

Food Security and Human Development in Africa: Strategic Considerations and Directions for Further Research¹

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Abstract: This paper argues that food security and human development are intricately linked, and that meaningful progress on the one cannot be sustained without concomitant progress on the other. The paper surveys recent research on various aspects of the linkages between food security and human development and highlights areas where further research would enrich our understanding of the complex interactions and synergies between the two. It concludes by calling for a more systematic investigation of the human development-food security nexus with a view to generating new and practical insights for improving food security and advancing human development in Sub-Saharan Africa.

¹ This paper is drawn from the proposal for the 2011 African Human Development Report on “Food Security for Human Development”. The proposal benefited from comments from the following experts, whose inputs are acknowledged with gratitude: Hans P Binswanger-Mkhize, Steve Wiggins, Monty Jones, Peter Timmer, Agnes Qisumbing, Lawrence Haddad, David Olusanya Ajakaiye, Sir Richard Jolly, Simon Maxwell, Stefan Dercon, David Norse, Elizabeth Wilson, Ayodele Odusola, Sebastian Levine, Basudeb Guha-khasnobis, Lisa Simrique Singh, Pa Lamin Beyai, Fatou Leigh, Thomas Kring, Asha Kannan, Amarakoon Bandara, Alka Bhatia.

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Introduction

Food security³ has moved to the forefront of the development debate, and it is likely to remain a chief development concern in Sub-Saharan Africa for the foreseeable future. The compounding effects of sharp increases in food prices in 2007 up to mid-2008 and the global economic downturn of 2009 are estimated to have reversed the steady decline experienced from the late 1960s to 2004-2006 in the proportion of undernourished population in developing countries (FAO 2009a). Estimates suggest that the share of the population in developing countries suffering from hunger increased in both 2008 and 2009, reaching close to 20 percent (FAO 2009a). In Sub-Saharan Africa (Africa, from here on), estimates indicate an increase in the proportion of undernourished from 28 percent in 2004-2006 to 29 percent in 2008 (UN 2009). This implies a reversal in progress towards achievement of Millennium Development Goal 1, to halve the population living in hunger by 2015 from 1990 levels, both globally and in Africa.

Awareness of these setbacks on hunger helped to galvanize global attention and action. In April 2008 a UN High Level Task Force on the Global Food Security Crisis was formed in response to the food price crisis, bringing together 22 UN agencies under a common comprehensive framework for action. The G8 meeting in l'Aquila a year later also addressed the global food security challenge. G8 Heads of State pledged \$20 billion over 3 years and agreed to a joint approach to promoting food security. In September 2009, at the G20 Summit in Pittsburgh, additional country pledges brought the total to \$22 billion. The commitments made at l'Aquila and Rome have lent important support to African initiatives, notably the Comprehensive Africa Agriculture Development Programme (CAADP), a program of the African Union's New Partnership for Africa's Development (NEPAD), which aims to improve food security, nutrition, and increase incomes in Africa. This political momentum, and the significant resources and political will it has unleashed, raises a historical opportunity to step up and accelerate efforts to advance food security in Africa.

The paper argues that food security and human development are intricately linked, and that meaningful progress on the one cannot be sustained without concomitant progress on the other. A first section will provide an overview of the current situation and key trends with regard to food security and human development in sub-Saharan. The following section summarizes key findings from recent research shedding light on specific aspects of the food security and human development nexus. A final section highlights critical gaps where further research may be warranted.

³ Food security is defined broadly as the condition whereby "all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life" (FAO 1996). The concept is defined as including both physical and economic access to food that meets people's nutritional needs – encompassing both micronutrient and calorie requirements – as well as their food preferences.

Key trends, and challenges for attaining food security in Africa

Food insecurity in Sub-Saharan Africa is characterized by widespread and chronic hunger and malnutrition as well as recurrent and acute food crises. Africa remains the region with the highest proportion of undernourished people in the population, at 29 percent, compared with a 17 percent average for developing countries (UN, 2009).⁴ In addition to chronic hunger and malnutrition, parts of the continent have been hit by sudden crises that create bouts of acute hunger (Wiggins 2009).

Over 70 percent of the food insecure population in Africa lives in rural areas. Smallholder farmers, the producers of over 90 percent of the continent's food supply, make up half of this population (Mwaniki, 2005). The rest of the food insecure population consists of the landless poor in rural areas and the urban poor (Mwaniki, 2005). Recent volatility in international food prices, combined with balance of payment difficulties in some food deficit countries, resulted in several countries needing to secure additional food supply through food aid.

