo for which we do not have household survey data. The Annex A list the source of data for the nineteen countries and present detailed data on expenditure shares, food expenditure shares, income shares, and agricultural income shares for each country.

When looking to the data it is important to take into account that the household surveys are not strictly comparable across countries as they often use different methodologies and questionnaires. In any case, the figures presented below give a reasonable picture of the importance of food as both a source of income and an expenditure item in the household budget. We use the data to answer four questions: (a) How much of their income households spend on food? (b) In what food items they spend their income? (c) How much income comes from agriculture sales? and (d) What are the sources of agriculture income?

#### *a. How much of their income households spend on food?*

Food expenditure shares are presented in Table 12 below for the nineteen countries for which we have household data. The first important point to notice is that food is a very important item in the households' budget taking from 40.1% in the case of South Africa up to 85.3% in the case of Tanzania, with an average of 64% for the nineteen countries. This average is 58.4% when considering only urban households and 66.5% when we look only to rural households. In fifteen of the countries food shares are larger for rural households. This result is often driven by income differences between the two sectors.

It is also important to make an analysis for different levels of income. The last two columns in Table 12 provide the food share for the first and last quintile. In all cases, food consumption takes a larger share of the income of the poorest households. On average, the households in the first quintile spend 69.9% of their income on food, while those in the fifth quintile spend 53.4%. In some countries the differences are of a considerable magnitude. For instance in Rwanda and South Africa the first quintile spend 77.1% and 58% of their income on food, while the households in the fifth quintile spend 31% and 15.9% respectively. On the other hand, in countries like Burundi, Malawi, and Gambia the differences are very small.

The last two columns allow us also to analyse the importance of food auto consumption. For the households in the first quintile on average 35% of the food is auto consumption. This average decreases to 22% for those households in the last quintile. This average, however, hide very important differences among countries. For instance, auto consumption is insignificant in South Africa where it provides less than 1% of the total consumption. In contrast, in countries like Benin, Ethiopia, Malawi, and Uganda auto-consumption provides more than 50% of the total food consumption of the poorest households.

Table 12: Food expenditure shares

	National	Urban	Rural	Quantile 1 (auto-cons)	Quantile 5 (auto-cons)
Benin	56.0	53.9	57.4	58.8 (31.1)	52.3 (7.8)
Burkina Faso	62.0	52.0	64.6	73.5 (35.2)	45.4 (9.5)
Burundi	57.1	60.4	57.0	53.9 (1.3)	52.8 (8.1)
Cameroun	62.5	55.4	67.6	68.4 (14.6)	52.8 (3.7)
Côte d'Ivoire	55.0	55.7	53.9	58.3 (2.8)	44.9 (1.6)
Ethiopia	70.4	57.0	74.9	81.8 (48.1)	52.0 (18.7)
Gambia	67.6	66.7	69.2	69.2 (n/a)	66.7 (n/a)
Ghana	61.8	58.0	64.1	66.2 (17.8)	57.7 (5.5)
Guinea Bissau	69.6	64.3	71.7	69.4 (27.4)	64.4 (11.0)
Kenya	72.8	56.9	76.7	83.1 (23.2)	56.1 (8.6)
Madagascar	83.7	75.5	86.2	84.1 (40.2)	76.8 (32.0)
Malawi	58.7	56.5	59.0	58.0 (32.1)	55.6 (20.9)
Mali	62.4	53.6	66.0	63.6 (14.4)	54.7 (14.0)
Nigeria	72.4	69.8	74.5	83.6 (39.1)	61.6 (11.3)
Rwanda	56.1	56.6	56.0	77.1 (36.5)	31.0 (8.9)
Senegal	57.2	52.6	60.9	61.6 (5.7)	48.3 (0.1)
South Africa	40.1	34.1	50.1	58.0 (0.5)	15.9 (0.0)
Tanzania	85.3	85.7	85.2	90.4 (37.8)	76.3 (14.6)
Uganda	64.9	44.0	69.2	69.7 (49.7)	49.8 (40.9)

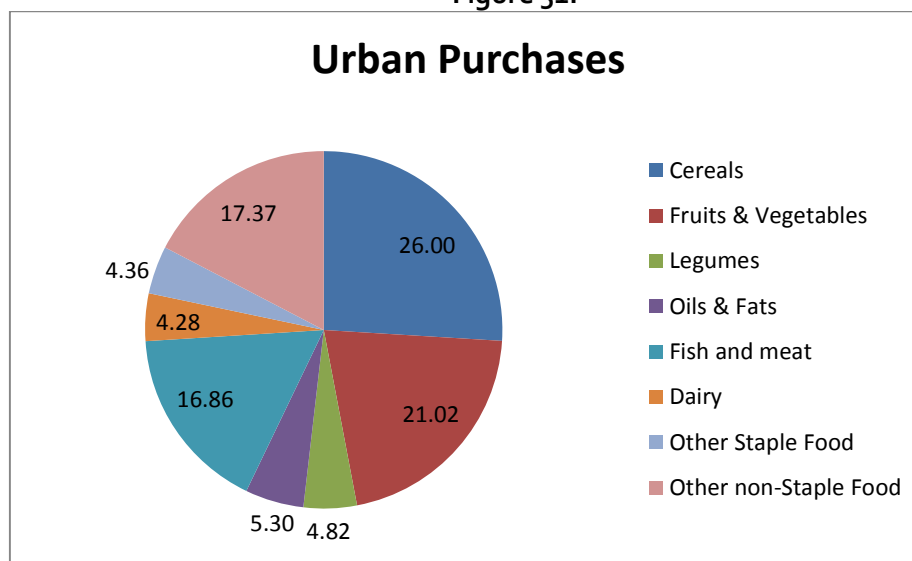
Source: Authors' elaboration using Household Surveys (see Annex A for details)

