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Full Length Research Paper

Exploration of food security situation in the Nile basin region

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The top economic development challenges in the Nile Basin region are food insecurity, poor infrastructure, chronic poverty and political instability. While these issues are interrelated, food security assumes a greater dimension at both national and regional levels. Hence, an eclectic approach is used to underscore food security indicators in River Nile basin. Food security is a multidimensional conceptualization of food availability, accessibility and utilization to sustain a healthy and productive life at an individual, household, national and regional levels, at all times. Using statistics from the World Bank, IFPRI, FAOSTAT, FAO/AGL-TERRASTAT and other studies in the basin, the study reviews food security situation and compares the main causes of food insecurity amongst nine Nile Basin countries. The study found that most countries in the Nile basin region are unable to produce enough food for their population, thus, there is high child mortality and a high proportion of people who cannot meet their energy (calorie) requirements. While food markets play a critical role in ensuring that food is distributed according to forces of supply and demand, they are generally weak, thin and inefficient in most Nile basin countries. As a result, there is limited intra-regional agricultural trade. The study recommends a paradigm shift in technology for the Nile basin agriculture towards people-centered and pro-poor approaches to improve food production, agro-processing and regional trade. To boost food production will require effective technologies for example, certified seed and fertilizer, that are adapted to local conditions and realities, expansion of irrigated agriculture, reduction of post-harvest losses, improved infrastructure (for example, storage), innovations that promote value addition (agribusiness) and expansion of intra-regional agricultural trade. Both the public and private sectors in the region need to encourage development of technological, infrastructural, and marketing innovations and provide the necessary economic infrastructure and policy commitments to improve food security in the Nile basin.

Key words: Nile basin, food insecurity, production, trade, policy.

INTRODUCTION

The concept of food security includes both physical and economic access to food that meets people's dietary needs as well as their food preferences at both household and individual level, and is therefore concerned with continuous and assured access to food (NEPAD, 2009; FAO, 1996). Per capita availability of food is principally influenced by factors that determine levels of food supply and demand such as factors of production (land, labour and capital), population growth, price levels, average levels of disposable income and tastes and preferences (NEPAD, 2009; FAO, 1996). Many countries in the Nile basin region are structurally unable to escape from food insecurity because there is inadequate food supply resulting from a complex mix of factors including; unstable social and political environments, macroeconomic imbalances in trade, natural resource constraints, natural disasters for

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example drought, floods, pests (e.g. locusts), diseases and the absence of good governance (Pingali et al., 2006; Smith et al., 2000; Nile Basin Initiative, 1998). When domestic production falls short of fulfilling national food demand, countries often resort to commercial food imports or humanitarian assistance. While per capita food production indicates the ability of a country to use domestic production to feed its population, the ratio of food imports to total exports provides an indication of the ability of a country to finance its food imports from export revenue. Some of these factors are highlighted in Table 1.

External factors make the status of food insecurity in the Nile Basin even grimmer. Such factors include rise in global food prices (as has been periodically witnessed since 2008), debt burden, limited trade, lack of adequate foreign exchange and the long-term risks associated with climate change (IFPRI, 2002; Appelgren et al., 2000). This is further aggravated by communicable human and animal diseases, and pest problems that often weaken the already delicate livelihoods for many households in the Nile basin. Poor infrastructure, high transport cost, limited investments in irrigation, pricing and marketing polices, expensive and inappropriate technologies have historically hampered efforts to increase food production and intra-regional trade in the Nile basin countries (NEPAD, 2009; Omiti et al., 2008; Anderson, 1992; Carter and Weibe, 1990). Considering the population growth and rapid urbanization, the demand for food will grow dramatically in coming decades (Delgado et al., 1999). Facilitating expansion of domestic and regional markets will be critical in efforts that are aimed at stimulating agricultural production, broad-based income growth and poverty reduction (United Nations, 2010; Berrett et al., 2005; Sen, 1981).

Since the launch of the New Partnership for Africa's Development (NEPAD) in 2000, a Comprehensive Africa Development Programme (CAADP) has been initiated, whose third pillar aims to increase food supply and reduce hunger in Africa by raising productivity and improving responses to food emergencies. This initiative will provide avenues for investments in improving domes-tic production and marketing, trade and productivity (NEPAD, 2009). With perhaps the exception of Egypt, the Nile basin countries have a predominant common feature of food insecurity which is mainly due to low and stagnating agricultural productivity, diverse and complex farming systems which make it difficult to single out a few systems that would be improved and made to work as is the case of Asia during the Green Revolution (Barrett et al., 2005; Smith et al., 2000; Nile Basin Initiative, 1998; Smith, 1994).

There are many casual factors for the persistent and chronic food insecurity in the Nile Basin. First, there is inadequate growth in agriculture which has an inherent relationship with incidences of chronic food insecurity. There is high dependence on rainfed agriculture that is heavily reliant on traditional factors of production (land, labour and capital). Without supplementary irrigation, many farmers are exposed to risks of production failure in both crop and livestock systems, which in turn, affect the proportion of food that is produced, consumed and marketed (Omiti et al*.,* 2008; Appelgren et al., 2000; Smith et al*.,* 2000). Secondly, most of the Nile basin countries have infertile soils as a result of prolonged and intensive land use, shortening fallow periods and abandonment of shifting cultivation that is used to restore fertility and productivity (ASARECA, 2004; Mwangi, 1997). In livestock, the public delivery systems have collapsed, the cost and quality of feeds often varies significantly and leads to low levels of output (Wanyoike et al*.,* 2002; Leonard, 2000). Pests and diseases cause substantial damage during production and storage processes. These constraints are aggravated by the behavior of farmers who tend to be risk averse for a variety of reasons including financial constraints (Barrett et al., 2005; Freeman and Omiti, 2003).

As a result of insufficient food supply, many of the countries in the region are forced to import food to meet domestic demand. Some of the imports are sought as food aid. Food aid is sometimes a common response to transitory food insecurity and is often a way to cope with variable food import requirements and restricted commercial import capacity in low-income economies (WFP, 2008; Barrett, 1999). An increased food import bill tends to be the opportunity cost for other imports such as equipment or investments in research and technology (Yu et al., 2010). While markets and related support services can improve access to food and hence encourage gradual development, poor physical and storage infrastructure in the Nile basin hinders develop-ment of food markets and limits access to food. However, a direct result has been decline in per capita agricultural production over time due to market distortions and the characteristic low-input low-output agriculture in countries such as Ethiopia (FAO/WFP, 2010; Gebreselassie, 2006).

Third, another critical aspect affecting food availability in the Nile basin is the rapid increase in human popu-lation, often in excess of the annual rate of economic growth. The total population in the Nile basin was expected to increase from 210 million in 2005 to 336 million in 2030 (FAONILE, 2005). For example, a recent (2009) population census in Kenya shows that the country's population has been growing at 3% per annum during the last decade (1999 to 2009). This has serious implications for national planning and socio-economic development including food security. No effective policies are in place to cope with the unprecedented pressure by the high population growth on food demand, infras-tructure and natural resources in most of the Nile basin countries. Natural resources especially land and water are increasingly diminishing, implying that technology and innovation will have a big role to play in ensuring that

Table 1. Average food security indicators in the Nile Basin countries, 1990 to 2009.

