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Commentary

Africa's Challenge in the 21st Century – Food Security

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Africa as a whole is going to face two major problems in the 21st century: The first problem is how to feed the growing population of the continent, the second is how to adapt to climate change. Both problems are interlinked since climate change has the potential for having severe implications on the food security in Africa. In the following, the matter and extent of population growth in Africa and the resulting implications will first be discussed. Then it will be assessed how adequate food supply can be achieved. After that the major challenges to ensuring sufficient food supply will be thoroughly addressed.

Population Growth and Food Demand

The population on the African continent is growing rapidly: For the period from 2000 to 2050 eight of the ten countries with the highest average annual growth rate in the world are African. Until 2055, 18 out of the 20 countries with the highest total fertility are located in Sub-Saharan Africa. Nigeria as an example is projected to have the third largest population growth in the world from 2000 to 2050. Already now Nigeria is in the top ten of the most populous countries on the planet and expected to climb in the top five in the course of this century. All these are indicators for the enormous ongoing population growth in Africa and they point to the most important fact: The population on the African continent is expected to double from around one billion to almost two billion over the next 40 years (United Nations, 2004).

Larger populations cause higher food demand on the African continent. The nations in Africa will act to ensure that this higher food demand is met by sufficient food supply. But as elaborated subsequently, the big challenge of the 21st century for the growing number of people in Africa will be to find means to meet their food demand.

Food Supply and the Challenges

Currently Africa ensures food supply by a mix of domestic food production and overseas food imports. West Africa for example depends to 40% on imports in ensuring sufficient rice supply with Thailand as the main rice supplier (FAO, 2010). The total volume of cereal imports in Africa was around 66 million tons in 2010 (FAO, 2013a). This means that for the whole of Africa 30% of all cereals consumed were imported. (Cereals exports are negligible: Even if all exports were instead to be used for domestic consumption, 28% of cereals consumed would still be constituted of imports. (FAO, 2013b)) One of the five largest trade flows of wheat in the world is from the US to Nigeria (FAO, 2013a). Despite domestic production and import efforts there were 239 million undernourished people living on the African continent in 2012, most of them in Sub-Saharan Africa. During the last two decades the number of undernourished people in Africa has increased by more than 35% (FAO, 2012). This shows that food insecurity already now is of increasingly relevant concern. In meeting the rising food demand caused by the growth in population in Africa, there are three options of how this rising demand can theoretically be covered by sufficient food supply: raise overseas food imports, raise domestic food production, or increase both food production and food imports.

Ensuring Food Supply through Increased Food Imports

There are several reasons leading to the conclusion that ensuring food supply through increased overseas food imports will not be an option which could satisfy the increasing demand for food:

The current world population could so far be sustained through the benefits of modern

agriculture, which promotes the use of irrigation systems, chemical fertilizer, farm machinery, and large-scale monoculture farms for increased efficiency and yields. It is now becoming increasingly understood that this system of modern agriculture is unsustainable at the current scale and potentially cannot even be sustained throughout this century (Cordell, et al., 2009; UNEP, 2011; Gleick & Palaniappan, 2010). The main reason for this is that modern agriculture depends heavily on water, fossil fuels (for irrigation, fertilizer production, machinery, transportation) and phosphate rock (for phosphorus fertilizer). Both fossil fuels and phosphate rock are finite resources and are becoming increasingly scarce. There are estimates that phosphate rock production will peak in the course of this century and thereafter continuously decline, thereby creating a supply-demand gap (Cordell, et al., 2010). Even the global oil company BP states that there are only 54.2 years of known crude oil reserves left and this only when assuming no growth in consumption (BP, 2012). There are other forms of unconventional oil such as tar sands but those deliver a much less favorable energy return on energy invested (EROEI) and therefore bear a much higher price making modern agriculture less affordable and food products more expensive. Additionally also these unconventional fuels will eventually diminish. Phosphorus on the other hand does not have any substitutes: Once the world's economically retrievable phosphate rock is completely mined there will be no alternative convenient way of obtaining phosphorus easily for the production of phosphorus fertilizer which is indispensable for efficient plant growth. While the dates stated of the end of economically producible fossil fuel and phosphate rock are issues with large vested interests and therefore significantly varying prognoses, it can definitely be expected that fertilizer and oil will become increasingly expensive leading to large increases in food prices making

food imports much more costly. A recent example of that problem of agricultural dependence on external inputs was the 2008 global rice crisis which was partly caused by the rise in fuel prices (Slayton, 2009).The same crisis also caused a 700% price increase in phosphate rock (Cordell, et al., 2009).