#### *b. In what food items they spend their income?*

It is important to decompose the food shares of the previous section in its different components to have a better idea of the diet of the African households. Figures 50 through 53 present average composition of food purchases and auto consumption for both rural and urban households in our sample of Sub-Saharan African countries.

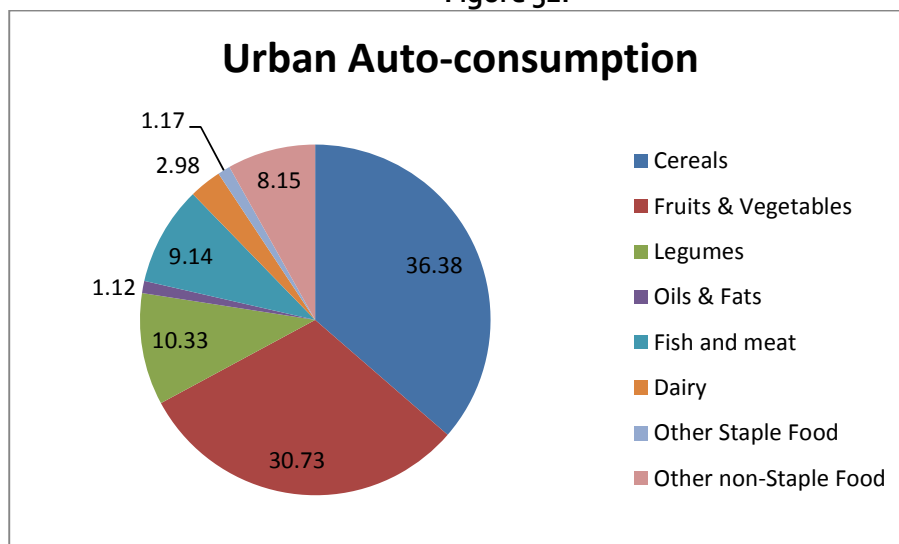
In our sample of countries, cereals are the most important component in food purchases both for urban (26%) and rural households (23.6%). The importance of cereals increases when we consider auto-consumption accounting for 36.4% for urban households and 41.9% for rural households. Fruits and vegetables are the second most important food expenditure, except in the case of rural households' purchases where it takes the third place behind other non-staple food items. As it is in the case of cereals, the share of fruit and vegetables and legumes increases when we consider auto consumption. On the other hand, meat and fish has often a larger share in the case of purchases than auto-consumption. This is probably the case because peasants often consider their cattle too important to be consumed and prefer to sell it in markets.

Figure 51:



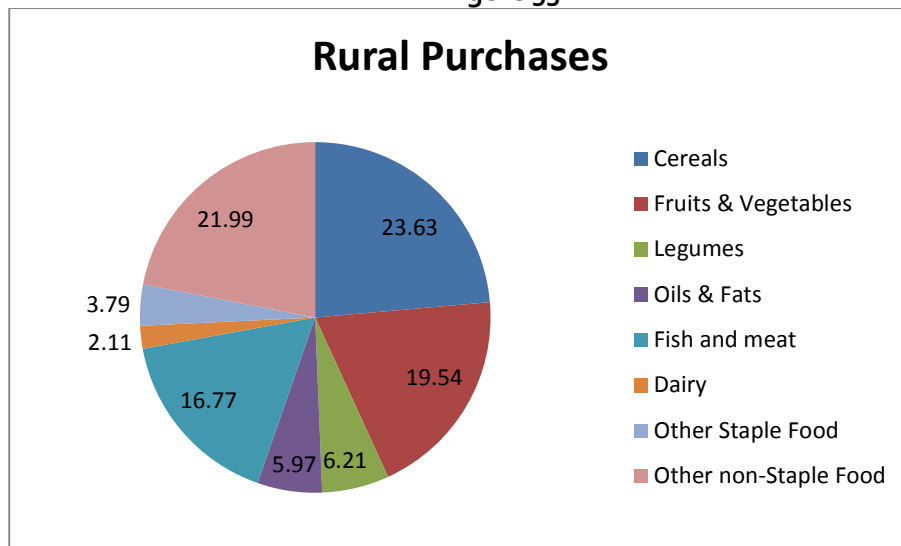
Source: Authors' elaboration using household surveys (see Annex A for details)

Figure 52:



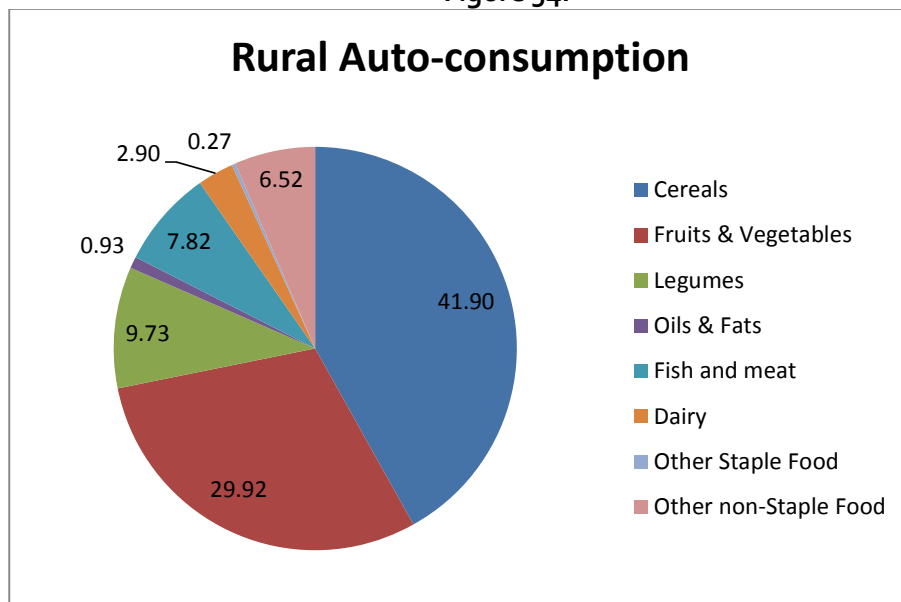
Source: Authors' elaboration using household surveys (see Annex A for details)

Figure 53:



Source: Authors' elaboration using household surveys (see Annex A for details)

Figure 54:



Source: Authors' elaboration using household surveys (see Annex A for details)

The average presented in Figures 50-53 masks however important idiosyncrasies across countries and within countries. Table 13a displays food expenditure details for urban households. Cereals has the largest purchased food share in Burkina Faso, Côte d'Ivoire, Ethiopia, Gambia, Kenya, Madagascar, Malawi, Mali, Nigeria, Senegal, and Tanzania. Fruits and vegetables have the largest share in Burundi, Cameroun, Rwanda, and Uganda. Fish and meats are the largest purchased item in Benin, Ghana, and South Africa. When considering urban auto-consumption, cereals still is the most important food item in most countries. The exception are Cameroun, Ghana, Kenya, Rwanda, South Africa, and Uganda

where fruits and vegetables have a larger share, Burundi where legumes are predominant and Côte d'Ivoire where the largest share goes to fish and meat.

When considering rural households (Table 13b), cereals are slightly less important in purchased items been the leading item in only seven countries. Fruits and vegetables is the most important item in four countries and fish and meat as well. Other non-staple food is the most important purchased item in rural households in Ethiopia, Malawi, and Mali. Cereals become once again the main food item when we consider rural households' auto-consumption. Only in Burundi, Ghana, Kenya, Rwanda, and Uganda fruits and vegetables have a larger share.

There are even more important differences when we look to the data within countries across different level of livelihood and gender groups. In Annex A the interested reader can find individual country tables where the food consumption items are presented in more details and for different level of incomes within the same country.



Table 13a: Food expenditure detail (Urban Households)

	Benin	Burkina Faso	Burundi	Cameroon	Côte d'Ivoire	Ethiopia	Gambia	Ghana	Guinea Bissau	Kenya	Madagascar	Malawi	Mali	Nigeria	Rwanda	Senegal	South Africa	Tanzania	Uganda
<b>A.1) Urban Purchases</b>																			
Cereals	24.04	35.33	16.43	14.20	24.53	37.03	30.24	17.18	n/a	26.05	44.81	29.53	33.06	29.42	15.82	23.51	23.34	32.84	10.57
Fruits & Vegetables	16.41	10.42	21.99	25.04	19.00	9.87	25.56	16.93	n/a	21.69	13.51	17.62	13.45	26.79	32.27	12.75	13.82	16.92	64.34
Legumes	4.17	1.95	12.37	4.44	2.87	8.71	0.63	2.35	n/a	6.29	3.52	6.21	0.04	8.54	9.58	0.71	0.28	4.94	9.11
Oils & Fats	6.04	4.25	6.61	7.02	3.18	8.54	1.42	6.65	n/a	6.47	5.33	7.58	6.79	6.79	2.60	8.29	4.00	3.51	0.39
Fish and meat	24.74	14.52	15.93	21.54	22.36	7.02	13.21	20.51	n/a	13.33	14.83	16.95	19.59	17.35	10.13	23.36	24.61	19.13	4.34
Dairy	1.81	1.71	3.36	3.09	2.38	1.77	7.91	4.38	n/a	10.25	2.43	4.92	2.32	2.74	5.41	6.98	8.67	3.07	3.84
Other Staple Food	13.20	1.51	1.88	11.59	13.41	5.91	3.94	16.29	n/a	0.19	0.00	2.35	1.18	2.66	0.14	1.06	3.09	0.00	0.00
Other non-Staple Food	9.60	30.32	21.43	13.09	12.27	21.17	17.10	15.71	n/a	15.73	15.56	14.82	23.55	5.71	24.03	23.35	22.18	19.59	7.42
<b>A.2) Urban Auto-Consumption</b>																			
Cereals	38.84	45.91	29.07	31.18	28.18	35.95	n/a	17.90	n/a	32.01	58.40	53.09	53.94	51.22	4.65	58.53	14.00	47.70	17.90
Fruits & Vegetables	15.55	21.33	13.88	37.00	15.31	15.29	n/a	63.69	n/a	44.37	24.76	32.24	12.60	39.20	54.58	19.93	53.29	31.80	27.64
Legumes	7.58	4.50	57.04	16.02	10.85	6.20	n/a	2.40	n/a	3.91	4.18	6.58	0.13	2.32	35.28	5.26	0.00	6.08	7.22
Oils & Fats	4.08	0.98	0.00	1.87	0.00	2.80	n/a	0.71	n/a	0.00	0.00	0.13	1.98	1.88	0.00	0.00	0.00	1.18	3.47
Fish and meat	7.40	5.84	0.00	13.90	36.53	5.96	n/a	8.30	n/a	8.97	10.93	3.01	6.95	4.47	1.23	0.00	23.49	5.64	12.81
Dairy	2.35	2.40	0.00	0.00	0.00	8.80	n/a	1.41	n/a	10.64	0.00	1.25	4.29	0.55	2.78	0.00	9.21	2.12	4.89
Other Staple Food	13.46	0.00	0.00	0.00	0.00	5.86	n/a	0.00	n/a	0.00	0.00	0.04	0.42	0.00	0.07	0.00	0.00	0.00	0.00
Other non-Staple Food	10.76	19.04	0.00	0.03	9.13	19.15	n/a	5.61	n/a	0.11	1.72	3.66	19.69	0.37	1.40	16.28	0.00	5.48	26.07