Country	Food production					Trade		Food stocks and utilization		
	Food production per person (Kg/year)	Potential arable land as % of total land	Potential arable land actually in use (%)	Soil without major constraints (%)	Fertilizer use on arable land (Kg/Ha)	Food imports share of total exports (%) (2004 -2006)	Share (%) of food aid in total consumption (2004 -2006)	Food aid cereal (Tonnes) (2004 -2006)	Global hunger index (2009)	Urban population % of total population
Burundi	105.1	37.33	21	30	25.94				38.7	10.40
Congo, D.R.	100.7	2.95	14	45	5.16	5.7	1	69,073	39.1	33.96
Egypt	94.5	2.82	n/a	n/a	4,781.37	13.2	0.1	14,422	<5	42.72
Ethiopia	101.3	10.93	34	26	62.95	4.4	5.2	687,377	30.8	17.00
Kenya	103.7	8.97	27	16	287.30	18.5	2.4	143,645	20.2	21.60
Rwanda	105.4	38.15	25	19	20.99	5.1	2.6	23,527	25.4	18.34
Sudan	95.8	6.87	14	25	39.16	8.9	7.1	436,403	19.6	43.44
Tanzania	105.0	10.25	25	49	54.62	13.9	n/a	55,475	21.1	25.52
Uganda	97.7	26.08	13	40	9.09	4	2.2	102,667	14.8	12.98

Source: World Bank, 2010; IFPRI, 2010; FAOSTAT, 2010; FAO/AGL-TERRASTAT, 2003.

agricultural commodities are produced at higher yield per unit of land, water, energy and time. With an exception of Egypt, other Nile basin countries are net food buyers, which especially affect the poor who spend 60 to 80% of their income on food (Yu et al., 2010). This paper explores policy dimensions of chronic food security in the Nile basin, by reviewing agricultural productivity and its potential to enhance food production capacity and trade to feed the increasing human population and support sustainable livelihoods in the nine African countries: Burundi, Democratic Republic of Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania and Uganda.

Objective of the study

The objective of this study were to scope out critical food insecurity issues in the Nile Basin region and suggest promising interventions to improve food security either by way of productive investments or technology development, especially at regional level.

METHODOLOGY

Conceptual framework

Conceptually, food security involves implementation of policies, strategies and action programmes to promote and guarantee food availability, accessibility and effective and efficient utilization by all people at all times (FAO, 1996). Issues around food availability comprise domestic production, import capacity, available food stocks and food distribution systems in a country or region. Application of modern agricultural technologies plays a pivotal role in increasing production and productivity which is critical to achieving the food supply-demand balance. The issue of access to food is essentially determined by the purchasing power (that is, incomes and wages), poverty level, prices of food, and the distribution, transport and market systems. Effective utilization of food is influenced by people's culture, access to knowledge about proper nutrition, energy and clean water. Figure 1 show the conceptual relationships embodied in assuring food security at a multi-sectoral and multi-dimensional level. For food security to be achieved, relevant policy recommendations and implementation on food and livelihood security is a prerequisite (United Nations, 2010; NEPAD, 2009; Tschirley et al., 2008; Majid, 2004).

Markets play a critical role in ensuring that the food produced is distributed. However, food markets in the Nile basin countries are thin and weak. There is a sufficient domestic demand or export possibilities to stimulate growth in food production frontier. There is need to increase food production and productivity since the population in the Nile basin region is rapidly growing. Proactive policies will need to be applied now to exploit the potential in agriculture and trade opportunities in the Nile Basin to meet future food demand (Tshirley et al., 2008; Maxwell, 1996).

Data

Food availability was captured by (1) the levels and trends of food production (for example, through per capita food

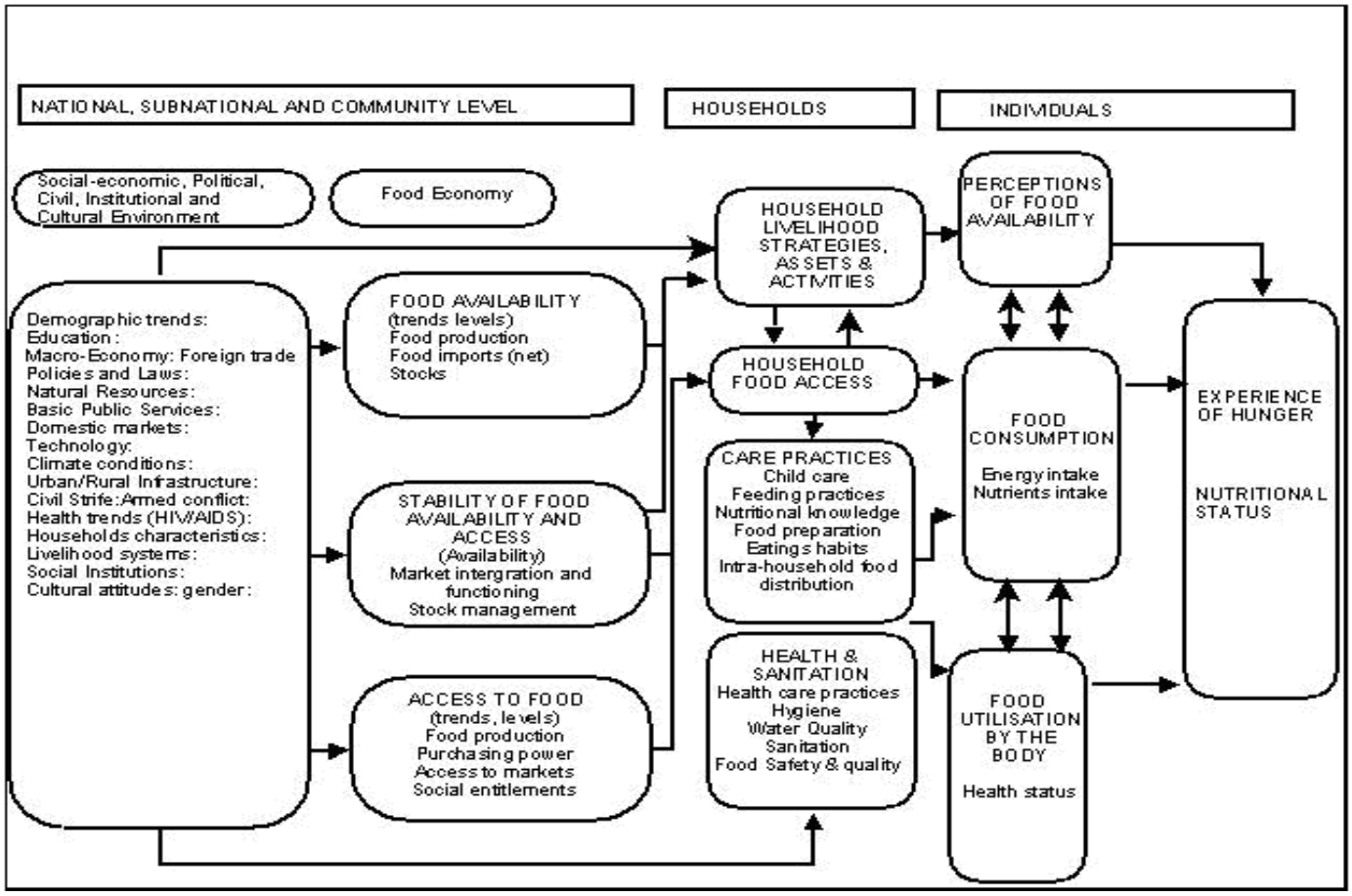

Figure 1. Food security as a multi-dimensional and multisectoral context. Source: Adapted from NEPAD (2009) and Benson (2004).

production, agricultural production /potential based on soil fertility, and input use), (2) trade or food imports, (3) food stocks, and (4) factors that affect food consumption. Per capita annual food production, agricultural potential/fertilizer use, and the ratio of imports to exports were used to indicate the status of food supply. Food distribution and utilization was proxied by the rate of urbanization while the level of hunger and malnutrition is computed by the global hunger index. The indicators can be used to shed more light on the different dimensions of food security at various levels of aggregation (household, community, national and regional).

