

Status, Drivers, and Trends of Food Security in Sub-Saharan Africa

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by

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ABSTRACT

Calories and nutrients are basic physiological human needs. Food security is therefore essential for creating healthy, happy communities. Sub-Saharan Africa has the highest prevalence of food insecurity of any major global region; the majority of the population experiences some degree of food insecurity, with approximately 30% of people experiencing severe food insecurity, and an additional 36% experiencing moderate food insecurity. Food security had been improving in Africa until 2014, but recent years have seen reduced agricultural yields due to effects of climate change, an increase in conflict in the region, and market disruption from the COVID-19 global pandemic, leading to more people becoming food insecure. Income is the strongest predictor of household food security, but other factors such as agricultural production, market integration, education, and gender also have an impact. Food security will be a challenge in Africa over the next century, due to climate change and a quickly-growing population.

BIOGRAPHICAL SKETCH

After graduating from American University in 2016 with a degree in International Studies, Aaron Langley served with the US Peace Corps in Tanzania as a community agriculture and nutrition volunteer. Stationed in the village of Mhezi in the Kilimanjaro region, he saw the powerful role that food security and agriculture have in determining people's opportunities and success in life. His projects in the village included speaking with farmers about biofortified crops for improved nutrition, collaborating with the local carpenters to establish a tree nursery, and working with local Non-Government Organizations to provide medical equipment for the local health clinic. After returning home he decided to pursue his MPS in Global Development, focusing on rural smallholders in Sub-Saharan Africa. He hopes his work will help to ensure that everyone has enough to eat, so that they can live to their fullest potential.

To all of the people working for a healthier, happier Africa

ACKNOWLEDGMENTS

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LIST OF ABBREVIATIONS

FAO	Food and Agriculture Organization
IFPRI	International Food policy Research Institute
IPCC	International Panel on Climate Change
NGO	Non-Government Organization
UN	United Nations
WHO	World Health Organization
SS Africa	Sub-Saharan Africa
SSA	Sub-Saharan Africa

Introduction

After improving consistently in most places around the world between the 1990's and 2013, food security worldwide has been declining since 2015 ([FAO, 2020](#)). The problem has been especially pronounced in Sub-Saharan Africa, where 70% of the people rely on their own smallholder farms as a primary source of livelihood ([World Economic Forum, 2016](#)). The Eastern and Central regions of the continent, which already struggled with the highest prevalence of food insecurity of any region even prior to the reversal, have been the hardest hit by the decline.

The goal of this essay is to provide a context of the state of African food security, the major factors which drive it, and to examine reasons for the recent deterioration. This essay therefore consists of three main parts: background concerning the definition of food security and global trends, analyzing the main drivers of household food security among smallholder farmers in Sub-Saharan Africa, and an investigation into the factors which are now causing more and more people to go hungry.

Background and Trends

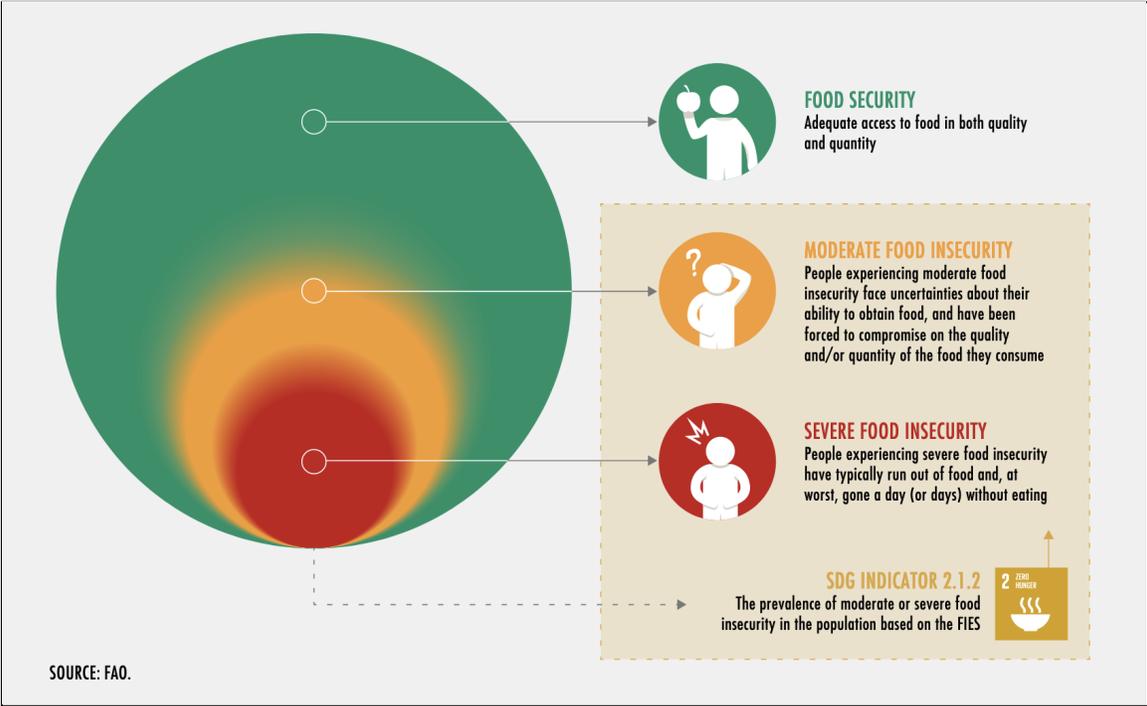
What is Food Security and Insecurity?

Before discussing the state of food insecurity in Sub-Saharan Africa and its causal factors, it is necessary to define what is meant by the phrases “food secure” and “insecure. According to the UN Food and Agriculture Organization, food security is defined as “when all people, at all times, have physical, social, and economic access to

sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life” (FAO, 2014). This definition was originally created and agreed upon by the UN Committee on World Food Security, and continues to stand as the benchmark for research in the field. Food *insecurity* therefore occurs when one or more of the above stipulations is not met.

While food security/insecurity is a binary status (a person is either food secure or they are food insecure), there are varying degrees of food insecurity (see Figure 1). Uncertainty and anxiety about access to food, even if food needs are ultimately met, is the mildest form of food insecurity. When a person is forced to compromise on the quality of their food, that person may be considered to be mildly food insecure. If a person is forced to consistently skip meals due to a lack of access to food, then that person is severely food insecure.

Figure 1: Food Security, Moderate Food Insecurity, and Severe Food Insecurity



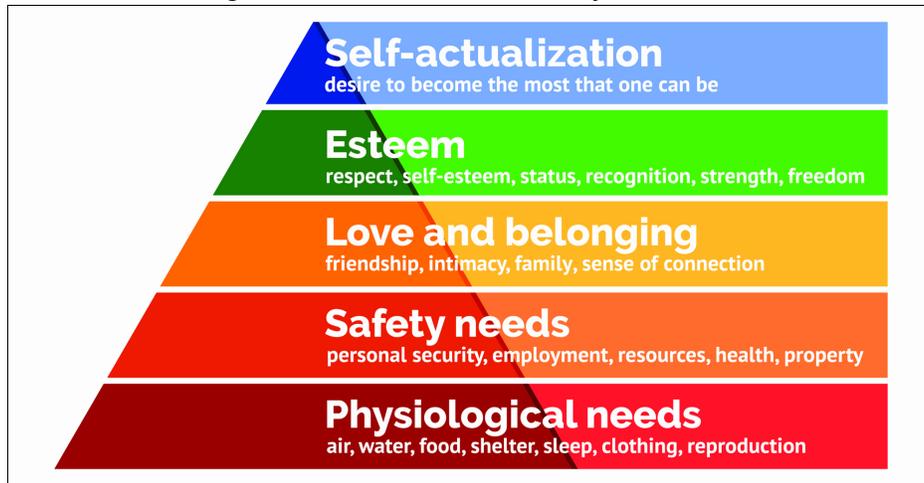
Source: [FAO, 2020](#)

Nutritional deficiency is a common consequence of food insecurity, and can have numerous and severe detrimental effects on a person's quality of life. Not everyone who is food insecure has a nutritional deficiency, and not everyone with a nutritional deficiency is food insecure, but the two are strongly correlated. Deficiencies are most dangerous when affecting young children. Even if children are receiving sufficient calories, their diet may be lacking in vital micronutrients which are essential for proper development. Different micronutrient deficiencies present in different ways as diseases and developmental disorders. In cases where pregnant mothers are malnourished, such deficiencies can begin to impact children even before birth. This type of malnourishment, undernutrition, is associated with 45% of child deaths ([WHO, 2021](#)). Some common illnesses associated with nutritional deficiencies include stunting (calories, protein, and zinc), impaired brain development (iodine), rickets (vitamin D), anemia (iron), and blindness or night blindness (vitamin A). These conditions can seriously limit a child's happiness and potential throughout their lives by making them more susceptible to illness and affecting their opportunities for enjoyment and livelihood.