Women and children are particularly vulnerable, but often overlooked. Women face many constraints in their quest to access and produce food and make a living out of agriculture. Women in rural areas are the most vulnerable: a recent study covering 27 countries in Sub-Saharan Africa shows that rural women were 68 percent more likely to be malnourished compared with their urban counterparts (Uthman and Aremo, 2008). Yet, there has been a general "failure to recognize the roles, differences and inequities [between men and women]" in the agricultural development agenda (World Bank, 2009), and women farmers are "frequently underestimated and overlooked in development strategies" (ibid). It is also known that pregnant and lactating women and preschool children are the most at risk from nutrient deficiency (Blössner and de Onis, 2005). Across Africa it is estimated that 27-51 percent of women of reproductive age and 21 percent of all children are underweight (ibid). Part of the malnutrition challenges in Africa results from ill health among young children – which in turn is linked to poor health and hygiene and lack of access to improved water and sanitation. Poor health means that the children lose the value of the food they consume. As a result close to a quarter of all births face severe short-term and long-term health consequences (ibid).

The concepts of food security and human development

The relationship between food security and human development can be traced back to the seminal work of Amartya Sen on poverty and famines (Sen 1981, Sen 1982) and his subsequent work with Jean Dreze on public interventions to avoid hunger (Dreze and Sen 1989). Sen's work was based on a new analytical framework in which hunger (and broader destitution) is seen as a consequence of "entitlement failure," or the inability of people to access and command food through legal means. This analytical framework was in contrast with the prevailing explanations

⁴ FAO statistics primarily measure access to food, and therefore do not necessarily give a good sense of the situation with regard to nutrition, which depend on food utilization and is influenced by a host of other factors.

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of (and policy responses to) famines until then, which were seen mostly as a result of a decline in food availability. Sen showed that famines occurred when certain groups could not purchase food, either because of a spike in prices, a fall in wages, or both.

This result has proved very important for famine prevention and relief, and has also provided a useful lens to study food security. Sen's approach implies that food security is not only a problem of food supply and inadequate food production. In many cases, people face hunger not because food is not available, but because they cannot afford it. They are forced to reduce their demand for food. The policy implications are important: to achieve food security, policies need to tackle both food supply and demand.

Sen's entitlements approach, as it is commonly known, is key to the concept of human development and is the basis for the Human Development Reports (HDRs). In another seminal book, *Commodities and Capabilities*, Sen outlined the foundations of an alternative view to well-being. Instead of utility maximization, Sen argued that well-being consisted on all the possible activities and social expressions a person would realize – his or her “beings and doings”. Sen called this collection of individual possibilities, the “capabilities” of people; the options any given person would have depend on his or her “entitlements” over a certain number of goods.

The “capabilities approach” is the analytical foundation of the HDRs series. The links between entitlements, capabilities and human development have been explored at length in the various HDRs and other academic publications. And the link between food security and human development is almost direct given the intellectual heritage of both discussions. However, new data and innovations in social protection call for a revision to the two-way interaction between human development and food security.

Recent papers on famine prevention in Africa – which follow the entitlement tradition - have focused on avoiding three types of failures: on production, of exchange (including markets) and response failure (Devereux 2009). While famine prevention is not the same as food security, a case can be made that these three elements are equally important to achieve food security.

Food production

Increasing food production will be a prerequisite for achieving food security. Africa has been – and for the foreseeable future will continue to be – the continent with the fastest growing population. While Africa was a net food exporter until the 1960s, it had come to rely on imports for 30 percent of its food grain needs by 2009 (FAO, 2009c). Recent global projections⁵ indicate that the population of Africa will double from today's level, reaching 1.7 billion by the year 2050, with over half of this figure being youth. Although Africa is the only region in the world to have