RESULTS AND DISCUSSION

Food production in the Nile basin countries

Most of the farmers in the Nile Basin practice rainfed agriculture with limited adoption of yield-increasing inputs. Egypt has a high fertilizer use of 386 Kg/ha compared to upstream countries such as Kenya with an average of 31 Kg/ ha or Ethiopia with an average of 14 Kg/ ha (FAO, 2009). Very little arable land is utilized in the region with countries like DR Congo utilizing less than 1% and Tanzania using only 5% (Table 1) yet these countries has considerable land without any major constraints. For example, DR Congo has about 14% and Tanzania about 25% of its soil without having any major constraints. Burundi and Rwanda are utilizing more than 85% of their arable land yet they are not able to feed their population due to low input usage. For instance, Sudan is endowed with plenty of cultivable land estimated at 86 million hectare. However, less than 20% is utilized at present under the three major farming sub-sectors: The irrigated, the semi-mechanized rain-fed and the agro-pastoral traditional rain-fed (FAO/WFP, 2010a). These results imply that different countries in the region require different interventions to increase their food security.

Average per capita food production in most countries of the Nile basin has not been enough to feed growing human population. For instance, in Ethiopia, the domestic food production matched population growth only in the 1960s as per capita domestic food production has steadily declined over the last three decades (United Nations, 2010). At the same time, the level of productivity for the different food crops is critical since the food basket is a mix of essential foodstuffs, where sources of energy (cereals) are critically important.

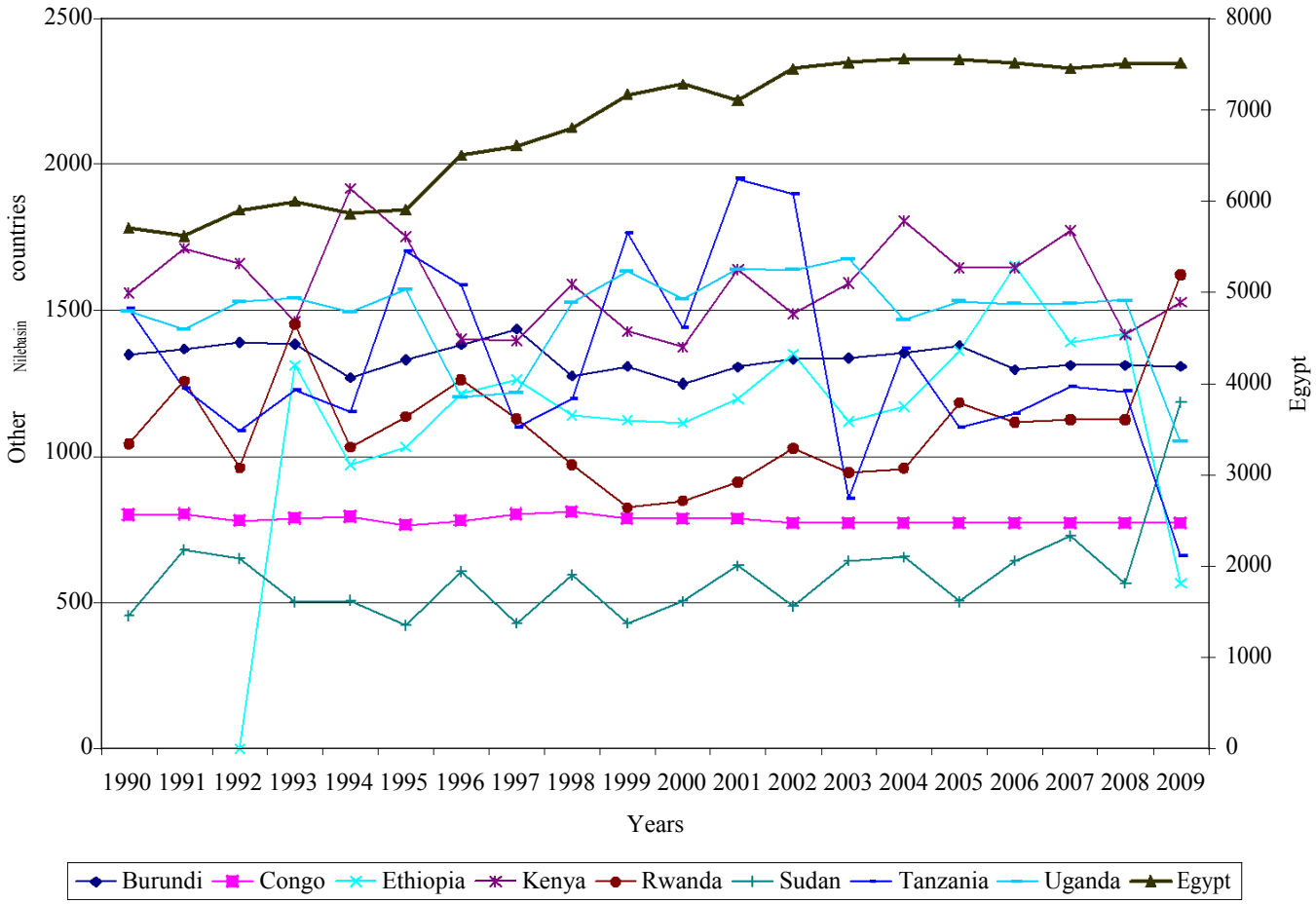

Figure 2. Cereal yields (Kg/ha) in the Nile basin countries, 1990-2008. Source: FAO Statistics Division, 2010.

As an illustration, Figure 2 shows the worrisome trends in cereal yields in the Nile basin between 1990 and 2008. It is evident that overall productivity has been declining. With the exception of Egypt, none of the other countries since the 1990s has been able to obtain two(2) tonnes/hectare although they have potential to realize three times as much. For instance, in 2008, Uganda had a cereal productivity of 1,590 kg/ha while Egypt has a cereal productivity of about 7,500 kg/ha. Nonetheless, Uganda is generally self-sufficient in most of the staples, except rice and wheat. Uganda supplies about 5% of Kenya's maize requirement in addition to exporting to Rwanda, Burundi, Tanzania and more recently Southern Sudan. Uganda can potentially serve as a grain basket for the region (RATIN, 2009). Tanzania is a net importer of cereals with a productivity of 1,350 kg/ha. Sudan and Democratic Republic of Congo (DRC) have the lowest productivities in the region of about 770 and 610 kg/ ha, respectively. It is not surprising that DRC has the highest malnutrition in the region and even in the world (FAO, 2010; Pauw, 2010).

The low cereal productivity in the Nile basin is partly attributed to limited adoption of high-yielding varieties and low usage of improved technologies (for example, hybrid seed, chemical fertilizer). With the exception of Egypt, usage of improved technologies is considerably low in other Nile basin countries. Egypt has high fertilizer use estimated at 385.8 Kg/ha while Burundi, Uganda, Rwanda and Sudan have very low fertilizer use of less than 3 kg/ ha. With hindsight on attitudes to risk under rainfed agriculture, Egypt practices intensive agriculture due to heavy investments in irrigation because of guaranteed access to the Nile waters. However, issues of water-efficient technologies have become increasingly important due to the resultant pollution and salinity due to high fertilizer use (Khalifa, 2010; Omiti et al., 2008; Nile Basin Initiative, 1998).