Source: Authors' elaboration using Household Surveys (see Annex A for details)

Table 13b: Food expenditure detail (Rural Households)

	Benin	Burkina Faso	Burundi	Cameroun	Côte d'Ivoire	Ethiopia	Gambia	Ghana	Guinea Bissau	Kenya	Madagascar	Malawi	Mali	Nigeria	Rwanda	Senegal	South Africa	Tanzania	Uganda
<b>B.1) Rural Purchases</b>																			
Cereals	23.34	26.46	2.34	21.77	24.18	23.04	36.38	16.33	n/a	30.64	37.13	20.65	22.14	19.84	15.17	30.12	34.71	27.41	13.67
Fruits & Vegetables	15.82	8.26	29.17	24.79	16.57	12.45	17.08	12.38	n/a	15.12	13.39	18.07	12.27	23.14	33.13	10.46	12.42	13.59	63.60
Legumes	5.26	1.57	14.22	5.68	2.76	11.59	0.63	3.09	n/a	8.31	4.39	6.32	0.05	10.78	17.50	0.86	0.54	6.00	12.20
Oils & Fats	7.09	4.64	13.00	8.40	3.83	4.33	0.96	7.62	n/a	8.16	7.26	4.55	3.35	10.01	5.60	11.54	3.95	2.95	0.15
Fish and meat	24.70	15.67	8.55	18.24	26.33	6.04	11.58	30.06	n/a	12.66	17.02	18.75	16.83	23.78	5.72	17.33	18.68	27.08	2.89
Dairy	1.26	0.78	0.16	0.76	1.55	1.19	4.51	2.03	n/a	4.39	1.05	1.63	1.40	2.62	0.67	2.30	6.28	2.44	2.95
Other Staple Food	11.50	0.37	12.18	8.24	11.55	0.72	4.98	11.21	n/a	0.06	0.00	2.92	0.13	1.27	0.04	0.52	2.50	0.00	0.00
Other non-Staple Food	11.03	42.25	20.36	12.13	13.22	40.63	23.88	17.28	n/a	20.66	19.75	27.13	43.83	8.56	22.17	26.87	20.93	20.53	4.56
<b>B.2) Rural Auto-Consumption</b>																			
Cereals	43.93	62.00	21.89	42.46	32.30	56.56	n/a	21.92	n/a	23.30	63.20	44.52	70.28	49.80	7.45	62.74	45.14	42.26	22.58
Fruits & Vegetables	22.69	14.72	52.15	32.58	10.94	19.48	n/a	63.36	n/a	43.02	24.86	29.29	7.73	39.00	60.31	9.96	13.90	34.83	29.86
Legumes	9.81	4.14	24.95	19.19	16.87	9.05	n/a	3.24	n/a	2.54	3.52	14.22	0.03	1.86	27.80	4.97	0.00	9.70	13.53
Oils & Fats	2.15	1.12	0.00	1.84	0.18	0.99	n/a	1.24	n/a	0.00	0.00	0.01	2.78	2.81	0.03	0.00	0.00	0.24	2.45
Fish	11.02	7.77	0.00	3.80	23.71	1.33	n/a	5.45	n/a	9.07	6.17	5.67	4.69	4.64	0.69	0.00	34.34	4.84	9.80
Meat	0.79	2.54	0.00	0.00	0.00	4.47	n/a	1.12	n/a	22.06	0.00	1.96	1.94	0.62	1.21	0.00	6.62	4.19	1.82
Other Staple Food	4.27	0.01	0.00	0.00	0.00	0.14	n/a	0.00	n/a	0.00	0.00	0.04	0.03	0.00	0.11	0.00	0.00	0.00	0.00
Other non-Staple Food	5.35	7.70	1.00	0.14	15.99	7.99	n/a	3.68	n/a	0.00	2.25	4.29	12.52	1.26	2.39	22.32	0.00	3.93	19.96