Even when basic biophysical needs are being met, people experiencing moderate food insecurity may be forced to endure periods of discomfort due to hunger, sacrifice other essential needs like housing or sleep, and experience anxiety, all of which negatively impact their quality of life. Abraham Maslow's famous "hierarchy of needs" model, widely accepted by social scientists worldwide, states that food is one of the basic essential needs making up the bedrock for human self-actualization and happiness (See Figure 2). Without first achieving all of the needs on any given level, a

person can not fully focus on needs at the next level. In other words, without food, a person is stranded at the bottom.

Figure 2: Maslow's Hierarchy of Needs



Source of image: [McLeod, 2020](#)

The Pillars of Food Security

In order for an individual to be food secure, there are four criteria which must be met: availability, accessibility, utilization, and stability. Each pillar, as per the FAO definition, is detailed below ([FAO, 2006](#)):

Availability - “The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid)”

Accessibility - “Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights such as access to common resources).”

Utility - “Utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security.”

Stability - “To be food secure, a population, household or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.”

In the case of the first three, each criterion builds upon the one previous. Food can not be utilized if it is not accessible, and it can not be accessible if it is not available.

Stability, the fourth pillar, requires that all of these criteria be met regardless of changes in season, weather, financial status, etc. Food security can be achieved only when all four criteria are met.

Trends in Food Security Globally, and in Sub-Saharan Africa

Of the approximately 928 million people around the world estimated to be severely food insecure as of 2020, a disproportionately high number are located in Sub-Saharan Africa ([FAO, 2020](#)). 928 million people, put another way, is 11.9% of the global population, or 1 in every 9 people. In Sub-Saharan Africa though, the percentage who qualify as severely food insecure rockets to 29.5%, almost 1 in every 3 ([FAO, 2020](#)). If we include mild food insecurity, we see that 66%, two thirds, of households in

Sub-Saharan Africa are mildly or severely food insecure, compared to the global average of 30% (See Table 1) ([FAO, 2020](#)).

Table 1: Prevalence of Food Insecurity Globally, in Africa, and Regionally within Africa

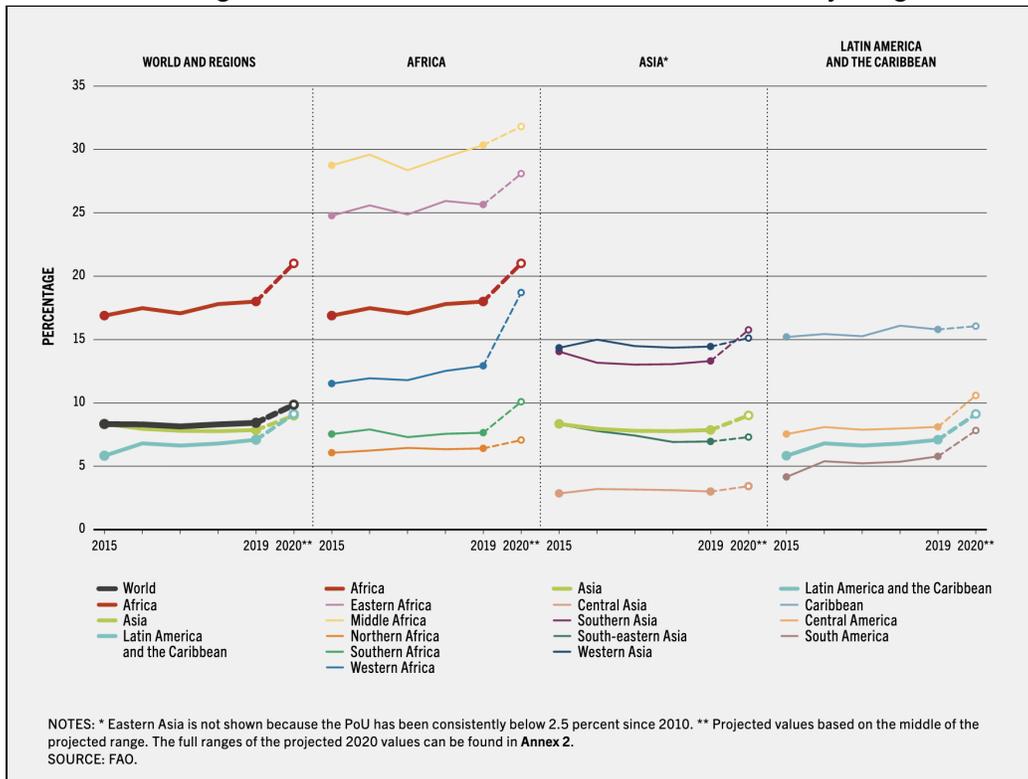
	Prevalence of severe food insecurity (%)							Prevalence of moderate or severe food insecurity (%)						
	2014	2015	2016	2017	2018	2019	2020	2014	2015	2016	2017	2018	2019	2020
WORLD	8.3	8.1	8.3	8.7	9.6	10.1	11.9	22.6	22.8	23.6	24.9	25.9	26.6	30.4
AFRICA	17.7	18.3	19.8	20.5	20.6	21.9	25.9	47.3	48.0	50.9	52.5	52.7	54.2	59.6
Northern Africa	10.2	9.0	10.4	10.6	9.3	8.8	9.5	29.7	26.4	30.0	33.1	31.1	28.9	30.2
Sub-Saharan Africa	19.4	20.4	22.0	22.7	23.2	24.9	29.5	51.4	53.0	55.8	57.0	57.6	59.9	66.2
Eastern Africa	23.7	24.1	25.8	25.3	25.0	26.0	28.7	57.7	58.1	62.2	62.1	61.6	63.4	65.3
Middle Africa	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	35.8	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	70.0
Southern Africa	18.9	18.9	19.0	19.0	19.1	19.2	22.7	43.8	43.9	44.0	44.1	44.2	44.3	49.7
Western Africa	8.6	10.8	12.9	15.3	16.8	19.6	28.8	39.2	42.8	45.5	48.7	50.6	54.2	68.3

Source: [FAO, 2020](#)

Within Sub-Saharan Africa, the subregions of Central and East Africa stand out in particular as having very high prevalences of food insecurity. Central Africa has, by far, the highest prevalence of undernourished people of any region in the world, with over 30% of the population lacking the proper nutrition for basic health and development (see Figure 3). East Africa fares slightly better, but still has an undernourishment rate of about 25%. No other part of the world comes close to these rates. They are anomalies even on their own continent. West Africa's undernutrition rate of 13% is worse than the global average of 9%, but still comparable to some regions of Asia and the Americas. Meanwhile, Southern and Northern Africa actually score even better than the global average, at about 8% and 7% respectively.

While some individual countries may experience similar or worse rates of severe food insecurity during times of famine or war (eg: Yemen, Syria), Central and East Africa are the only two regions of the world where such a prevalence of undernutrition and food security has been sustained consistently for decades.

Figure 3: Prevalence of Undernourishment, By Region



Source: [FAO, 2020](#)

The scale of the problem has been growing over the last several years. After slow but steady improvements in food security worldwide between 2000 and 2014 ([FAO, 2014](#)), most areas are now experiencing a backslide. Globally, between 2015 and 2019, severe food insecurity rose an average of 0.5%, or approximately 38 million people each year¹ ([FAO, 2020](#)). In Sub-Saharan Africa, the problem has been growing even faster. After seeing progress from the 1990's-2014 ([FAO, 2014](#)), severe food insecurity has increased by an average of 1.1% per year from 2014-2019² ([FAO, 2020](#)).