Though maize is widely grown in the Nile basin, it is more predominant in the lower and Eastern Nile in addition to wheat, millet and sorghum. In the Southern Nile (DR Congo, Rwanda, Burundi), roots and tubers (for example, sweet potatoes, cassava and yams) are the main food staples. Figure 3 shows the trends in yield of roots and tubers in the Nile basin. Egypt has higher productivity though it declined from about 25,000 kg/ ha in 2004 to 11,000 kg/ ha in 2008. Kenya has an average

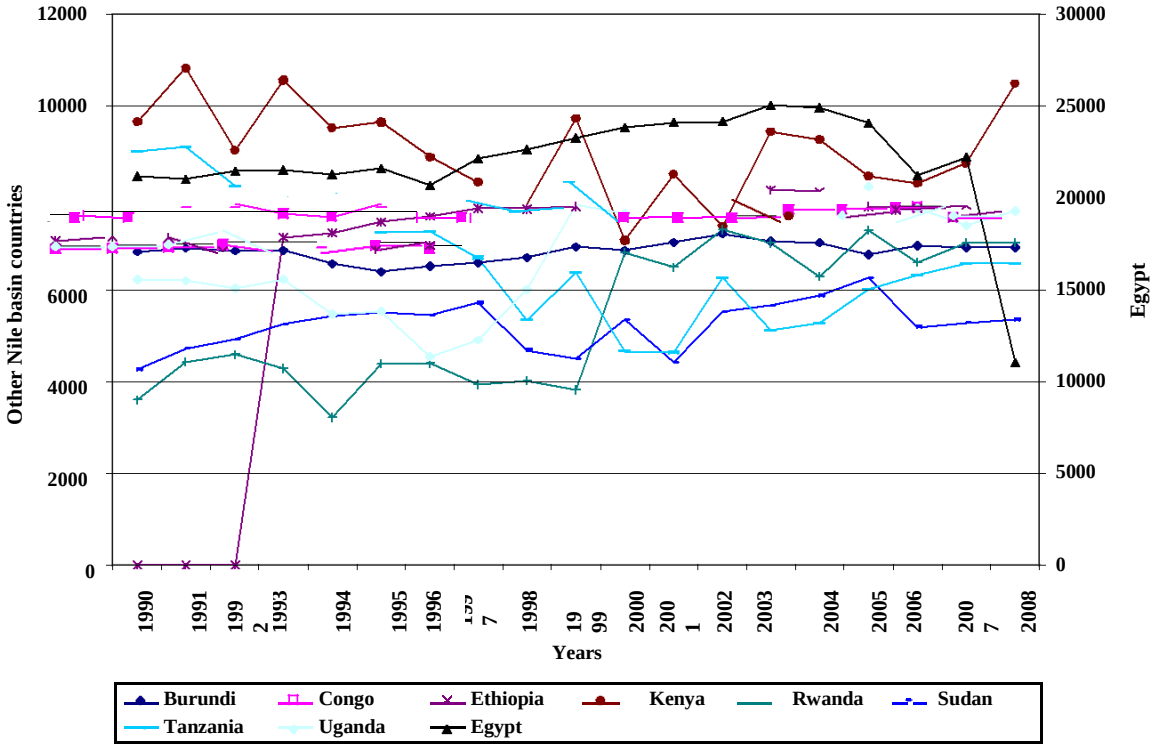

Figure 3. Yields of roots and tubers (Kg/ ha) in the Nile basin, 1990 to 2008. Source: FAO Statistics Division, 2010.

of about 10,000 kg/ ha with the other basin countries producing between 4,000 and 8,000 kg/ ha. Although, roots and tubers are not internationally traded in their primary form, they are important food security crops in the region. In addition, except for Irish potatoes, markets for roots and tubers are not well developed on a national or regional scale due to the bulkiness and perishability of these food commodities.

Pulses (for example, beans, peas) are an important source of protein especially for rural population in most Sub–Saharan African countries, which may not frequently afford the relatively more expensive meat (for example beef, and chicken). Figure 4 shows the yields of pulses over the last decade. Notably Sudan had productivity of about 1400 kg/ha but this has declined to 900 kg/ha. The other basin countries have productivity ranging from 400 kg/ha in Kenya to 700 kg/ ha in Rwanda, Tanzania and Uganda.

Productivity of pulses has been increasing annually in Ethiopia from 800 kg/ha in 1993 to 1200 kg/ha in 2008 while Burundi achieves about 900 kg/ha. A major challenge to increasing pulse production lies in the fact that most of pulses are often intercropped and therefore proper crop husbandry is not often practiced widely.

Livestock for example cattle, sheep, goat, poultry and camel production is an important source of livelihood for pastoralists in the Nile basin countries. Livestock production systems range from subsistence to intensive commercial production. Production is concentrated in the Lower Nile basin and cattle production dominates the sector. Individual Nile basin countries have different production systems that range from nomadic grazing, through small-holder farming based on animal traction and growing of legumes and forage to enhance livestock production and to increase soil fertility and crop yields.

Figure 5 shows composite yields from livestock in the Nile basin countries, indicating an average productivity of 700 kg/animal in Egypt and 550 kg/animal in Kenya compared to 350 kg/animal in Ethiopia and Sudan while other Nile basin countries recorded average productivity levels in the range of 150 to 250 kg/animal. These low levels of performance demonstrate that the production efficiencies need to be improved with major emphasis being placed on herd improvement, better husbandry practices including nutrition and feeding.Other sectors that have potential in the region include aquaculture which makes a significant contribution to fish production in the lower Nile. However, statistics indicate little contribution of fisheries to the wider economy and food security in the Nile basin. For example, Nile perch (*Lates niloticus*) and tilapia (*Tilapiine cichlid* tribe) dominate the inland fisheries from Lake Victoria and are major exports for the three East African countries of Kenya, Tanzania and Uganda.

Food imports into the Nile basin region

Although, the Nile Basin Initiative countries are characterized by variation in factor endowments, imperfections

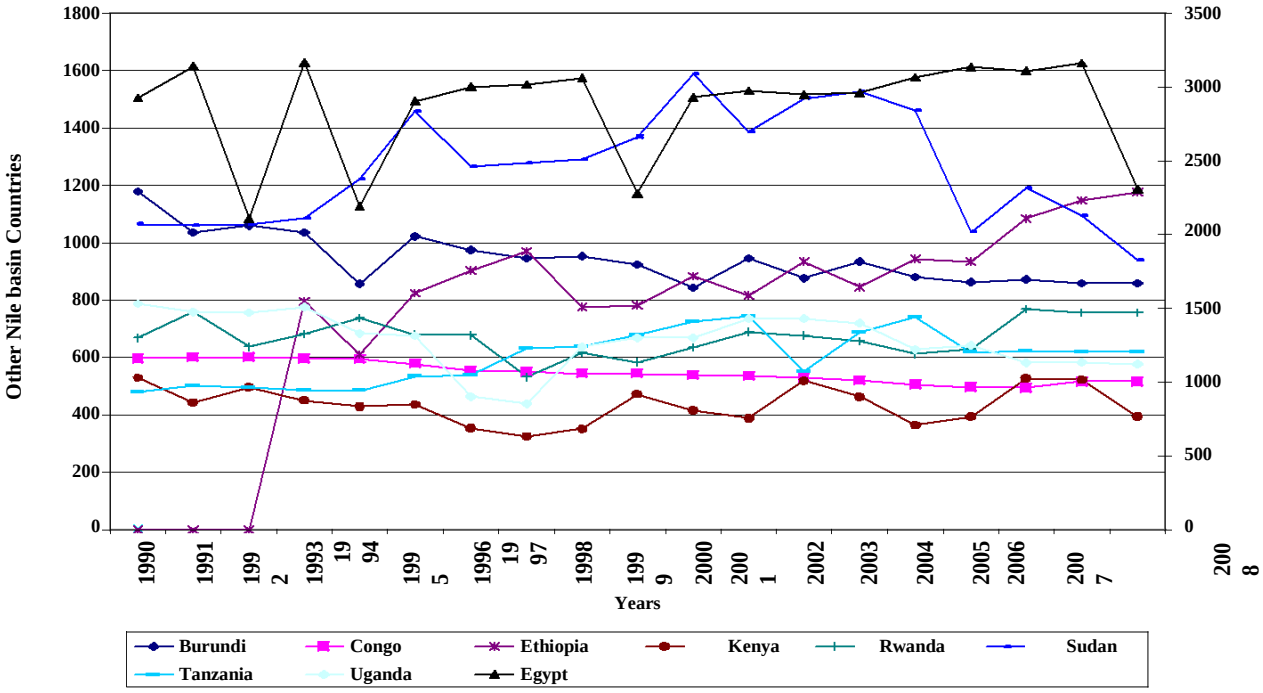

Figure 4. Yields of pulses (Kg/ ha) in the Nile basin, 1990 to 2008. Source: FAO Statistics Division, 2010.