Source: Authors' elaboration using Household Surveys (see Annex A for details)

### *c. How much income comes from agriculture sales?*

On average agriculture sales generate 23.6% of the households' income in our sample of countries at the national level, 9.5% for urban households and 28.3% for rural households. In rural areas, agriculture sales are the second most important source of income after auto-consumption (33.6%). It is far less important in urban areas where wages (34.4%) are the most important source of income. Table 14 below show the income shares decomposition for each country in the sample for which data exists. Agricultural sales are the most important source of income in Burundi, Côte d'Ivoire, and Madagascar where they respectively generate 70.7%, 41.5%, and 31.2% of the total. If they do not have a larger share of income it is because in most Sub-Saharan African countries, the agriculture production never reaches the market as it is consumed by the household. Auto consumption is the largest source of income in Burkina Faso, Cameroun, Ethiopia, Ghana, Guinea Bissau, Malawi, Nigeria, Rwanda, and Uganda. Wages are the most important source of income in South Africa, sales of good and services in Gambia, and transfers in Benin.

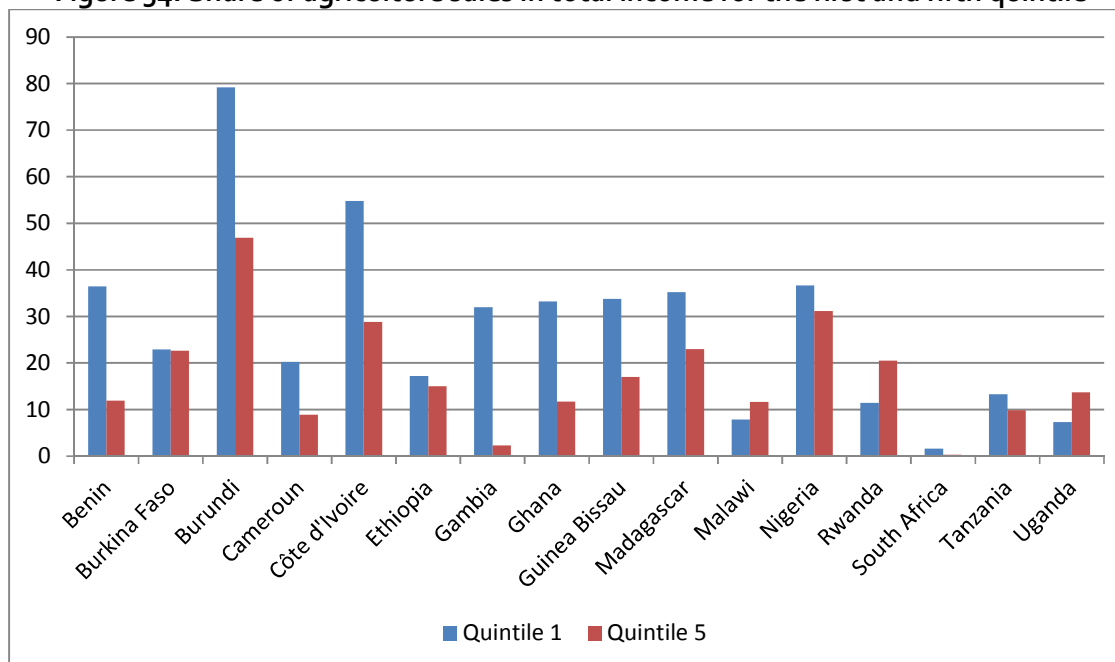
It is important to differentiate the standing of agriculture sales across different levels of income. The Figure 54 below displays the share of agriculture sales in total income for the first and last quintile. In most cases agriculture sales are far more important for the households with the lowest income. For example, in Burundi the households in the first quintile derive almost 80% of their income from agriculture sales, while those in the last quintile less than half. Also in Benin, Côte d'Ivoire, Ghana, Guinea Bissau, Madagascar, and Nigeria the households in the first quintile generate more than one third of their income from agriculture sales. This is only true for the richest households in the case of Burundi that was mentioned above.