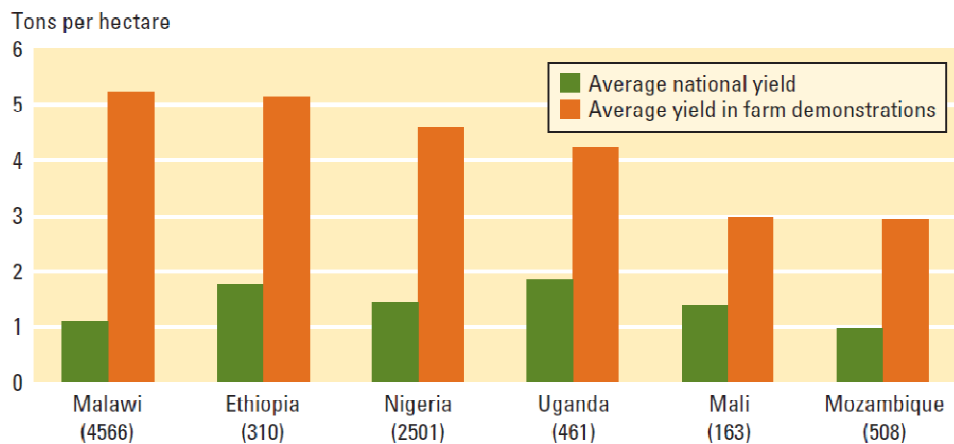
⁵ Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2008 Revision*, <http://esa.un.org/unpp>.

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experienced a modest decline in per capita consumption of milk and meat between 1961 and 2005, such consumption is projected to double between 2000 and 2050 – albeit from a low level (FAO, 2009b). The FAO (2009c) estimates that Africa will need adequate food supplies for 18 million additional people each year and to improve the nutrition status of the 94 million people currently undernourished if it is to meet the hunger-related Millennium Development Goals. This is the equivalent of achieving a 4.6 percent growth in food supplies. Thus increasing food production will be an important prerequisite to addressing food insecurity in the 21st century in Africa.

A key priority will be to close the agricultural yield gaps in Africa. Africa has the potential to significantly increase food production. Most countries are far from their maximum technical potential for growing crops. Indeed average grain yields are the lowest in the world, at less than a third of what is achieved in other developing country regions, and only a fifth of yields in developed countries (FAO, 2009a). There is abundant evidence showing that this poor agricultural performance cannot be attributed to the conditions of African soils or agro-climatic conditions in the continent. As Figure 1 shows, farm demonstrations in several African countries suggest that it is possible to increase by as much as five-fold yields in Africa.

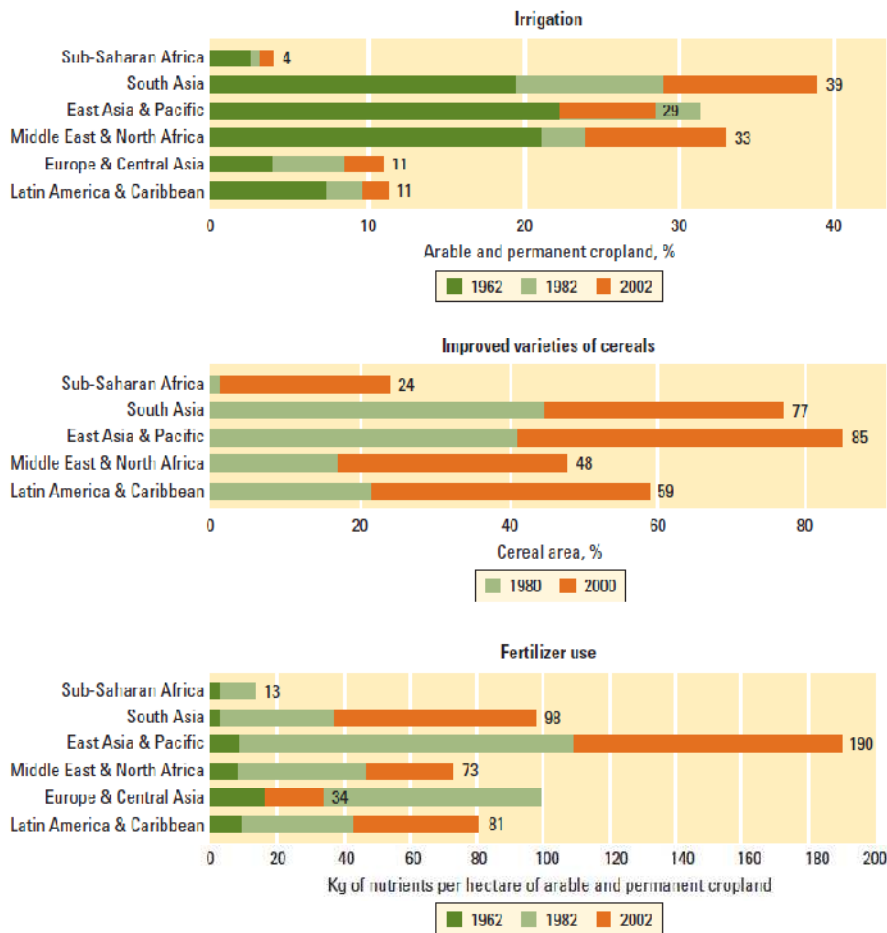
Figure 1 – Yield Gaps in Africa.