¹ Though available, 2020 data has been omitted from this average due to its being a statistical outlier as result of the COVID-19 pandemic

² Though available, 2020 data has been omitted from this average due to its being a statistical outlier as result of the COVID-19 pandemic

Drivers of Food Security

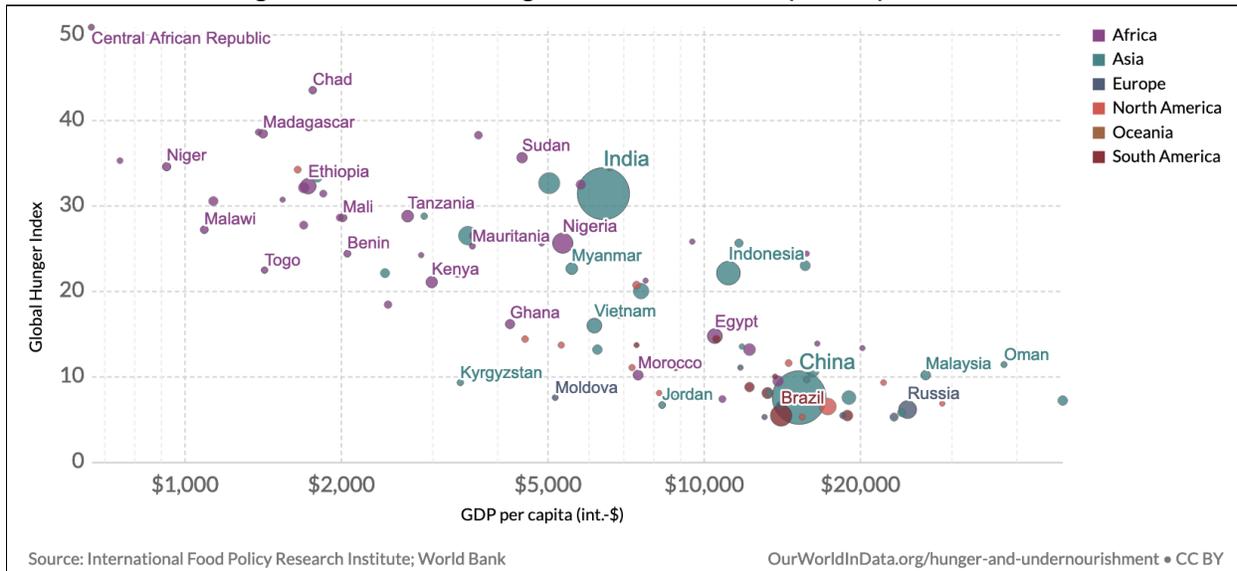
The factors affecting food security are numerous, and vary in magnitude between households and regions. Many of the drivers identified are themselves affected by other drivers, and may interact to create reinforcing vicious or virtuous cycles. This paper provides an analysis of the variables with the most drastic impacts, but there are many more variables that could be investigated.

Income

Income is the strongest predictor of household food security, at both the macro (country) and micro (individual or household) levels. Most food insecurity in the world is associated with chronic poverty ([Barrett, 2010](#)). As a general trend at the macro level, the lower a nation's GDP per capita, the greater its issues with food insecurity (see Figure 4 below). The world's lowest-income countries, overwhelmingly located in Sub-Saharan Africa (shown in purple), also have the lowest food security. Higher-income countries have relatively little food insecurity, and middle-income countries rank between the low and high-income countries.

Income, however, is not the only factor which affects food security, as evidenced by the fact that even within Figure 4 there are countries which enjoy greater food security than their higher-income counterparts, and vice-versa. For example, Tanzania scores better on food security than Sudan, despite a lower GDP per capita.

Figure 4: Global Hunger Index vs. GDP per capita, 2017



Source: [Our World in Data: Synthesis of IFPRI 2017 and World Bank 2017 Data](#)

At the micro, or household level, numerous studies have similarly found that off-farm income has a strong positive association with food security in rural areas ([Dzanku, 2019](#)). A study of over 13,000 households across 17 countries in SSA found that, on average, off-farm income accounted for 27% of income in food secure households, versus only 12% of income for food insecure households ([Frelat et al., 2015](#)). Factors which affect households' earning potential, such as level of education and market integration, therefore also strongly impact food security. A survey in Ethiopia found that households in which the household head had received formal education were 39% less likely to experience food insecurity than houses in which the head had received no formal education ([Hassen et al., 2016](#)). Diversifying sources of household income so as not to “put all the eggs in one basket” has also been shown to improve

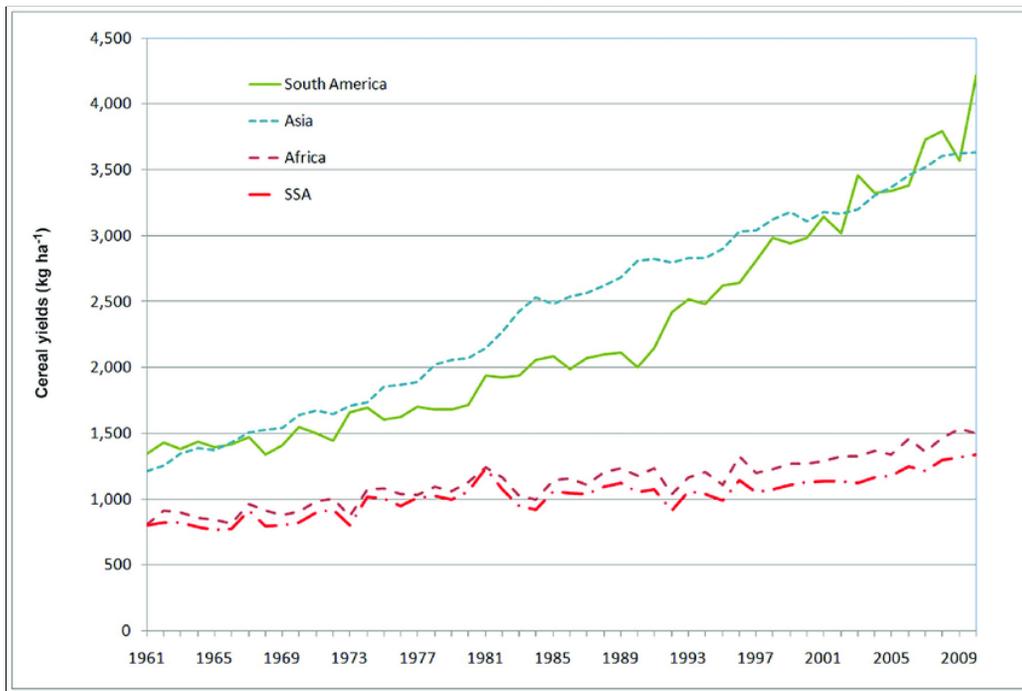
food security. Even if one income source is interrupted, others remain, ensuring that the household still has at least some income with which to get by ([Silvestri et al., 2015](#)).

Production & Yield

Crop production and yield are a highly important factor contributing to food security. Production refers to the amount produced, while yield refers to how much is produced in a given area. They are major determinants of food availability, which is the first pillar of food security. Put simply, if not enough food is produced then people will go hungry.

Yield is affected by many variables, such as access to inputs, water availability, pest and disease prevalence, weeds, soil suitability, climate and weather, and farmer knowledge. Farms in Sub-Saharan Africa have very low cereal yields relative to the rest of the world for various reasons, including low water availability, lack of irrigation, reliance on hand-labor, and difficulty accessing inputs ([Thomas, 2020](#)). Yields have been increasing slowly in SSA in spite of these challenges, but have not increased at nearly the rates enjoyed by farmers in other regions of the world (See Figure 5). Many experts speculate that this is due to an agricultural cycle of poverty; smallholder farmers rarely create surplus, and so have little extra money to invest in inputs or equipment which would make their farm more productive ([Oluwatayo & Ojo, 2016](#)).

Figure 5: Cereal Yields in Africa, SS Africa, Asia, and South America, 1961-2009



Source: [van der Velde, et al., 2013](#)

Farm production is an equation of yield multiplied by area. It is therefore unsurprising that larger farm size is closely associated with higher farm productivity ([Jayne, 2003](#)). Despite the proven link between farm size and productivity, it is estimated that 70–80% of farms in SSA are less than two hectares in size ([Lowder et al., 2016](#)). Studies also show that average farm size in SSA is shrinking as the region experiences a boom in population and more people must share the same amount of land ([Abay et al., 2020](#); [Aspen Institute, 2012](#)). Similar to farm size, among farmers with livestock, productivity has a direct positive association with the number of animals ([Fraval et al., 2019](#)).

Low yields on already small plots means little food to eat and sell. This is a major reason for poverty and food insecurity among Sub-Saharan Africa's farmers ([Dixon et al., 2001](#)).