Table 14: Income Shares

	Benin	Burkina Faso	Burundi	Cameroun	Côte d'Ivoire	Ethiopia	Gambia	Ghana	Guinea Bissau	Kenya	Madagascar	Malawi	Mali	Nigeria	Rwanda	Senegal	South Africa	Tanzania	Uganda
<b>A) National</b>																			
Ag Sales	25.71	23.37	70.70	15.70	41.49	17.34	17.42	22.53	24.99	n/a	30.17	10.45	n/a	33.63	17.36	n/a	0.63	12.90	13.20
Wages	n/a	15.21	6.92	27.13	6.70	9.27	28.42	15.65	18.31	n/a	23.02	18.35	n/a	1.95	28.66	n/a	54.70	22.77	18.40
Sales of goods & services	n/a	10.83	6.47	22.93	22.50	22.16	36.32	20.50	4.69	n/a	13.03	14.23	n/a	1.05	n/a	n/a	n/a	12.05	n/a
Transfers	47.17	14.02	11.31	n/a	24.69	9.36	17.83	16.61	10.05	n/a	5.27	15.83	n/a	9.21	10.78	n/a	43.83	19.20	19.23
Auto consumption	27.12	36.56	4.60	34.24	4.63	41.88	0.00	24.71	41.96	n/a	28.50	41.15	n/a	54.16	43.21	n/a	0.84	33.09	49.17
<b>B) Urban</b>																			
Ag Sales	13.50	6.99	10.40	5.49	29.59	4.88	3.69	11.68	10.15	n/a	14.89	2.60	n/a	27.54	2.31	n/a	0.20	4.43	3.77
Wages	n/a	10.98	46.32	35.10	8.36	29.44	16.61	25.87	49.28	n/a	39.53	46.76	n/a	2.20	82.85	n/a	63.26	27.87	30.86
Sales of goods & services	n/a	28.45	16.19	43.32	31.24	32.36	53.07	30.33	10.18	n/a	22.30	26.52	n/a	2.15	n/a	n/a	n/a	29.04	n/a
Transfers	63.61	39.66	26.79	n/a	28.07	22.05	26.63	23.30	14.69	n/a	9.32	13.72	n/a	24.34	8.11	n/a	36.40	27.67	17.68
Auto consumption	22.89	13.91	0.29	16.10	2.75	11.27	0.00	8.83	15.70	n/a	13.95	10.40	n/a	43.77	6.73	n/a	0.15	11.00	47.68
<b>C) Rural</b>																			
Ag Sales	33.61	26.80	72.79	21.07	52.09	21.52	32.04	28.97	30.50	n/a	34.78	11.45	n/a	35.89	18.86	n/a	1.35	15.13	15.14
Wages	n/a	16.10	5.55	22.94	5.14	2.49	40.23	9.60	6.82	n/a	18.04	14.74	n/a	1.86	23.25	n/a	40.75	21.42	15.83
Sales of goods & services	n/a	7.14	6.13	12.21	15.04	18.73	19.78	14.67	2.66	n/a	10.24	12.67	n/a	0.65	n/a	n/a	n/a	7.57	n/a
Transfers	36.54	8.65	10.77	n/a	21.42	5.10	7.96	12.65	8.32	n/a	4.05	16.09	n/a	3.60	11.04	n/a	55.94	16.97	19.54
Auto consumption	29.85	41.31	4.75	43.77	6.31	52.16	0.00	34.12	51.71	n/a	32.88	45.05	n/a	58.00	46.85	n/a	1.96	38.92	49.48

Source: Authors' elaboration using Household Surveys (see Annex A for details)

**Figure 54: Share of agriculture sales in total income for the first and fifth quintile**



Source: Authors' elaboration using Household Surveys (see Annex A for details)

#### *d. What are the sources of agriculture income?*

The Table 15 below shows the decomposition of agriculture sales between cereals, fruits and vegetables, other staple food, and other non-staple food for both urban and rural households. The first thing to notice is that while cereals and fruits and vegetables had the largest share in food consumption budget, they are far less important as a source of income. For instance, for urban households, cereals are the main source of agriculture sales only in Ghana. For rural households, cereals are the most important item in Ghana, Nigeria, and Uganda. Fruits and vegetables are the most important source of agriculture income for urban households in Cameroun, Gambia, and Uganda, and for rural households only in Cameroun.

Other staple and non-staple food items are important source of agriculture income in all the countries in our sample. For example, in Ethiopia and Cote d'Ivoire two third of the agriculture income is generated by other staple food items such as cocoa and coffee. These cash crops along with cotton, tea, and ground nuts are often important source of agriculture income in several countries in our sample.

The distribution of the sources of agriculture income also varies across level of income within each country. For space constraints we do not present this information here but we have included detailed data in the tables in Annex A for the interested reader.

Table 15: Agriculture Income Shares

<b>A. Urban Households</b>	Cereals	Fruits & Vegetables	Other Staple Food	Other non-Staple Food
Benin	17.15	11.06	29.67	42.12
Burkina Faso	12.89	18.12	57.63	11.36
Burundi	19.06	13.14	64.26	3.54
Cameroun	16.36	43.15	40.27	0.22
Côte d'Ivoire	12.26	19.12	10.98	57.64
Ethiopia	2.70	4.59	32.57	60.14
Gambia	3.91	60.26	0.00	35.83
Ghana	37.76	9.62	29.34	23.28
Guinea Bissau	n/a	n/a	n/a	n/a
Kenya	n/a	n/a	n/a	n/a
Madagascar	25.61	17.85	48.91	7.63
Malawi	25.96	33.26	26.77	14.01
Mali	n/a	n/a	n/a	n/a
Nigeria	24.14	20.36	9.61	45.89
Rwanda	17.61	29.63	42.15	10.61
Senegal	n/a	n/a	n/a	n/a
South Africa	5.44	38.93	55.63	n/a
Tanzania	n/a	n/a	n/a	n/a
Uganda	23.00	28.32	27.95	20.74
<b>B. Rural Households</b>	Cereals	Fruits & Vegetables	Other Staple Food	Other non-Staple Food
Benin	20.01	14.95	28.39	36.65
Burkina Faso	14.14	7.31	66.25	12.30
Burundi	5.02	23.29	30.77	40.93
Cameroun	13.70	43.99	41.34	0.96
Côte d'Ivoire	10.74	15.37	11.77	62.12
Ethiopia	1.36	1.70	69.03	27.91
Gambia	3.46	25.90	2.41	68.22
Ghana	32.00	17.30	24.48	26.23
Guinea Bissau	n/a	n/a	n/a	n/a
Kenya	n/a	n/a	n/a	n/a
Madagascar	29.56	21.23	40.37	8.83
Malawi	15.48	29.06	37.04	18.42
Mali	n/a	n/a	n/a	n/a
Nigeria	36.39	28.96	16.54	18.11
Rwanda	18.26	30.33	32.39	19.01
Senegal	n/a	n/a	n/a	n/a
South Africa	15.30	13.37	71.33	n/a
Tanzania	n/a	n/a	n/a	n/a
Uganda	26.51	24.86	22.63	26.00