Source: World Bank (2008).

As Figure 2 shows, the intensity of irrigation, improved crop varieties, or fertilizer have barely increased since the early 1960s. For example, only 4% of African cropland is irrigated – up from 2% in 1962 – compared with almost 40% in South Asia. Inadequate infrastructure, lack of mechanization, and massive market failures in access to credit, insurance, and agricultural markets for agriculture produce also act as important constraints. In the most productive areas there is little room for increasing production through opening up uncultivated land by small holders. Hence for many areas the only realistic option for increasing production is through increasing productivity.

Figure 2 – Diffusion of Agricultural Technologies.



Source: World Bank (2008).

The broad challenges and interventions for boosting agricultural productivity are well covered in recent publications (World Bank, 2008; FAO 2009; OECD, 2008; IFPRI, 2009a; IFPRI, 2009b). Priorities include: (i) building markets and value chains, including improving access to inputs and output markets⁶ for smallholder farmers; (ii) reducing harvest and postharvest losses, namely by developing rural infrastructure (e.g. roads and storage facilities); (iii) strengthening extension services targeted to addressing Africa’s specific geo-climatic conditions; (iv) adopting favorable land tenure regimes; (v) investing in the development and deployment of appropriate technologies; (vi) creating off-farm employment opportunities, (vii) enhancing access to credit, and improving risk management strategies (including by strengthening social protection). There

⁶ Improving access to inputs goes hand in hand with improving access to outputs markets that are necessary for producers to obtain decent returns on their production some of which they can use to procure inputs. We are grateful to Michael Lipton for this observation.

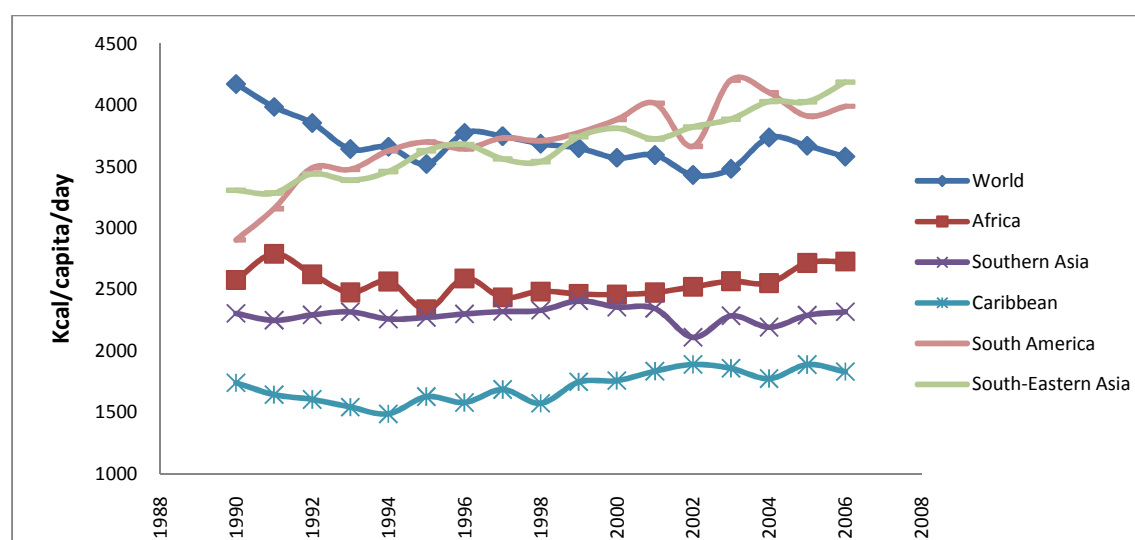
is also broad acknowledgement of the need to undertake these interventions in parallel to make them mutually reinforcing (World Bank, 2008; FAO, 2009; OECD, 2009).

Fisheries will also have an important role to play. Fish provide an important source of food and nutrition for many Africans, yet the development of the sector has been overlooked in many countries. According to a 2005 report by the WorldFish Center, the proportion of dietary protein that comes from fish is extremely high in many African countries, accounting for close to half of dietary protein for Senegalese, and closer to two thirds for Gambians (62%), Sierra Leoneans (63%) and Ghanaians (63%).