Even if farmers are successful in raising yields, doing so over a small area means that the absolute increase in production remains constrained by farm size:

“While technologies already exist that can raise smallholder farmers' yields 3 or 4 times, even under rainfed conditions, the small size of land available to them limits how much can be grown and the per capita income from agriculture is insufficient to allow people to move above the current World Bank-defined poverty line of US\$1.90 per day” ([Gassner et al., 2019](#)).

This is not to suggest that yield improvement is not a worthwhile endeavor, only to state that yield increases alone are likely not enough to achieve food security.

Food Price

The value of food can rise and fall for a host of reasons including seasonal availability and market integration, which will each be examined individually later in this essay, as well as production, demand, and oil prices, to name a few. The cost of food has a strong inverse correlation with food security, with poor households being the most-affected by price increases ([FAO, 2008](#)). Despite the majority of poor farm households producing their own food, these households are still usually net food buyers, as they rarely produce enough food on their own ([FAO, 2008](#)). When prices rise, families tend to sacrifice on both quality and quantity of food ([Fyles and Madramootoo, 2016](#)).

Peace or Conflict

Armed conflict has a strong negative association with food insecurity. Of the estimated 815 million people who suffered from chronic malnutrition in 2016, 60% lived in areas affected by armed conflict ([National Geographic, 2019](#)). The UN Food and Agriculture Organization reported a similar finding, that more than half of food emergencies in Africa were created by civil conflict and displacement due to conflict ([FAO, 2006](#)), and the International Food Policy Research Institute found that 65% of all stunted children worldwide are located in countries affected by conflict ([IFPRI, 2015](#)). Many of the most hunger-affected areas in the world currently are located in war zones (eg: Yemen, Syria, Ethiopia).

Fighting leads to hunger in two major ways. The primary avenue by which combat causes hunger is through displacement. As people flee for safety, they are forced to leave behind farmland, which many rely upon for food, and valuables which could otherwise help them afford to buy food ([IFPRI, 2015](#)). If they leave their house and do not have another one to go to, families may also be forced to make the terrible choice of whether to spend their money on food or other necessities.

The second avenue by which warfare commonly leads to food insecurity is through the disruption of markets and supply chains. As civilians flee, farms may go untended, and transporting goods for sale frequently becomes difficult or impossible due to roadblocks or fear of violence ([IFPRI, 2015](#)). Investors and tourists avoid areas of violence, reducing economic opportunities for civilians who choose to stay. As the economy contracts, those civilians whose incomes have been affected often become

food insecure. Additionally, an army may co-opt supply chains for their own military benefit, intentionally or inadvertently diverting resources away from civilians. Hunger itself can also be used as a weapon, and armies may destroy farms, food production facilities, and supply chain infrastructure as a tactic to weaken enemy forces, cutting off food for civilians in the process ([National Geographic, 2019](#)).

In some instances, food insecurity can actually be the precursor to conflict, which can then lead to further deterioration of food security. The French Revolution and Arab Spring protests both were famously sparked by soaring bread prices. In each case, long-simmering social unrest was finally brought to a boil by soaring food costs, leading to civil unrest and widespread fighting ([National Geographic, 2019](#)).

Disease

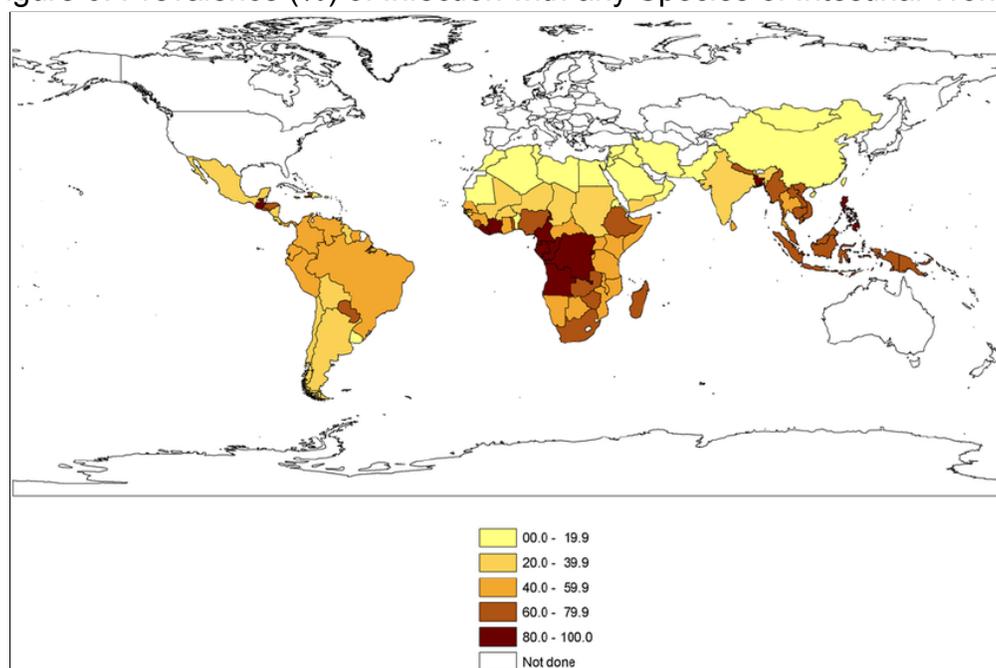
Diseases contribute to food insecurity in several ways: causing school absenteeism ([Miguel & Kremer, 2016](#)) which affects future earning potential, reducing productivity ([Fink & Masiye, 2015](#); [Anema et al., 2009](#)), and by causing or exacerbating malnutrition through inhibiting nutrient absorption ([Loukas et al., 2016](#)). Notable illnesses include malaria, HIV/AIDS, and intestinal parasites. An analysis of the impact of HIV/AIDS on food security in SSA states:

“The impact of HIV/AIDS on food insecurity has been well-documented in Africa and manifests through the debilitation of the most productive household members, decreased household economic capacity, decreased household agricultural output, and increased caregiver burden” ([Anema et al., 2009](#)).

While this passage refers to HIV/AIDS specifically, these negative impacts can hold equally true for other illnesses. A study in Zambia found that farmers who were given access to free bed nets to protect from mosquito-borne illness missed fewer workdays, increasing their yearly income by nearly 15% ([Fink & Masiye, 2015](#)).

Intestinal worms (roundworms, hookworms, whipworms, and schistosomiasis) are of particular note due to their prevalence and disproportionate impact on young children. As of 2009, it was estimated that as many as half of all people living in developing countries suffer from infection of one or more species of intestinal worms ([Hall et al., 2009](#)). Of these infected individuals, the majority are located in Central and West Africa, affecting more than 80% of the population in some regions (see Figure 6).

Figure 6: Prevalence (%) of Infection with any Species of Intestinal Worms



Source: [Hall et al., 2009](#)

Worms colonize in the intestines where their presence can lead to inflammation and bleeding, reducing the body's ability to absorb nutrients, and losing some nutrients like

iron through blood loss ([Loukas et al., 2016](#)). Children are the most likely to be infected, and a study in Kenya found that deworming schoolchildren resulted in a 25% improvement in class attendance ([Miguel & Kremer, 2016](#)). According to Planting Peace, an NGO, large-scale periodic deworming is the most cost-effective means of combating malnutrition ([Planting Peace, 2021](#)).