Source: Authors' elaboration based on Household Surveys (see Annex A for details)

#### **4. Policy Implications: Agriculture Transformation and Food Security**

The review of the production and consumption trends in the previous sections paint a gloomy picture of the food situation in most Sub Saharan African countries. Agricultural GDP growth in sub Saharan Africa averaged 2.3 percent per year in the 1980s (lower than the average population growth) and 3.8 percent per year during the 2000s but growth has been mostly based on area expansion. As land becomes more and more scarce many countries are facing limits to further expansion. Land and agricultural productivity must increase because African farm yields are among the lowest in the world. The poor performance of the sector over the last three or four decades has been a major drag on Africa's development. This poor performance of the sector comes from a variety of constraints, particular to the sector in Africa, that need to be analysed and better understood by policy makers and followed by the right set of policies.

The bulk of agricultural production in Africa consists primarily of food crops with agricultural export crops accounting for less than 10 percent of total production. Food crops for the family, produced mainly by women, have however performed very poorly in most countries with cereal yields in Africa, in the mid 2000s for example, being less than half those in South Asia and one-third those in Latin America. This has been due to several factors including land rights for women and the environment in which farmers operate in Africa which, in general, has made them risk averse. Africa also lags behind other Regions in the percentage of cropland irrigated, fertilizer use, and labor and land productivity per worker. It is therefore important to review the main factors that would provide African farmers with the right incentives to practice intensive agriculture and to take risks with new crop varieties and practices. The main factors that would help improve the level of transformation of African agriculture would include the use of improved seeds, increase in the cropland irrigated, increased use of modern inputs, availability of credit, and access to markets; good extension advice; and adequate returns through undistorted prices for inputs and outputs.

Another reason to focus on agricultural transformation is that agriculture has strong indirect effects on growth in other sectors. Recent research demonstrates that the effect of agriculture on wider growth is likely to be substantial. Christiaensen et al (2010) looked at the direct and indirect effects of agriculture growth and argue that while agriculture in general tends to grow more slowly than non-agriculture, the indirect effects of agriculture on non-agriculture are substantially larger than the reverse. These effects arise from linkages to agro-processing and input production, for example, as well as from the "wage good effect," whereby lower food prices resulting from increased agricultural production would imply an increase in saving at a given level of income and can stimulate demand for goods produced by the non-agriculture sector. Moving forward therefore, a focus on agricultural development is critical to contribute to poverty reduction and economic growth in the Region. Agricultural transformation which involves higher productivity of the sector and increased production and marketable surplus implies therefore higher growth of the sector and a more substantial contribution to economic growth and poverty reduction. However, this approach may not be applicable to all SSA countries. The role of policy makers is to evaluate the current challenges and prospects of the agriculture and food

producing sectors and prioritize areas where the country has a latent comparative advantage.

The main policy implications and priorities coming from the review of the current situation in Africa's agriculture sector can be summarized in the following seven points:

### *1. Major Constraints that limit Agricultural Transformation*

The first objective of policy makers should be to try to understand the main constraints that have limited changes in the key indicators that would normally point to a successful agricultural transformation in Africa. Understanding these constraints in each country would help design policies and programs adapted to the specific conditions of the country.

### *2. Agricultural Productivity over Time*

We know that labor and land productivity per worker has stagnated and in some cases even declined in most African countries with production increases coming mainly from area expansion. Policy makers should seek to understand why average yields have stagnated or declined over the last two to three decades. It is imperative to do an analysis of the main factors that have affected yields and understand the main binding constraints to improving yields. Some of the constraints for adopting improved technology that have to be looked at include; the impact of climate change and declining rainfall, absence of modern inputs, lack of technological packages, lack of agricultural advice, lack of investment (land, inputs) by farmers, and availability of finance, and general risk aversion. Apart from these factors that affect the production side, it will be important to look at demand for the products, such as markets, pricing policy, and administrative and transport bottlenecks that discourage farmers from selling their produce and hence limit their interest or ability to adopt high yielding crop varieties and productivity enhancing methods of cultivation.