Finally and probably most importantly there is an increasing lack of water available for agricultural purpose for which no substitutes exist. Generally speaking water is a renewable resource and therefore does not get depleted the same way that fossil fuels get depleted. However there is a maximum of water available at a certain period of time (e.g. through rainfall). If population growth trends continue, the available renewable water during a certain period of time will not be sufficient to meet the agricultural water requirements in that time frame anymore. P. Gleick et al.(2010) suggest for instance that the U.S. already consumes more water than is renewably available by tapping into non-renewable groundwater aquifers. The Colorado River in the U.S., the Huang He in China, or the Nile in Northern Africa often do not reach the sea anymore with river flows falling to zero due to extensive water withdrawals for agricultural use (Gleick & Palaniappan, 2010). The Chairman of Nestlé Mr. Brabeck-Letmathe himself said: “I am convinced that, under present conditions and considering the way water is being currently managed, we will run out of water long before we run out of fuel” (Agence France-Presse, 2009). Climate change is additionally expected to aggravate water scarcity by causing salination of coastal freshwater sources and through a general decline in water quality due to higher average temperatures (IPCC, 2007). These are all signs which strongly indicate that water is becoming a more limited resource. With water, fossil fuels, and phosphate rock becoming increasingly scarce, efficient food production will be challenged, yields might decrease and food prices increase.

Population growth is occurring all over the world. The estimated world population is expected to reach 8.9 billion by 2050 having increased by almost 50% since 2000 (United Nations, 2004). In this context Africa will contribute only around 20% to the total world population. Other nations will have to increasingly make efforts to meet their own domestic demand due to higher population numbers and more challenged modern agriculture systems and therefore have less to spare for exports. The USA – currently the world's largest exporter of agricultural products– has by some scientists been predicted to cease to be a food exporter and use all of its production for domestic consumption by 2025 given population growth, food consumption, and topsoil loss trends (Pimentel & Giampietro, 1994). Another example, Japan, which has high food import dependence, is aware of the risk of food insecurity and has put increasing food self-sufficiency on the national agenda (OECD, 2013). With nations increasingly focusing on ensuring the food security of their own people there would be fewer opportunities for profitable imports of food products.

Based on this analysis of global population growth paired with diminishing available water, fossil fuels, and phosphate rock for practicing efficient, modern agriculture it should be concluded that food imports will not be the means of how Africa can effectively meet the growing food demand in the long run. Therefore the other proposal to meet increasing food demand – domestic production – should be examined more closely.

Ensuring Food Supply through Increased Domestic Production

Looking at the current conditions there are several challenges to ensure sufficient food supply through domestic production. The primary condition for successfully growing any crop is having soil with appropriate properties. However many African soils are of low quality. A study by the US Department of Agriculture points out: "Fifty five percent of the land in Africa is unsuitable for any kind of agriculture except nomadic grazing." (Eswaran, et al., 1997) Many soils provide poor amounts of organic matter and have a low soil quality and fertility. As stated in the most recent Climate Change 2007 Report by the Intergovernmental Panel on Climate Change (IPCC): "A number of countries in Africa already face semi-arid conditions that make agriculture challenging".

In Sub-Saharan Africa almost 75% of agricultural soils are nutrient deficient (Cordell, et al., 2009). Current deforestation trends exacerbate the issue of low soil quality: When the protective tree canopy is lost soils become more prone to wind and water erosion which further degrades the soil. Soil erosion in Africa is estimated to cause a loss of 1kg of phosphorus per hectare per year (UNEP, 2011). Ongoing desertification trends also reduce available soil for crop production.