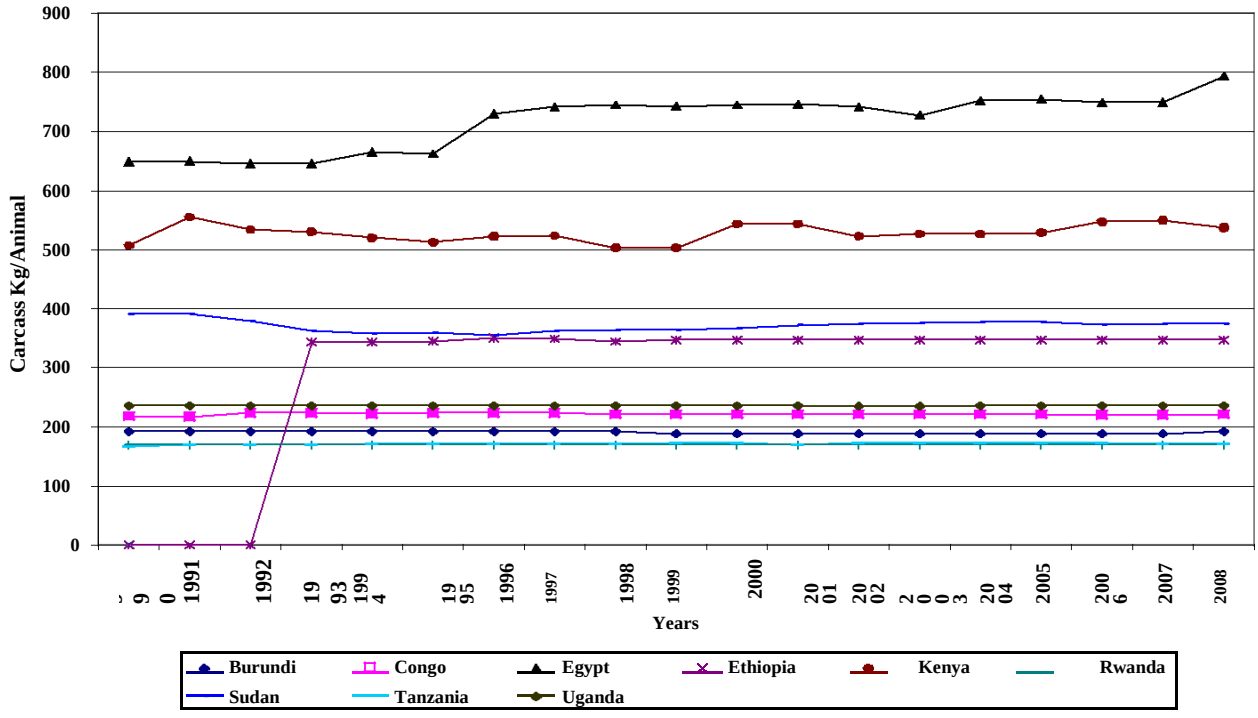

Figure 5. Yields of livestock (Kg/animal) in the Nile basin, 1990 to 2008. Source: FAO Statistics Division, 2010.

in the markets and differential preferences for the commodities, the volume and value of intra-regional trade is small. Cross border trade between the Nile Basin countries has largely been ignored and its potential remains un-exploited. Almost all the Nile basin countries are members of the COMESA trading block, where grain, and for most countries maize, is synonymous to food security. In a bid to ensure trade in grain contributes

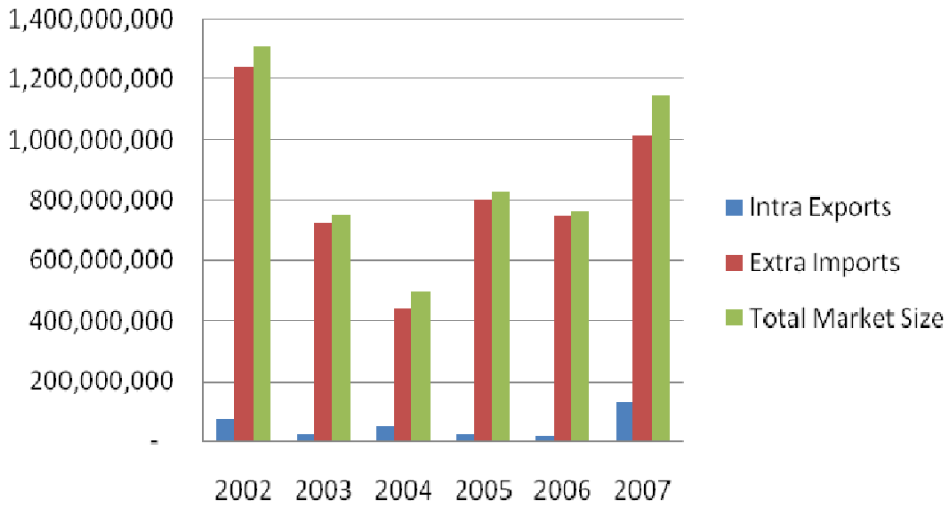

Figure 6. COMESA and EAC maize intra export and import. Source: COMESA database, 2008.

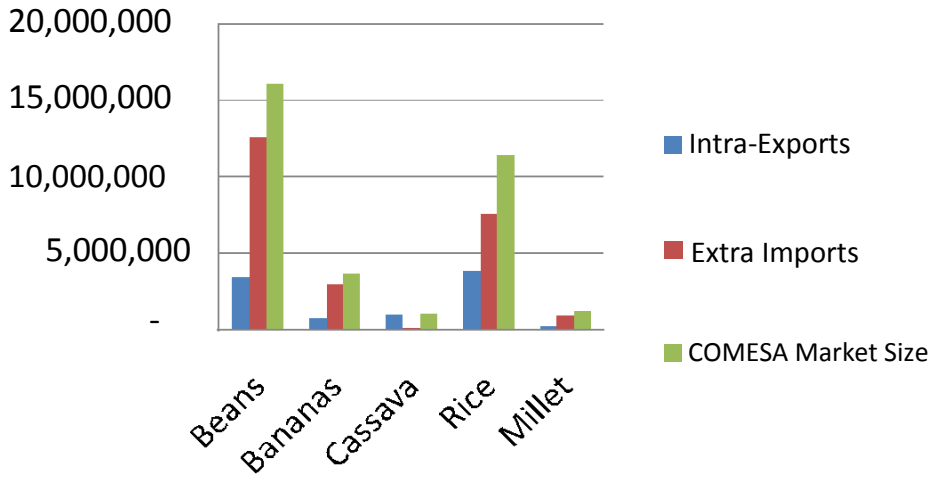

Figure 7. COMESA market size for beans, cassava, rice and millet in 2007 (figures in US$). Source: COMESA database, 2008.

towards regional food security, COMESA and EAC have removed tariff on intra regional trade in grain but adopted an external tariff structure ranging between 35% for rice to 50% for maize in a bid to protect regional market and encourage investments in the production of grain. This notwithstanding, regional trade in grain is quite dismal figure 6. For instance, in 2007, total maize exports within the region (intra exports) amounted to only about US$ 170 million out of the total market size of over US $ 1.75 billion (COMESA database, 2008).

The same case applies to beans, bananas, cassava, rice and millet, all of which are important food crops in the region. The level of intra COMESA exports has consistently been small compared to extra regional imports (Figure 7). These examples demonstrate the existence of huge trading potential in food products among Nile basin countries.