### *3. Agricultural Diversification*

Agricultural diversification presents new opportunities to farmers to access new markets, to produce for niche markets and/or to move to higher value crops compared to what they have traditionally been growing or produce for niche markets. This is particularly true for farmers in areas with good agricultural potential. Even for those in less endowed areas, diversification can be used as partly a response to climatic risk and to improve the level of their agriculture. The extent of diversification and its potential can therefore be a good measure of transformation possibility in the sector. It is important to analyse the diversification possibilities in terms of demand (internal, regional and export markets) and in terms of available technical packages and possibilities that exist for farmers in the country concerned. It would be important to understand if farmers have the technical capacity to adopt the new crops and if not what is required in terms of support for the farmer to bring them up to speed and to expand adoption of the diversification crops. In order to provide the required support for the new areas of production, policy makers should know if the process of diversification requires any changes in production methods in terms of moving from small-holder to medium and/or large-scale commercial farms and if yes how to manage the transition especially in terms of land tenure and displacement of small



holders from their lands. If however production methods remain small-scale, it is important to assure effective markets (transformation possibilities) for the new products.

#### *4. Supply Factors: Technological Packages, Research and Extension*

Improvements in agricultural productivity require innovations in technology and adoption and application of these technologies. Research and extension play a key role in adapting technological packages to farm level conditions and diffusing them to farmers. Most people agree that there are several packages that are available from the main research stations in Africa and if these are properly adapted, diffused and applied, they can make a big difference to agricultural productivity gains in Africa. Policy makers need to review what affordable technical packages are available in the country and can come off the shelf in the short term to improve productivity both of currently cultivated crops and new diversification crops. Based on the history of the introduction of technology, they should identify what obstacles have constrained the adoption of these packages and what are realistic approaches to tackle these constraints. Some factors that work against the use of new technology include sociological factors such as biases against the use of modern inputs and introduction of new production methods (use of herbicides, fertilizer, pesticides, etc.) and new crops especially for the local and regional markets. It would be important to look at efforts, if any, to introduce genetically modified crops and what reception these efforts have received. If there is a general bias with genetically modified crops and the use of certain inputs, they should look at if there have been any efforts to research organic cultivation methods and whether this can provide a niche market for crops from Africa. It is also imperative to examine why the use of irrigation and water management methods for agricultural production in Africa are so low. The issue of existing institutions (public, private and/or farmer organizations) to manage irrigation and other water control programs need also to be re-examined.

#### *5. Input and Output Markets, Agricultural Processing, and Access to Finance*

For farmers to have the right incentives to practice intensive agriculture and to increase their production both price (input and output prices) and non-price factors (access to markets, credit, among others) have to be favorable. Policy makers need to answer some questions about existing value chains in the sector for each country and see how these value chains can be strengthened. The main questions would include:

- What are some existing profitable supply and value chains that have established direct links between farmers (especially smallholders and local industries – small or medium)?
- For a large number of traditional crops for which the value chains are weak or inexistent, what is lacking? How can the linkages be established and/or strengthened?
- Where there are no direct links between producers and industries, are there marketing organizations for the crops concerned? How has the lack of “guaranteed markets” affected production and productivity in these crops?

- What are the main constraints in setting up credible and effective professional organizations that can contribute to the creation of supply and value chains? Are there possibilities for public-private partnerships in this area?
- How available are modern inputs (fertilizer, improved seeds) on the market? What supply and distribution channels exist for these? Is there competition between Government-sponsored input programs and private ones?

Other major constraints in this category that will need to be examined will include the system of property rights and land tenure that generally are biased against women, who make up a large part of the labor force in food agriculture. There is also access to credit and finance.

#### *6. Commercial Agriculture*

While smallholders dominate agriculture in Africa, the idea of private commercial agriculture is gaining traction as a result of opportunities for economies of scale associated with mechanization and marketing. There may also be possibilities to identify smallholders with an orientation towards commercial agriculture that would help them increase their labor and land productivity. Policy makers should look at the experience with commercial agriculture both in Africa and elsewhere and how successful experiences may be replicated. The key issues to be examined would include:

- Why commercial agriculture (in terms of area, mechanization, large-scale input use, etc.) has not evolved and what possibilities there are to introduce medium to large-scale commercial agriculture
- What the minimum size of a sustainable commercial farm should be and whether tracts of land are available to support such farms
- Whether there are specific crops that would be better suited to the commercial farming models that can be introduced
- The support that would be needed (inputs, mechanization, output markets, extension, etc.) especially if these types of farms are to be introduced in large numbers
- The possible role for smallholders with commercial farmer orientation, including some form of commercial agriculture for smallholders with 10 ha or less but get these farmers to produce exclusively for the market or for agro-processing
- If it is possible to get some type of small-holder commercial agriculture, what would be required to create this class of smallholder farmers (e.g availability of common services such as equipment leasing, input supply, contract with industry, contract with an exporter, etc.)

There may be different models of commercial agriculture that can be introduced depending on the country involved. In some countries, the multi-national model may be appropriate. In others, such as Ghana however, it may be more appropriate to start with medium scale farms.

#### *7. Agricultural Policy Reforms*

An important part of the agricultural transformation agenda would involve the impact of policy reforms meant to improve the incentives for farmers to increase production by reducing domestic market distortions. While policy reforms have had variable results across countries and crops, it would be important to look at reforms that improve the governance of the sector and how these can help the transformation process. Chances for success for some of the agricultural policy reforms are most of the time enhanced by general macro-economic and institutional reforms.

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