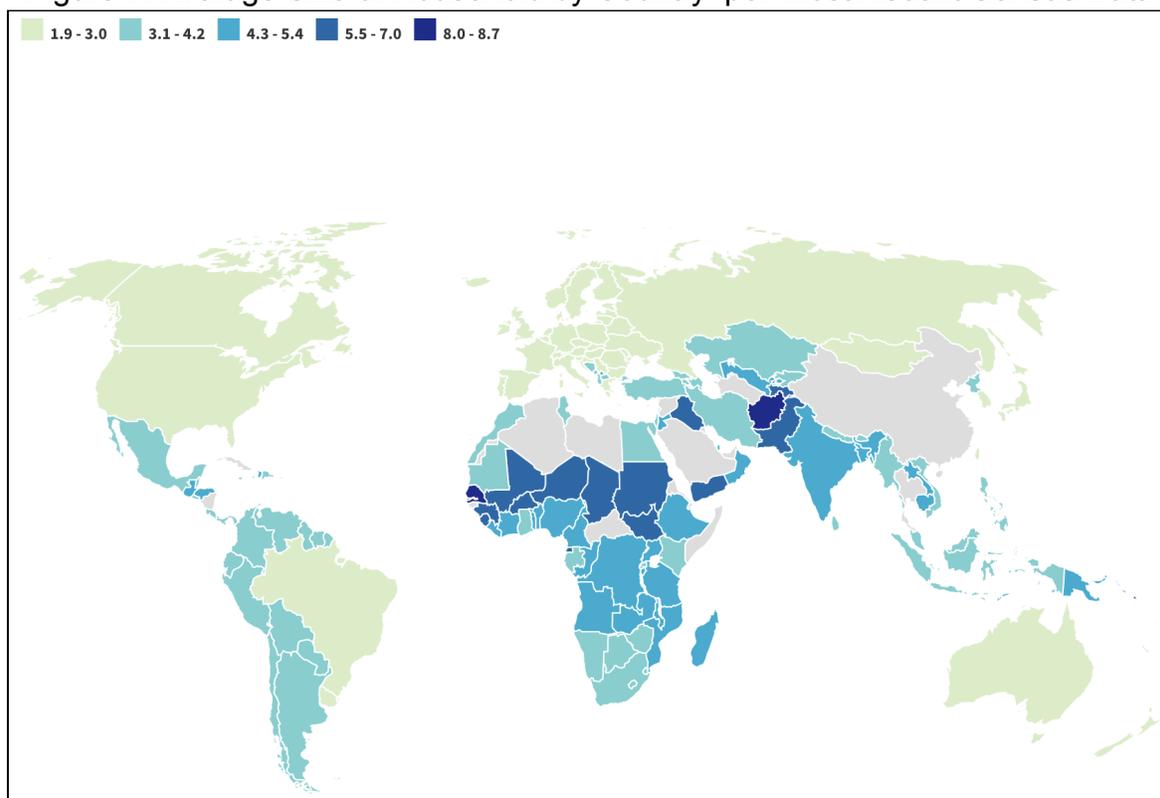
Household Size

Studies have shown that the number of people in a household has a significant negative correlation with household food security ([Silvestri et al., 2015](#); [Frelat et al., 2016](#)). As the number of people in the house increases, food security decreases. A study of 600 households across three countries in East Africa found that households which were food secure had fewer people on average than households which experienced food insecurity. Food secure households averaged 4.5 members, while food insecure houses averaged 5.8 ([Silvestri et al., 2015](#)). Households have finite resources, and as more people are forced to share the same resources each individual necessarily must receive less ([Silvestri et al., 2015](#)). This is especially true for households with many young children, who require resources, but are not yet capable of contributing much for the household.

Birth rates across Africa are high compared to most wealthy countries for a multitude of reasons, including culture, religious beliefs, gender relations, the need for household farm labor, and low child survival rates ([Bakilana & Hasan, 2016](#)). Sahelian countries have a particularly high average household size compared to most other

countries (see Figure 7), owing largely to the fact that in this region having a big family is considered a source of prestige ([Bakilana & Hasan, 2016](#)).

Figure 7: Average Size of Household by Country per Most Recent Census Data



Source: [Population Reference Bureau, 2021](#)

Market Integration

A major factor affecting access to food is access to markets. Most people rely on markets as the source for at least some of their food, and selling at markets also serves as a source of income. It is estimated that only 4% of farming households in SSA do not sell any of the products from their farm ([Frelat et al., 2016](#)). Markets also provide farmers with agricultural inputs like fertilizers and pesticides, without which farm yields would suffer greatly. For all of these reasons, people who have difficulty reaching

marketplaces are more likely to be food insecure. Despite the critical role that market integration plays in food security, only 25% of farmers in Sub-Saharan Africa live within 2 hours of a market if travelling by motorized transport, which most lack ([Smale et al., 2011](#)). Asia, by comparison, has nearly half its population within two hours of a market, and a higher percentage of people who own some kind of vehicle ([Smale et al., 2011](#)).

Integration of markets between other markets is also a key driver of food prices, another factor which affects food accessibility. The Law of One Price in economics states that, in a frictionless market (ie: no transport costs, tariffs, etc.), identical goods will have the same price globally. Markets in real life though are not frictionless, and some markets experience much more “friction” than others. Factors such as road length and quality, tariffs, fuel costs, travel time, driver wages, etc, affect the cost of transporting food between selling points. The higher the cost to deliver food to the consumer, the higher the price that will be demanded of that consumer. Sub-Saharan Africa’s population is extremely spread out, and only a third of people living in rural areas have access to all-season roads ([Wilson Center, 2010](#)). These roads are often unpaved or in poor condition. Market integration in SSA is therefore extremely weak. A study in Eastern and Central Africa found that a distance of 298 kilometers between cities (the average distance between towns in the sample) accounted for an average price increase of 42% ([Brenton et al., 2014](#)). The study concluded that road length, quality, and border tariffs have a significant negative impact on market integration in the region, driving up food prices. Frelat et al. conclude that improving market integration and opportunities for off-farm income is a better strategy for alleviating poverty than

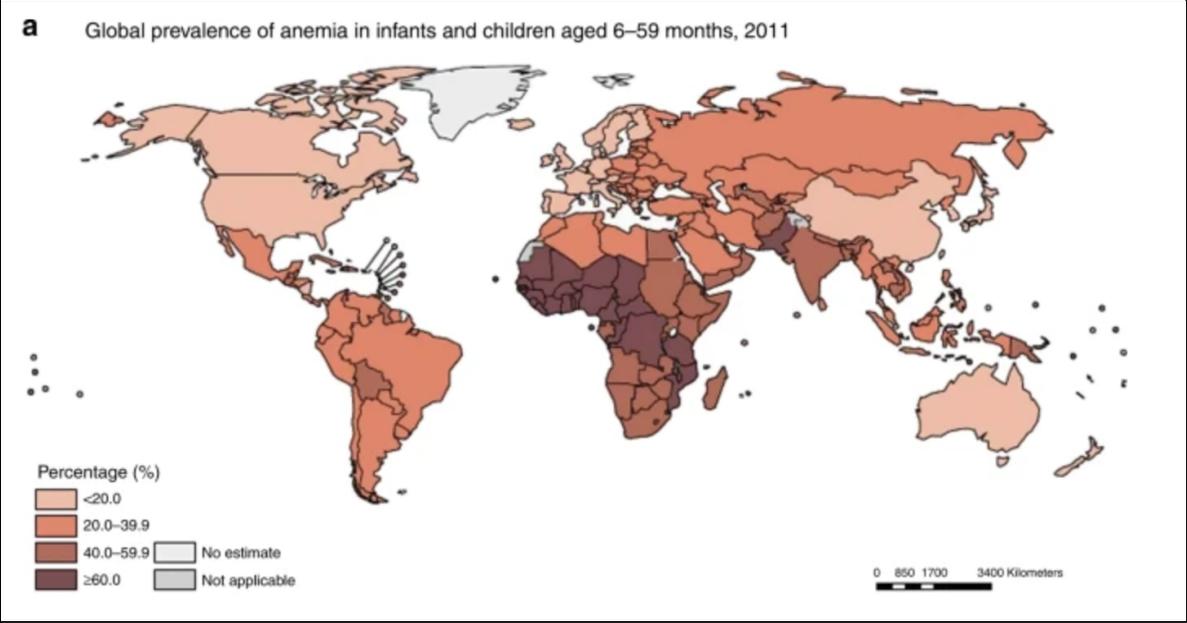
focusing on reducing yield gaps ([Frelat et al., 2016](#)).

Preparation and Cooking Methods

A major, often underappreciated, driver of food insecurity is food being prepared in ways that reduce nutrient availability. In some cases, households may have enough food and dietary diversity to meet their basic nutritional needs, but still suffer from malnutrition because the food was prepared in a way that made significant quantities of the nutrients non-available.