Exchange (markets and demand for food)

Food insecurity is more than a mere consequence of inadequate supply of food. The co-occurrence of bountiful harvests and acute hunger is well documented and vividly described in Amartya Sen's seminal study of poverty and famines (Sen, 1981), briefly described above. Sen's analysis highlighted the importance of understanding the differential opportunities that face different segments of society in accessing food. Recent data from Tanzania and other African countries for example show that the link between national agricultural production and nutrition is often quite slim (Wiggins 2009). Indeed, while the availability of staple food in Africa increased since the mid-1990s – with more than 2,500 kcal available per person across the continent there is on average sufficient food to meet everyone's minimum dietary needs (Figure 3) – there remains great regional and in-country variation in the availability of food, and closing the yield gap remains critical (Wiggins and Keats, 2009).

Figure 3 – Staple food availability (kcal/capita/day) across a selection of regions



Source: from Wiggins and Keats (2009), constructed by the authors from FAOStat data

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Michael Lipton (2005) shows how the Green Revolution's success was driven in part by enhancing "food entitlements" as it increased the income of poor farmers, which enabled them to access food. Devereux (2009) states that all recent acute episodes of food insecurity in Africa (Ethiopia in 1999-2000, Malawi in 2001-2002 and Niger in 2004-2005) were caused by a "failure of markets to deliver access to food at affordable prices" (Devereux 2009, p 27); this situation occurred either because of chronic poverty or a sudden spike in food prices coupled with a decline in people's wealth – which in many cases took the form of livestock.

There have been compelling analyses of how agricultural growth, by boosting rural incomes, improves peoples' ability to purchase food available on the market (World Bank, 2008). This is particularly important in the African context, given that 30 of the world's 40 most agriculture-dependent countries are located in Africa; 60 percent of the population of Africa (excluding South Africa) are rural; and some 80 percent of Africa's poorest people live in rural areas (FAO, 2009c). In these countries, primary agriculture is a source for two thirds of rural incomes while the majority of the remaining income is generated by activities that the report describes are "loosely linked to and supporting the agricultural sector" (FAO, 2009c). Thus, while poverty is a root cause of hunger in Africa, often the most effective way out of poverty is through development based on agricultural and other rural resources accessible to the poor (Conway, 2005: 705; NEPAD, 2003). Dercon (2009) argues that agricultural development is particularly critical in landlocked, resource-poor countries.

Response

In many cases social protection measures will be needed to ensure continuous access to food by the poorest and most vulnerable in the face of external shocks (including economic and climate related shocks, pests). Social protection instruments have an important role to play in addressing both acute food crises - e.g. direct cash transfers to restore assets that enable households to participate in functioning markets and ensure that health and education services continue and can be used by those affected – and chronic food insecurity – e.g. through transfers to support entitlements, including cash transfers, school feeding and public works programmes. With its focus on human capabilities, a human development approach can contribute to a richer understanding of poor peoples' vulnerabilities, which is key to designing more effective social protection instruments.

Access to food is only one part of nutritional security. Dietary variety and nutritional adequacy (in key vitamins and minerals), intra-household distribution of food, its preparation, and feeding practices are important determinants of how food is converted to nutrition, as is the ability of individuals to make use of nutrients, in turn a function of prevailing health and sanitary conditions. Here again, women have crucial roles to play as they almost universally have the primary responsibility for processing and preparing food for their families. While food

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availability and access trends are improving – albeit tentatively, slowly and unevenly – for Africa as a whole progress to reduce malnutrition has been less clear (Wiggins and Keats, 2009). This may be because some of the health and care factors have not been sufficiently addressed, or because growth has tended to be very unequally distributed. There is a broader need to better understand links between dietary/nutritional patterns and human development outcomes.

HIV/AIDS and food insecurity interact in a vicious circle of disability. Evidence shows that adequately nourished individuals are less susceptible to the complications associated with HIV and are less likely to have an early onset of full-blown AIDS. The kind of nourishment is important too. For example, fisheries products contain 12 of the 15 vitamins and minerals which are most important for the health of the HIV/AIDS affected population (FAO, 2009).