The analysis of the current situation of African soils and crop growing conditions can generally been seen as unfavorable. But looking forward into the century climate change also has to be taken increasingly into consideration as a determining factor. Climate change is having and will increasingly have more severe implications on food security in Africa. As stated by the IPCC: "Agricultural production and food security (including access to food) in many African countries and regions are likely to be severely compromised by climate change and climate variability" (IPCC, 2007). Climate change, which is caused by carbon emissions into the atmosphere, results in an average increase in global temperatures. This temperature increase has several severe implications: Crop productivity is projected to decrease at lower latitudes, especially in seasonally dry and tropical regions, even for low

local temperature increases between 1-2°C. According to the IPCC report the reductions in yields could be as much as 50% by 2020. Wheat production for instance is expected to disappear from Africa by the 2080s. In Africa climate change is also expected to decrease the areas suitable for agriculture and the length of the growing season, particularly in arid and semi-arid areas (IPCC,.

A recent analysis by M. Fader et al. (2013) points out that most African countries will need an increase in agricultural efficiency and/or an expansion of agricultural land use in order to satisfy the growing consumption needs even under conservative population growth scenarios (Fader, et al., 2013). Climate change however causes lower crop productivity and therefore reduced agricultural efficiency and also has the effect of a reduction in the land suitable for production. Extraordinary agricultural efficiency improvements will therefore be necessary in Africa to offset the negative effects of climate change while still increasing agricultural productivity. Even without accounting for climate change as a determining factor M. Fader et al. (2013) conclude: “Assuming that the economies of LIE countries (low-income economies, most of them are situated in Africa) will not develop fast and strong enough in the next 40 years and, thus, that they will not have the financial means for improving agricultural productivity, expanding cropland or importing agricultural goods, in 2050 there would be a food security gap in those countries equivalent to 0.9–1.3 billion people”. It should also be pointed out that there will be some countries in Africa like Niger and Somalia which due to their environmental constraints do not have the option to increase domestic production to satisfy food consumption needs but will – provided current population growth trends continue – inevitably be dependent on additional food imports (Fader, et al., 2013).

From this analysis it can be concluded that Africa will be severely challenged in achieving food security through increased domestic production and in some cases even will not be able to achieve this goal: Soil properties in many areas in Africa already disfavor agriculture. As climate change decreases the areas suitable for production and in many cases impairs agricultural efficiency, special emphasis has to be placed on efficiency improvement measures. It is of high importance to create

awareness of the challenges ahead for food production in Africa, especially the impacts of climate change, so that adaptive actions can be taken in a timely manner.

Conclusion

The African population is expected to double from one to two billion people in the course of the next 40 years. This population growth requires a significant increase in food supply. Already now there are an increasing number of malnourished people that indicate the increasing importance of ensuring food security. Africa as a continent is currently partially dependent on food imports yet a sufficient increase in food imports is unlikely to occur. This is due to globally occurring population growth and due to increasingly challenged modern agricultural systems with their high dependence on non-renewable resources: The rising global population will cause national governments to decrease food exports in order to meet national food demand.

Declining non-renewable resources on which the agricultural sector is depended will cause an increase in food prices and a decrease in yields, both contributing to impaired global food production and reduced opportunities for food imports to Africa. Instead of increasing the dependence on food imports, which would pose an increasingly large risk in the future as the 2008 rice crisis has already indicated, the African nations should focus on increasing domestic production sufficiently. This goal will however also be severely challenged due to the less favorable growing conditions in many African regions and will be further impaired by the ongoing climate change. How should the African nations respond to these challenges? Highest immediate priority should be given to developmental efforts that increase agricultural efficiency such as the widespread implementation of drip irrigation schemes to offset the negative effects of climate change while still increasing production. Awareness has to be created about the effects of climate change on food security and appropriate adaptive capacity should be created. Changes in diet and a lower dependence on meat based food might have to be promoted. Finally, a solution to the ongoing unsustainable population growth needs to be found.

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