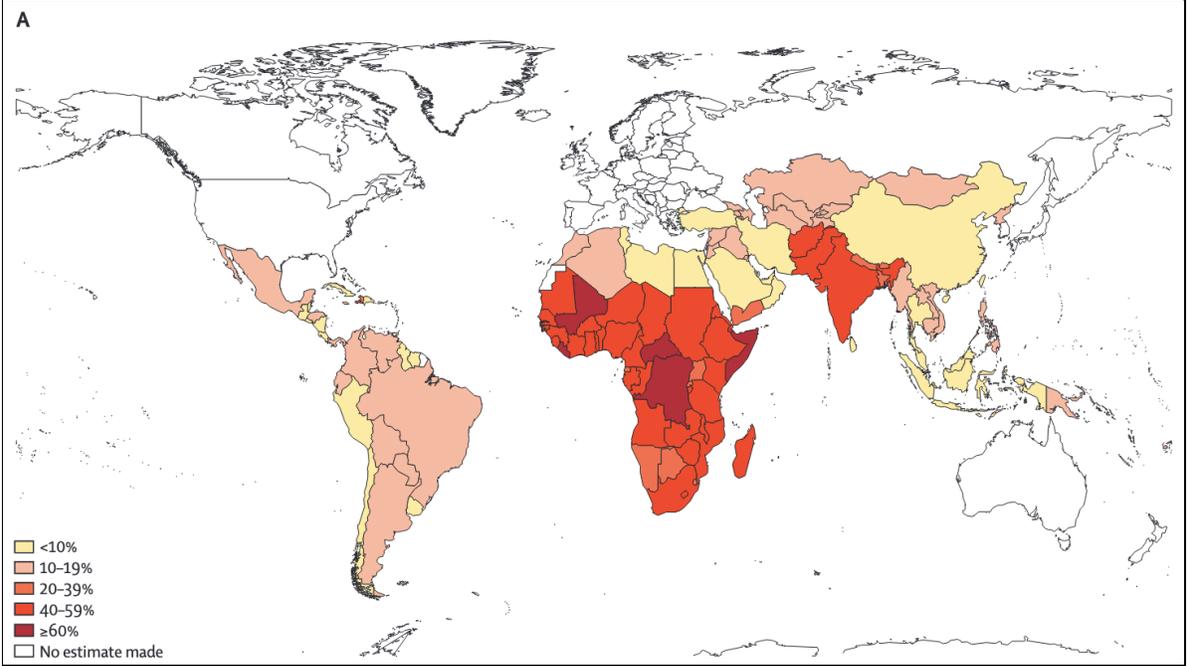
The two most common micronutrient deficiencies in Sub-Saharan Africa are for iron and vitamin A, especially among women and children ([WHO, 2021](#)). In Tanzania, for example, 65% of children under 5 are estimated to have deficient levels of iron, and about 40% are deficient in vitamin A (See Figures 8 and 9 below) ([Oluoch et al., 2012](#)). This is despite the fact that many African indigenous vegetables naturally contain high levels of both beta carotenes (which the body metabolizes to create vitamin A) and iron, in addition to other important nutrients. Some of these commonly-used vegetables include African eggplant, cassava leaves, sweet potato leaves, pumpkin leaves, African nightshade, cowpea leaves, jute mallow, and amaranth ([Oluoch et al., 2012](#)) ([Lyimo et al., 1991](#)).

Figure 8: Prevalence of Iron Deficiency Among Children Aged 6-59 Months, circa 2011



Source: [Sundararajan & Rabe, 2020](#)

Figure 9: Prevalence of Vitamin A Deficiency Among Children 6-59 Months, circa 2013



Source: [Stevens et al., 2015](#)

A study in Tanzania found that the predominant preparation method for cassava and pumpkin leaves, which involved boiling for long periods of time, resulted in

“significant losses in protein, fats, and vitamins” ([Lyimo et al., 1991](#)). Traditional sun drying methods for the same foods also substantially reduced the availability of vitamin A, by about 37% in each case, as carotenoids are sensitive to light ([Lyimo et al., 1991](#)).

Methods to retain these nutrients vary by crop and preparation style. For green vegetables that are traditionally prepared by long boiling, it is recommended to instead steam, or fry with oil. These methods better retain the carotenoids and iron, and in some cases can actually increase the bioavailability of carotenoids to higher rates than if the vegetable were eaten raw ([Oluoch et al., 2012](#)). If boiling, it is recommended to boil only for a few minutes, and to also consume the cooking water, as the water contains nutrients leached from the vegetables during the cooking process. When drying food, it is recommended to do so using an oven at low temperatures or a solar cabinet dryer ([Lyimo et al., 1991](#)).

A household following these best practices may still be malnourished or food insecure. However, these methods are valuable because, while other factors of food security such as food prices and availability are usually not up to the individual, preparation methods are an aspect over which households have control. Armed with this knowledge, cooks can make the most of what food they do have.

Crop Selection

Crop diversity and varieties can have a significant effect on household food security and nutrition. Studies show a positive correlation between crop diversity and household food security ([Silvestri et al., 2015](#)). Growing and consuming many different kinds of food ensures that households are incorporating a wide range of nutrients,

decreasing the risk of deficiency. Crop diversification can also help shield households from hunger in the event of crop failure; even if one crop dies, the household may still be able to rely on the others.

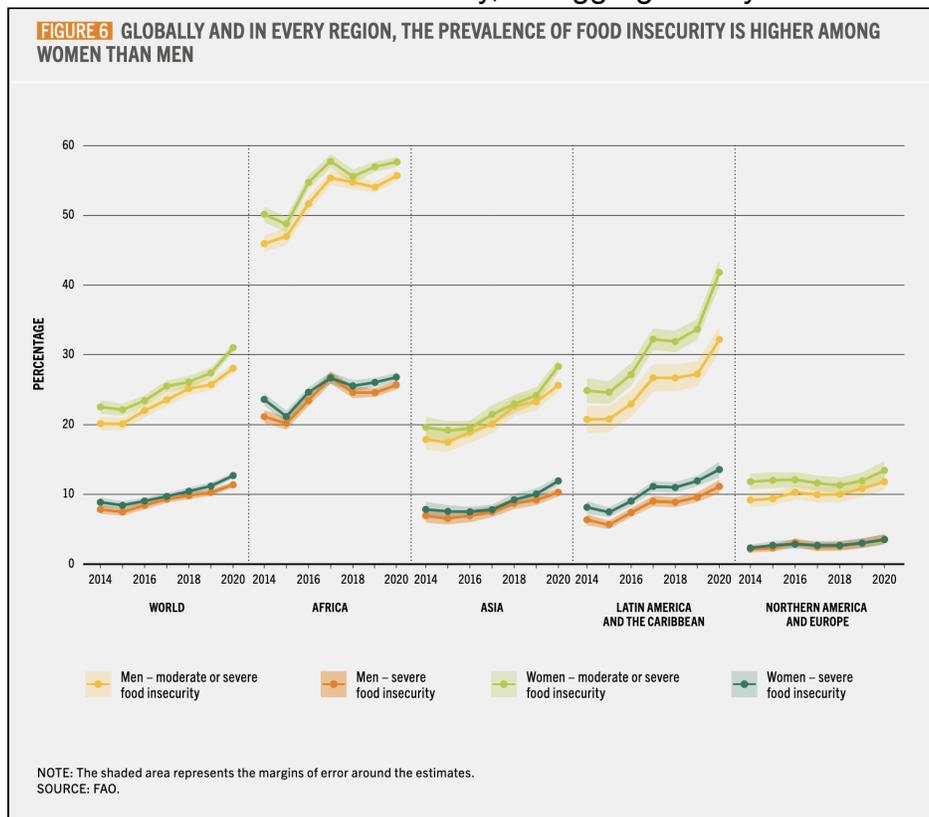
In addition to crop diversity, farmers should give serious consideration to what varieties they are planting. Yield and nutritional content can differ significantly even between different varieties of the same crop. Maize, the most-consumed crop in Sub-Saharan Africa, is a prime example. Modern hybrid maize varieties can offer farmers many advantages: greater yield per hectare, higher tolerance for drought, pest resistance, and faster ripening. But as of 2007 it was estimated that improved hybrid maize varieties accounted for just 60% of area under cultivation for maize in Central and West Africa, and just 44% of maize farming in East and Southern Africa ([Smale et al., 2011](#)).

A similar missed opportunity exists with consideration to biofortified crop varieties, which can contain far more nutrients than their conventional alternatives. For example, orange-fleshed sweet potato is an excellent source of vitamin A, a deficiency which affects roughly 40% of young children in SSA ([Oluoch et al., 2012](#)). Nonetheless, uptake has been slow, and the vast majority of sweet potato growers continue to use traditional white varieties with little to no vitamin A ([Low & Thiele, 2020](#)). Other biofortified staples include high-vitamin-A cassava and maize, and high-iron beans, which, if widely adopted, could help to significantly reduce the prevalence of the two most common nutritional deficiencies in Africa.