The insignificant volume of intra-regional trade has been attributed to various technological, policy, institutional, legal and other barriers to trade that inhibit movement of goods and services from one country to another. Shortfalls in domestic food production are mainly satisfied through trade or humanitarian assistance from outside the Nile basin. Most of the Nile basin countries have limited capacity to finance their food imports from their exports. This is especially significant for the land-locked countries such as Burundi, DR Congo, Ethiopia, Rwanda and Uganda. On average, food imports surpass food exports suggesting that the Nile Basin region is becoming increasingly food-deficient which is an important policy concern in many Nile Basin countries.

When the share of food aid in total consumption is taken into account (Table 1), Sudan is the largest recipient of food aid (at about 7%) in the Nile Basin

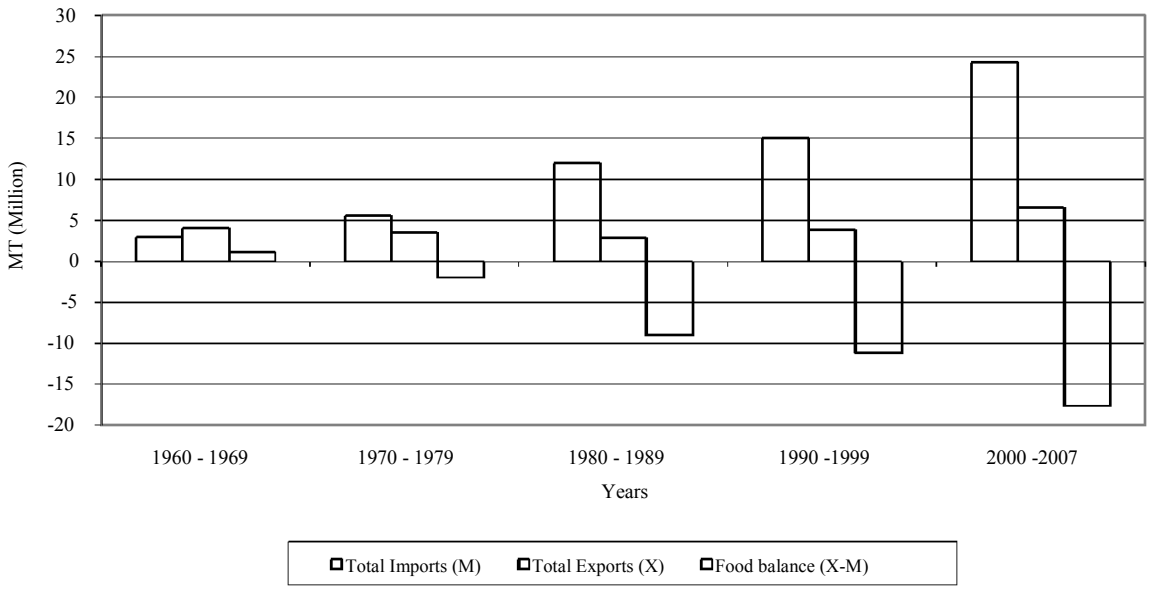

Figure 8. Average annual balance of food imports and exports of Nile basin countries. Source: FAOSTAT (2010).

followed by Ethiopia and Burundi where about 5% of total consumption is from food aid. It is instructive to note that parts of these countries have either experienced extreme droughts (and therefore, crop failure), insecurity or sporadic conflict that has necessitated international assistance. Besides maize, other staples imported during the same period were wheat and rice where there is rising consumer demand. This has some important implications in terms of the changing diets and therefore, emerging need to think of expanding wheat and rice farming in the Nile basin to reduce heavy dependency on imports.

Trends in per capita food supply and consumption

Like elsewhere in the developing world, urbanization is a major factor driving the socio-economic development of in most Nile Basin countries. Egypt has 43% of its population in the urban areas, Sudan 41% and Kenya 21% (Table 1). While food production is concentrated in the rural areas and along the River Nile, urban populations tend to be more involved in the formal and informal employment sector. Through interactions with the market, urbanization often encourages changes in dietary habits and lifestyles. The average annual change in food availability per person (Figure 8) is declining for Burundi, Congo and Tanzania indicating high food insecurity. In other Nile basin countries, the growth in food availability and population growth shows positive growth especially in Egypt, Kenya and Uganda where food availability per person has been growing at about 1% annually, for the last two decades (1990 to 2010).

The global hunger index measures the proportion of the population that does not meet its food requirements to sustain a normal and healthy productive life. Conflicts, political instability, and high rates of HIV and AIDS have lead to high child mortality and a high proportion of people who cannot meet their energy requirements especially in Sub-Saharan Africa. There are large disparities in the fight against hunger in the Nile Basin countries. Figure 9 shows the countries with the largest changes in hunger within the Nile basin countries, proxied by their global hunger index rating (GHI). With a GHI index of below 5% of the population, Egypt has very few citizens experiencing levels of hunger that can trigger serious policy concerns. Between 1986 and 1993, the country implemented a multi-year agricultural policy reform program to remove government control on farm prices, crop area controls, procurement quotas, private sector processing and marketing of farm products and inputs and to eliminate farm input subsidies. Simultaneously, the whole economy underwent structural and fiscal reforms to facilitate growth, especially in the agricultural sector. The only food subsidy currently in operation is the “baladi” bread subsidy (Soliman et al., 2010).

In stark contrast to Egypt, the other eight Nile Basin countries have a sizeable proportion of their population experiencing chronic hunger and pervasive malnutrition. For the last two decades, DRC (GHI = 39.1), Ethiopia (GHI = 30.8) and Burundi (GHI = 38.7) have extremely alarming hunger levels which could be attributed to the civil war for DR Congo and Burundi, in addition to low agricultural productivity and limited regional trade. In Ethiopia, almost half of the population does not meet its daily food requirements. Uganda (GHI = 14.8) has a better index than other East African countries largely due to its better climatic regime and greater food diversity.

Overall, hunger has been decreasing for all the Nile basin countries since 2007 but at varying rates. However, because of increasing population, the number of people

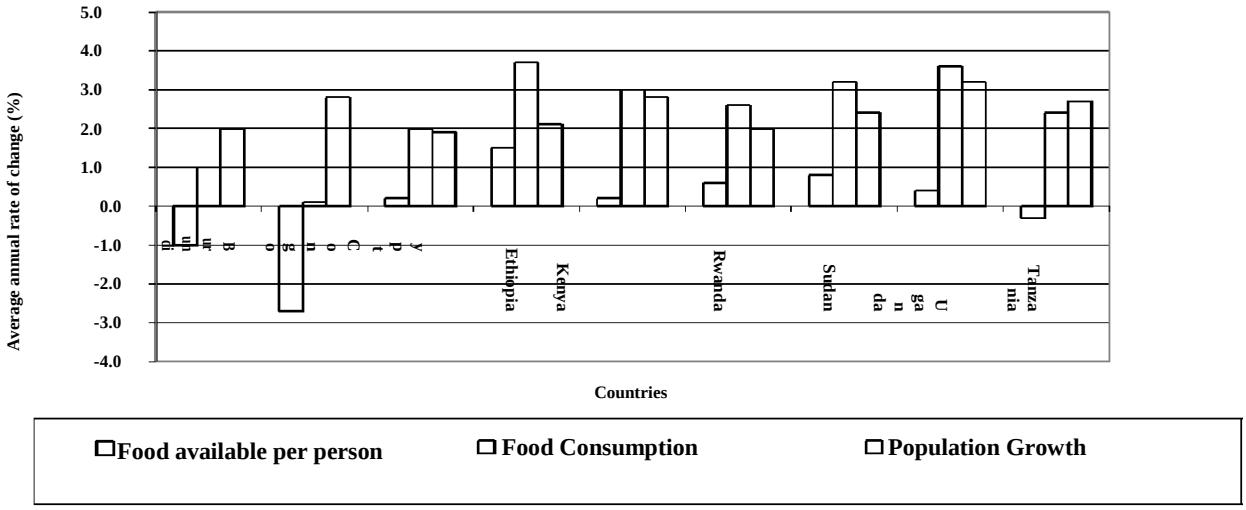

Figure 9. Average annual rate of change (%) in food consumption and population growth 1990 to 2005. Source: FAO Statistics Division, 2010.