Gender

There is evidence that gender can play a significant role in affecting food security, though results and hypotheses as to why vary between studies and regions. Globally, women are slightly more likely to experience food insecurity than men (FAO, 2020). This trend holds true in Africa, though the disparity in food security between genders is not as large as in other regions (see Figure 10 below). Even within Africa, trends vary between regions. In Ghana, for example, studies found no significant difference in food security between genders, while in Tanzania there was a clear disparity (FAO, 2020).

Figure 10: Prevalence of Food Insecurity, Disaggregated by Gender circa 2020



Source: [FAO, 2020](#)

This inequality between genders is thought to stem from cultural norms and gender biases limiting women’s ability to have their own bank accounts, own land,

receive financial services like loans, negotiate with suppliers, and access inputs ([Oxford Business Group, 2021](#)). A study in Uganda found that male farmers used almost ten times as much fertilizer per acre compared to female farmers in the same area, providing strong evidence that female farmers may have more difficulty than male farmers in accessing inputs ([Oxford Business Group, 2021](#)). Another study across Zambia, Kenya, and Ethiopia, found that households headed by an unmarried female had, on average, 1.05, 1.03, and 0.25 hectares less land than households headed by men ([Jayne, 2003](#)). As previously discussed, smaller farm size is linked to higher likelihood of food insecurity.

When not limited by the unequal access to resources described above, there is evidence to suggest that households with a female household head may have greater food security on average than male-headed households. A study of rural households in East Africa (Uganda, Kenya, and Tanzania) linked higher crop diversity to better food security, and noted that women-headed households planted a wider variety of food crops, while male-headed households more frequently focused on cash crops ([Silvestri et al., 2015](#)). A study in Ethiopia found that households in which the husband was responsible for food purchases were more than twice as likely to experience food insecurity compared with households in which women were the primary purchasers ([Hassen et al., 2019](#)).

Seasonality

Stability is the fourth pillar of food security. But food security and insecurity frequently fluctuate in synchronization with agricultural seasons. In areas with only one

major annual harvest, the “hunger season” typically occurs in the pre-harvest window when reserves from the last harvest are running low or completely gone, but the new harvest is not yet ready for consumption ([Rogawski McQuade et al., 2019](#)).

This seasonality affects everyone, not just farmers who rely on their own crops. The time of year dictates job opportunities for agricultural workers, and seasonality has a significant impact on food prices for the general public. A study among farm workers in South Africa found that severe food insecurity increased by 39% during the hunger season relative to the post-harvest period ([Devereux & Tavener-Smith, 2019](#)). Another study which analyzed food prices across multiple countries in Southern Africa found that prices for maize, the most calorically important staple crop in Africa, increased by an average of 33% in the period between the post-harvest and hunger season, and rice prices rose by 16.5%. ([Giwa and Choga, 2020](#)). Fruits and vegetables, which contain essential nutrients but are difficult to preserve, saw the largest price increases (61% for tomatoes), while foods which are produced year-round saw little to no change in price ([Gilbert et al., 2017](#)). Higher prices in the lean season are linked to lower food consumption and higher prevalence of food insecurity ([Brander et al., 2021](#))([Devereux & Tavener-Smith, 2019](#)).

Two phenomena which have significant effect on seasonal price changes are climate/weather (as discussed earlier in this essay) and food spoilage. Crops may be abundant or scarce depending on the season’s growing conditions. Spoilage though is a consistent factor which is largely responsible for the drastic increase in prices during the lean season. In its report on Sub-Saharan Africa, the UN Food and Agriculture

Organization states:

“Post-harvest losses can reach up to 20% for cereals, 30% for dairy and fish, and 40% for fruit and vegetables. Much of this loss happens because of a lack of technology, limited knowledge in supply chains, limited access to markets, poor infrastructure and inadequate financing.” ([FAO, 2018](#)).

Spoilage compels farmers to sell off significant amounts of their food stock even when they know they will go hungry later in the year. Spoilage often degrades the crops' value faster than seasonal pricing causes it to increase. Farmers therefore sell early at lower prices in order to have at least some money for the future, rather than wait for the harvest to spoil and lose value.

If it could be saved, SSA's wasted food would be enough to feed 48 million people ([FAO, 2018](#)). Some waste could only be reduced through significant investment in infrastructure, such as cold storage and road construction/repair for reduced travel times. Some of it though, most notably cereals, could be relatively cheap to preserve by educating farmers on how to treat their harvest to prevent mold and insects, and implementing programs to provide better storage containers such as PICS (Purdue Improved Crop Storage) bags ([Brander et al., 2021](#)). Reduced spoilage would lead to better food security for the farming families who produce the food, as well as the general public, for whom seasonal price fluctuations would likewise be reduced.

Education

The primary avenue by which education leads to higher food security is through enabling those who are better-educated to earn a higher income ([Wanka & Rena, 2019](#))

([Botha, 2010](#)). A study in South Africa found that for each additional stage of schooling (primary, secondary, higher education) completed by a household head, the chances of household poverty dropped by approximately 10% ([Botha, 2010](#)). More education is linked with more income, and, as discussed previously, income is the strongest predictor of household food security.

However, studies show that even when controlling for income, higher levels of education have a small but statistically significant positive impact on food security. One study in Kenya which calculated the average number of school years per household found that the probability of a household being food insecure decreased by 1.9% for each additional year of school ([Mutisya et al., 2016](#)). They hypothesize that more-educated individuals have better access and literacy with regard to agricultural best practices, nutrition, sanitation, and better business acumen ([Mutisya et al., 2016](#)).

Reasons Behind Africa's Food Security Decline and Predictions for the Future

COVID-19

The effects of the COVID-19 pandemic on food security have been so drastic that it would be remiss not to lead with them. Since its beginning in December 2019, the COVID-19 global health crisis has disrupted the lives and livelihoods of virtually everyone on Earth, either directly by threatening their income, or indirectly by disturbing global supply chains and markets. The International Food Policy Research Institute has called COVID-19 the “largest disruption of livelihoods in human history” ([IFPRI, 2020](#)).

The health crisis has had such a precipitous and deleterious effect on food security that 2020 must be acknowledged as a statistical outlier when analyzing trends in data.

From 2015-2019, severe food security was increasing globally at an average rate of 0.5% per year ([FAO, 2020](#)). Through 2020 alone, during the pandemic, severe food insecurity increased by 1.8% ([FAO, 2020](#)). From 2014-2019, pre-pandemic, severe food insecurity was increasing in Sub-Saharan Africa at an average rate of 1.1% per year. During the pandemic, the rate more than quadrupled, increasing by 4.6% ([FAO, 2020](#)).

The Joint Data Center on Forced Displacement estimates that between 88 million to 115 million people were pushed into extreme poverty in 2020 as a result of the COVID-19-induced recession ([Joint Data Center, 2020](#)). After losing their income, many families have been forced to make hard decisions about how to spend, and *not* to spend, what money they have. Some financial coping strategies have included not sending a child to school, borrowing money, and not paying rent or debt, but the most common strategy has been reducing spending on food. According to surveys conducted by the United Nations High Council on Refugees, an estimated 51% of the families pushed into extreme poverty in 2020 reduced spending on food as a coping strategy.

Economies are expected to recover once vaccines become available worldwide, as they have already begun to do in some countries with high rates of vaccination. However, much remains unknown, including when vaccines might become widely available for everyone, the timeline for recovery, and if those whose livelihoods were affected will return to the same lines of work.

Climate Change

As established earlier in this essay, yield and seasonality have strong influences on food security. Together these two factors impact three of the four pillars of food security: availability (by partially dictating how much food is usable at any given time), accessibility (by affecting prices), and stability (due to seasonal food scarcity and price spikes). Now, as a result of climate change, yields are expected to fall and seasonal food and water shortages are expected to be exacerbated. Agricultural producers in most areas will experience higher heat, less available water, more extreme weather events, and changing growing seasons. A 2017 UN report stated that warmer and more unpredictable weather due to climate change, in combination with an especially bad harvest due to the El Niño weather phenomenon, was one of the factors that caused food security in SSA to decrease from 2015-2016 ([UN, 2017](#)).