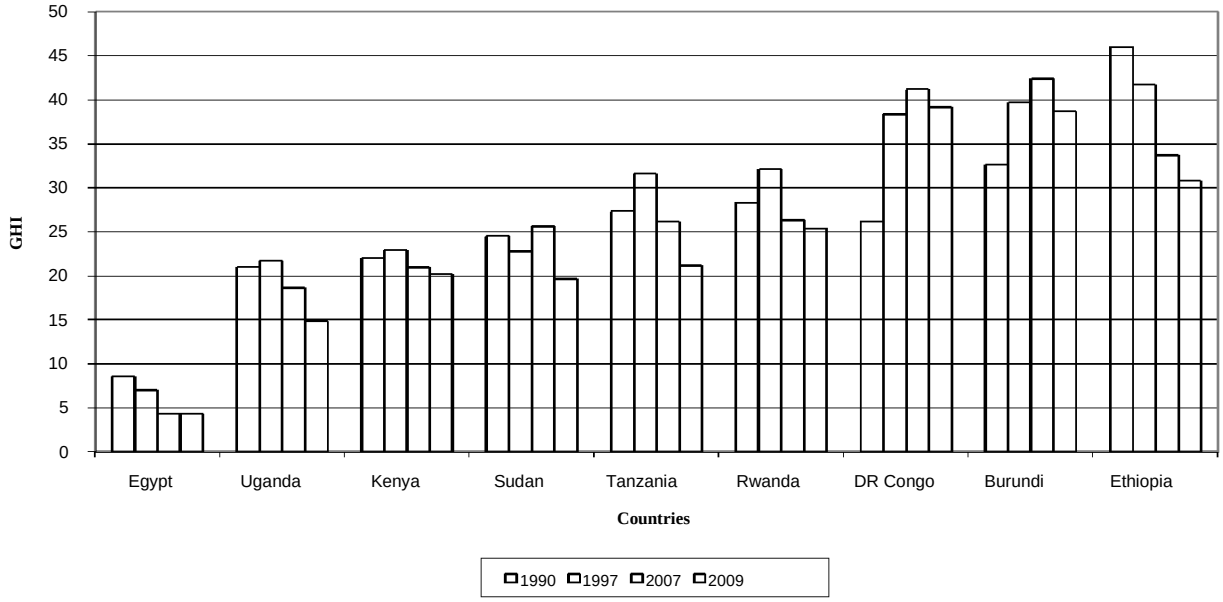

Figure 10. Global hunger index for Nile basin countries, 1990 to 2009. Source: IFPRI, 2010.

experiencing hunger and malnutrition could be increasing in absolute numbers (Figure 10).

Food security policies in the Nile basin

A number of countries in the Nile basin region have developed food security and nutrition programmes to facilitate implementation of food security policies as well as promote agricultural growth. The policy interventions can be broadly grouped into three categories namely those (1) promoting domestic supply, (2) affecting food distribution, and (3) facilitating trade. Trade is critical to net food importing countries in the Nile basin region, therefore the trade policies play a critical role in ensuring food supply, accessibility and stability of food prices (United Nations, 2010). Some of the policy interventions that the Nile basin countries have taken Table 2.For instance, Kenya has applied the largest are presented in cocktail of polices compared to the other Nile basin countries. These interventions have been carried out intermittently, sometimes with abrupt changes in speed and direction. Except perhaps for Egypt, the other eight Nile basin countries are generally food insecured.

CONCLUSIONS AND RECOMMENDATIONS

Food insecurity is one of the primary development challenges facing the Nile Basin countries. A majority of

Table 2. Some food security policy interventions in some Nile Basin countries.

	Countries					
Policy Intervention	**Burundi**	**Ethiopia**	**Kenya**	**Rwanda**	**Tanzania**	**Egypt**
Consumer focused						
Reduce taxes on food grains	√	√	√		√	
Cash transfers	√		√			
Price controls and/or consumer subsidies				√		
Food stamps or vouchers	√		√		√	
Food-for-work	√		√			√
School feeding	√		√			√
Domestic supply						
Agricultural input subsidies			√			
Increase food supply using food grain stocks		√	√		√	
International trade						
Increase food supply via imports		√	√	√		
Reduce food import tariffs			√			
Lower import tariffs for agricultural inputs			√			
Food export restrictions		√	√		√	√

Source: (FAO, 2009; Karugia et al., 2009).

these countries experience chronic food shortages and frequent famines despite considerable potential to address this problem. Agriculture in the basin is characterized by low productivity and limited intraregional trade, leading to insufficient food, both produced and imported. Compared to other regions of the world where the problem of food insecurity has been overcome, it seems that food insecurity is more of a problem of structural and policy failure in the Nile Basin region. Despite variations across countries and livelihood systems in various aspects of food insecurity, there are some generalisable characteristics that can permit policy makers to re-start the debate on regional food security agenda and prioritize interventions to address food insecurity in the region. These interventions must recognize the location-specific challenges and the socio-economic and political considerations in order to be successful.

Critical determinants of achieving food production revolve around land, access to technology, credit, infrastructure (including water), and markets. Relevant policies need to be implemented or put in place before the Nile basin countries can begin to anticipate an African Green Revolution. There is need for a paradigm shift for the Nile basin agriculture to focus on improved seed, biotechnology, greater input use, irrigated agriculture, integrated pest management and commercial-orientation (value addition and international trade). The rate of adoption of these technologies should be enhanced through the use of better delivery mechanisms and systems.

Governments should facilitate a conducive environment to encourage the development of technological, infrastructural, and marketing innovations in crop, fish and livestock production. One critical aspect is storage infrastructure that will allow for surpluses to be stored for future consumption and allow in price arbitrage thus, cushioning the poor populations in the region. Critical issues that may need to be addressed to facilitate this paradigm shift will be increase investments in food production, improved governance structures and political goodwill to push this agenda forward.

On the other hand, regional trade in food staples represents one of the single biggest opportunity for agricultural development and has the potential to significantly contribute to stabilizing food supply and food prices. Prioritizing this issue is consistent with the priorities identified in the CAADP framework, which highlights the importance of trade infrastructure, market access, and cross-border trade to attain food security (NEPAD, 2009). The trading blocs promote trade through low preferential tariff rates, investments and agreements. The Nile basin country governments should remove various restrictions on trade in order to reduce costs; thereby facilitating increased cross-border flow of agricultural commodities. Regional commerce will also allow industries to grow and compete effectively and also provide a platform to push for regional agenda with a strong voice at international arena especially in trade negotiations, hence, safeguard the interests of Nile basin.

REFERENCES

Appelgren B, Klohn W, Alam U (2000). Water and Agriculture in the Nile Basin. Nile Basin Initiative Report to ICCON. Background Paper prepared by FAO Land and Water Development Division, FAO. Rome AGL/MISC/29/2000 ftp://ftp.fao.org/agl/aglw/docs/misc29.pdf.

Anderson JR (1992). Difficulties in African agricultural systems enhancement? Ten hypotheses. Agric. Syst., 38(4): 387-409.

Barrett CB (1999). Does Food Aid Stabilize Food Availability? Department of Agricultural, Resource and Managerial Economics, Cornell University Ithaca, WP 99-01 January 1999 http://www.cals.cornell.edu/dept/arme/staff/cbb2/.

Barrett CB, Bezuneh M, Clay DC, Reardon T (2005). Heterogeneous Constraints, Incentives, and Income Diversification Strategies in Rural Africa. Quarterly J. International Agricultur*e* 44(1): 37-60.