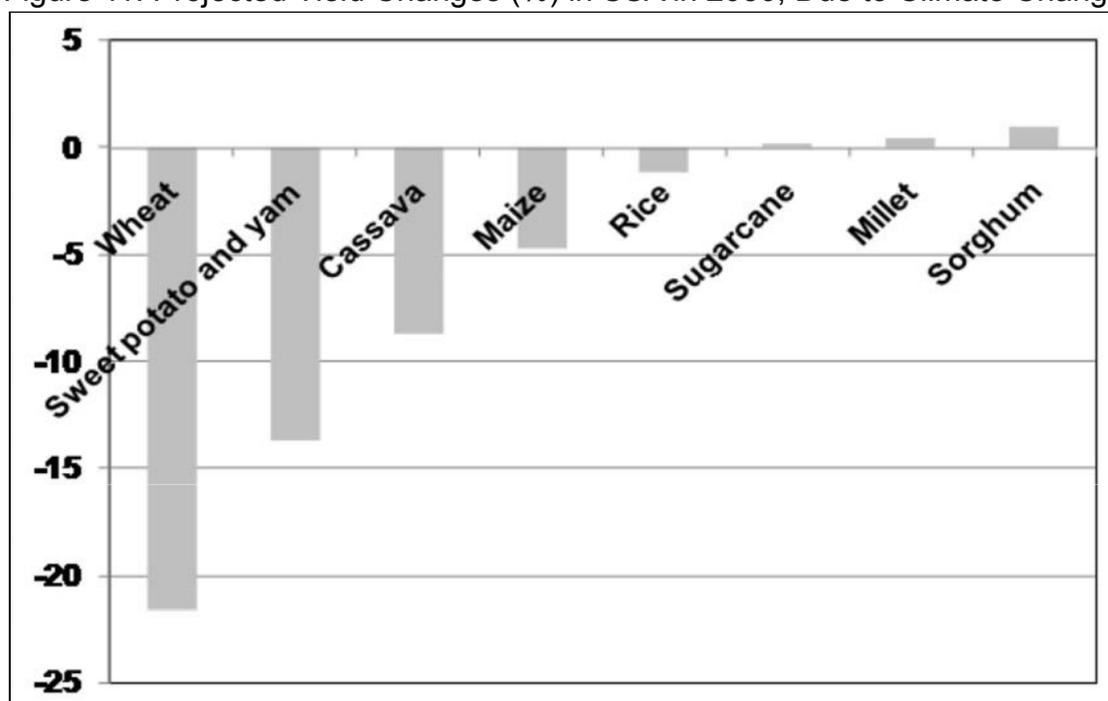
As global average temperatures rise, most areas worldwide are expected to see diminished yields. As higher heat evaporates greater volumes of water from lakes and other water sources and weather becomes more unpredictable, farmers will increasingly struggle to cope with drought and deluge. According to the Oxford Business Group, “the frequency of climate shocks – extreme weather events causing food production declines of 2.5% or more – increased from once every 12.5 years between 1982 and 2006 to once every 2.5 years between 2007 and 2016” ([Oxford Business Group, 2021](#)).

The forecast looks particularly dire in Sub-Saharan Africa, where temperatures are expected to increase as much as 1.5x faster than the global average ([IPCC, 2014](#)), and 97% of agriculture is rainfed ([Fyles and Madramootoo, 2016](#)). The lack of irrigation means farmers have little ability to ration or portion water according to crop needs,

leaving crops, and therefore farmers, at the mercy of the weather. It is important to note that different regions of the continent are expected to be affected in different ways. In general, farms in SSA will experience more heat and drought, but models predict that some areas, such as the Ethiopian highlands, may actually see an increase in rainfall ([IPCC, 2014](#)).

Different areas will be affected in different ways and estimates vary between models, but overall the trend is clear; declines in yield are expected for almost every staple crop. These declines are expected to become apparent starting in the 2020's-2030's and continue to worsen through the rest of the century ([Knox, et al., 2012](#))([Adhikari, et al., 2015](#)). Wheat yields are expected to see the greatest decline: -22% by 2050, while yields for the more drought-hardy millet and sorghum may actually slightly increase (see Figure 11 below), though selective breeding and recent breakthroughs in genetic engineering technology may help to salvage some of the projected decrease in yields. Desertification encroaching on grasslands (particularly in the Sahel), will also make it more difficult for livestock owners to provide their herds with pasture and fodder.

Figure 11: Projected Yield Changes (%) in SSA in 2050, Due to Climate Change



Source: [Ringler et al., 2010](#)

Increased Conflict

Fighting affects the availability, accessibility, and stability of food supply by negatively impacting other critical variables related to civilian food security, most notably income and market integration. According to the Global Peace Index, the Sub-Saharan region has become markedly more peaceful in the 2000's than it was in the 90's. However, the region as a whole has consistently experienced slight deteriorations in peacefulness since 2014 ([Global Peace Index, 2020](#)), the same year that food security in the region also began to fall ([FAO, 2020](#)). It is worth noting that this regional deterioration of peace is largely the result of significant breakdowns in a few individual countries like Democratic Republic of Congo, Central African Republic, and Ethiopia. Other countries in the region, such as Botswana and Rwanda have become consistently

more peaceful. Nonetheless, the UN reports that increase in conflict, along with climate change, was one of the drivers of the decline of food security in 2015-2016 ([UN, 2017](#)).

Security experts also expect an uptick in violent conflict in Sub-Saharan Africa over the next several decades. The Sahel region in particular is seen as the area of highest risk, as climate change puts additional pressure on the region's already scant water resources. The causal mechanism for this is not, as one might expect, that people in areas with dwindling resources (water, cropland, etc) will take up arms to conquer nearby territories in order to usurp theirs. Instead, studies show that the most likely source of conflict will be an increase in armed insurgency, especially jihadism ([International Crisis Group, 2020](#)). The Sahel region is already rife with political and religious violence due to groups like Boko Haram and Al Qaeda in the Islamic Maghreb. As pastoralism, the predominant livelihood strategy in the Sahel, becomes less feasible due to less available water and grasslands, young men will seek alternative livelihood strategies. Some will turn to jihadism, as it is one of the few paying opportunities available to those with little education ([International Crisis Group, 2020](#)).

Population Growth

Rapid population growth is expected to pose a considerable challenge to African food security over the next several decades by affecting the availability and accessibility of food. Just as larger household population is a significant predictor of household food security due to finite resources being split between more people, this concept is also playing out on a macro level across the continent.

Sub-Saharan Africa is the fastest growing major area in the world. The UN projects that the population will increase from 1.1 billion (circa 2015) to 2.4 billion by

2050 before starting to level off sometime in the second half of the century ([United Nations, 2017](#)). Birth rates are falling, from 5.1 births per woman to 4.7 between 2000 and 2015, but Sub-Saharan Africa still has the highest average number of births per woman of any world region ([United Nations, 2017](#)). Some of Africa's poorest countries (Angola, Burundi, DRC, Malawi, Mali, Niger, Somalia, Uganda, Tanzania, and Zambia) are expected to quintuple in population by 2100 ([Hall et al., 2017](#)).

In addition to resources being split between more people, family farms are expected to shrink. Africa still possesses a large amount of unused land which is suitable for agriculture, but previous experience shows that families are more likely to split existing land holdings among their children and stay in the same area, rather than children leaving to settle in areas with more available land ([Mekuria, 2018](#)). A study in the Democratic Republic of the Congo found that a doubling in population between 1970 and 1990 led to the average farm size shrinking from 1.5 to just 0.5 hectares ([Aspen Institute, 2012](#)). A model by Hall et al. concluded that population growth will be the main driver of food insecurity in SSA through 2050 ([Hall et al., 2017](#)). It will no doubt be an immense challenge. Africans will need to find ways to feed more people than ever before, in a region with already-low agricultural productivity, as the effects of climate change make it harder to achieve sufficient yield.

Conclusion

_____ This essay has sought to illustrate and provide context for the state of food security in Sub-Saharan Africa by analyzing the main drivers of household food security, as well as emerging trends. Food security is complex, and there are many more factors

which could also be included in any analysis (soil quality and degradation, water availability, changing eating habits, livestock ownership, agricultural subsidies, reliance on imports, etc). Virtually all of the factors analyzed in this essay are themselves affected by other factors, some of which have also been analyzed here, and others not.

There is also much more information needed in order to make accurate predictions. One glaring knowledge gap is the extent to which climate change will increase stress on food production, as effects will depend largely on what climate legislation and action is, or is not, implemented in the years to come. It also remains to be seen how much human ingenuity and engineering can help create new solutions to accomplish the task of feeding more people, and how new investments in African countries and companies will affect GDP growth and household incomes.

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