Benson T (2004). Africa's Food and Nutrition Security Situation: Where Are We and How Did We Get Here? 2020 Discussion Paper No. 37, International Food Policy Research Institute (IFPRI), Washington DC. http://www.ifpri.org/sites/default/files/publications/2020dp37.pdf.

Carter MR, Weibe KD (1990). Access to Capital and its Impacts on Agrarian Structure and Productivity in Kenya, Am. J. Agric. Econ., 72(5): 1146-1150.

Delgado C, Rosegrant M, Steinfeld H, Ehui S, Courbois C (1999). Livestock to 2020: The Next Food Revolution. Food Agriculture, and Environment,Discussion Paper 28. International Food Policy Research Institute (IFPRI), Washington DC. http://www.ifpri.org/sites/default/files/publications/pubs_2020_dp_dp28.pdf http://www.ifpri.org/sites/default/files/publications/dsgdp29.pdf.

FAO/AGL - TERRASTAT (2003). www.fao.org/ag/agl/agll/terrastat/.

FAO (1996). Declaration on world food security, World foods summit FAO, ROME http://www.fao.org/docrep/003/w3613e/w3613e00.HTM

FAO (2010). FAOSTAT database, FAO Statistics Division, Food and Agriculture Organization, Rome. <faostat.fao.org>.

FAO (2009). The 2007 – 2008 Food Price Swing, Impact and Policies in Eastern and Southern Africa. FAO Commodities and Trade Technical Papers 12, FAO, Rome.

FAO NILE (2005). Information Products for Nile Basin Water Resources Management, info@www.faonile.org.

FAO/WFP (2010). Crop and Food Security Assessment Mission to Ethiopia. Special Report. Food and Agriculture Organization, Rome, World Food Programme, Rome http://www.fao.org/docrep/012/ak346e/ak346e00.htm.

FAO/WFP (2010a). Crop and Food Security Assessment Mission to Southern Sudan. Special Report. Food and Agriculture Organization, Rome,World Food Programme, Rome http://www.fao.org/docrep/012/ak345e/ak345e00.htm.

Freeman HA, Omiti JM (2003). Fertilizer Use in Semi-Arid Areas Of Kenya: Analysis Of Smallholder Farmers Adoption Behaviour Under Liberalized Markets. Nutrient Cycling in Agro-ecosyst., 66: 23-31.

Gebreselassie S (2006). Food Aid and Small-holder Agriculture in Ethiopia: Options and Scenarios, A paper for the Future Agricultures Consortium workshop, Institute of Development Studies, 20-22 March 2006 Future Agricultures Consortium (FAC), Institute of Development Studies, Sussex. http://www.future-agricultures.org/pdf%20files/SG_paper_1.pdf.

IFPRI (2002). Green Revolution Curse or Blessing? IFPRI Brief, Washington DC. http://chapters.ewb.ca/pages/member-learning/africa-%28culture_-history_-livelihoods%29/greenrevreading1.pdf.

IFPRI (2010). Global Hunger Index: Facts, Determinants and trends. Washington DC: International Food Policy Research Institute.

Karugia J, Waithaka M, Freeman A, Prabhu R, Shiferaw B, Gbegbelegbe S, Massawe S, Kyotalimye M, Wanjiku J, Macharia E (2009). Responding to Food Price Crisis in Eastern and Southern Africa: Policy Options for National and Regional Action. ReSAKSS Working Paper No. 27.ReSAKSS-Eastern and Central Africa. www.resakss.org/index.php?pdf=42454.

Khalifa H (2010). Improving livelihoods through sustainable land-use management in Middle East Countries, Conference Paper, International Center for Agricultural Research in the Dry Areas (*ICARDA*), Aleppo.

Leonard DK (2000). Africa's Changing Markets for Health and Veterinary Services: The New Institutional Issues, Macmillan, London, 320p.

Majid N (2004). Reaching Millennium Goals: How well does agricultural productivity growth reduce poverty? Employment Strategy Working Paper No.12, International Labour Organization (ILO), Geneva. http://www.ilo.org/wcmsp5/groups/public/---ed_emp/-emp_elm/documents/publication/wcms_114303.pdf.

Maxwell S (1996). Food security: A post-modern perspective, Food Policy, 21(2): 155-170.

Mwangi WM (1997). Low use of fertilizers and low productivity in sub-Saharan Africa, Nutr. Cycl. Agro-ecosyst., 47: 135–147.

NEPAD (2009). Comprehensive African Agriculture Development Programme (CAADP) Pillar III. Framework for African Food Security (FAFS) http://www.caadp.net/pdf/CAADP%20FAFS%20BROCHURE%20indd.pdf.

Nile Basin Initiative (1998). Nile River Basin Action Plan Review: Towards a Priority Action Plan, Nile Basin Initiative (NBI), Entebbe.

Omiti JM, Ndirangu L, Waiyaki N, Mwakubo S (2008). Low Agricultural Productivity and Food Security in the Nile Basin Countries KENYA. Project ID. No.P075952. Kenya Institute for Public Policy Research and Analysis. PMU, Soico-Economic Development and Benefit Sharing (SDBS), Nile Basin Intitiative, Entebbe.

Pauw K, Thurlow J (2010). Agricultural Growth, Poverty, and Nutrition in Tanzania. Development Strategy and Governance Division IFPRI Discussion Paper 00947 http://www.ifpri.org/sites/default/files/publications/ifpridp00947.pdf

Pingali P, Stamoulis K, Stringer R (2006). Eradicating Extreme Poverty and Hunger: Towards a Coherent Policy Agenda, ESA Working paper No. 06-01, FAO: Rome. http://www.fao.org/docrep/008/af839e/af839e00.HTM.

Sen A (1981). Poverty and famines: An essay on entitlement and deprivation, Oxford University Press, New York.

Schultz TW (1964). Transforming Traditional Agriculture, Yale University Press, New Haven.

Smith LC (1998). Can FAO's measure of chronic undernourishment bestrengthened? Food Policy, 23(5): 425-445.

Smith PJ (1994). Identifying research priorities in developing countries, Agric. Syst., 45(4): 455-468.

Smith LC, Obeid El, AE Jensen HH (2000). The Geography And Causes Of Food Insecurity In Developing Countries. Agric. Econ., 22: 199-215.

Soliman I, Fabiosa JF, Bassiony H (2010). A Review of Agricultural Policy Evolution, Agricultural Data Sources, and Food Supply and Demand Studies in Egypt, Working Paper 10-WP 506, Center for Agricultural and Rural Development, Iowa State University, http://www.card.iastate.edu/publications/DBS/PDFFiles/10wp506.pdf

Tshirley D, Jayne TS (2008). Food Crises and Food Markets: Implications for Emergency Response in Southern Africa, Working paper No. 94, Michigan State University, Michigan. http://ageconsearch.umn.edu/bitstream/54559/2/idwp94.pdf

United Nations (2010). Technology and Innovation Report: Enhancing Food Security in Africa through Science Technology and Innovation. United Nations Publication UNCTAD/Tir/2009.

Wanyoike MM, Wahome RG, Mbogoh SG (2000). Issues Constraining Production, Processing and Marketing of Dairy and Other Livestock Products. A paper presented to International Conference on Strategy for Revitalizing Agriculture in Kenya 22 February 2002, Nairobi.

WFP (2008). The World Food Programme and Global Food Security, Tenth Report of Session 2007–08, House of Commons, London.

World Development Indicators, World Bank (2010),http://data.worldbank.org/topic/agriculture-and-rural-development

Yu B, You L, Fan S (2010). Towards a Typology of Food Security in Developing Countries. Development Strategy and Governance Division, Discussion paper 00945, International Food Policy Research Institute (IFPRI), Washington D.C. http://www.reliefweb.int/rw/lib.nsf/db900sid/VVOS-7ZMSBX/$file/ifpri_jan2010.pdf?openelement.