Environmental degradation and external economic shocks pose challenges for achieving food security in Africa. For example, land degradation is reducing Africa's agricultural GDP by 5 percent per year (FAO, 2009). Rapid population growth over the decades ahead will add to environmental strains leading to intensified competition over scarce natural resources with attendant increases in the risks of conflict. In this context, inefficient strategies to manage and cope with risks will constrain investments in higher yielding crops and productivity enhancing inputs (Dercon, 2009; Udry, 2009). The limited diversification of agriculture-based economies also makes these economies structurally vulnerable to external food price and commodity shocks. This was clearly illustrated during the 2007-2008 food price spikes, which caused severe macroeconomic imbalances in many food importing countries, directly impacting on balance of payments and fiscal priorities, and triggering food related riots and political/social instability in several countries (Conceição and Mendoza 2009).

Climate change will compound these challenges. Africa is the region most at risk of hunger linked to climate change. Globally the number of people at risk of hunger is projected to increase 10-20 percent by 2050 as a consequence of climate change (IFPRI, 2009). About 65 percent of the global total increase in climate-related hunger is projected to occur in Africa (ibid). This is due to weak coping capacities and the acute vulnerability of agricultural production to climate shocks and stresses⁷ resulting from: (i) the overwhelming dominance (over 95 percent) of rain-fed agriculture; (ii) increasing water stress, mainly in the Horn of Africa, North and Southern Africa; (iii) the sensitivity to even small temperature increases of many African crops which are grown close to their limits of thermal tolerance; (iv) extreme weather events such as floods, droughts and dry winds, which accelerate soil erosion and degradation (IFPRI, 2009; Conway, 2009). It is likely that some of the greatest impacts of climate change will be felt in grazing systems in arid and semi-arid areas, particularly at low latitudes. Climate change will have far-reaching consequences for animal production through its effects on forage and range productivity.

⁷ The World Development Report 2008 identifies five main factors through which climate change will affect agricultural productivity: changes in temperature, changes in precipitation, changes in carbon dioxide (CO₂) fertilization, increased climate variability, and changes in surface water runoff.

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Increasing temperatures and decreasing rainfall reduce yields of rangelands and contribute to their degradation.

Public action goes beyond the agricultural sector. It has been argued that good use of food requires efficient public services such as water and sanitation (Sen 1999). One direction in the relationship between food security and human development is regulated through nutrition – in other words, food security leads to nutrition that leads to higher human development. For this relationship to hold, access to health care, clean drinking water, sanitary facilities, and vaccination are very important. These are usually publicly provided goods, hence the importance of public action in the relationship between human development and food security, which will be explored in the next section.

Food security and human development linkages: key considerations

This section considers the complex linkages between food security and human development factors. Improving our understanding of these interactions will be helpful in giving strategic policy advice on how to improve food security in sub-Saharan Africa. These interactions run both ways, from human development to food security and from food security to human development. The transmission mechanisms, however, are different in each case.

Some aspects of these interactions are well documented. For example, food insecurity and income poverty are directly linked, since the bulk of the poor derive income from agriculture related activities with 70 percent of employment in Africa being on small-scale farms (Conway, 2005). It is not surprising therefore that GDP growth generated by agriculture is up to four times more effective in reducing poverty than non-agricultural growth (World Bank, 2008). A typical family in Africa spends between 50 and 70 percent of its budget on staple foods (Diao et. al. 2008). Past failure to grow and the neglect of agriculture have dramatically increased poverty and hunger in Africa. Recent economic growth on the other hand has reduced poverty and the associated agricultural growth is a powerful factor in reducing hunger (Binswanger 2010).

There is also good empirical evidence on the interaction between public health related factors and nutrition. For example the prevalence of bacterial and parasitic diseases has been shown to contribute greatly to malnutrition in Africa (Uthman, O.A., Aremu, 2008). Other aspects are less well understood, such as how increasing women's control over resources, improving their access to opportunities and participation in decision-making processes can be important means through which the poor and food-insecure are able to lift themselves out of hunger. Likewise further investigation will be needed in to how improved literacy and educational levels can help farmers/herders/ fisherfolk to express their needs more effectively and demand accountability from public service providers; to access and use relevant knowledge, apply best agricultural techniques, and access markets.

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Human development opportunities can also be identified in the production and processing of food. There is strong evidence, for example, to suggest that gender equality and improved health and education can contribute significantly to increasing agricultural and fisheries productivity in sub-Saharan Africa. Indeed, women farmers tend to dominate African farming systems – contributing up to 70 percent of farm labour in countries like Malawi – yet they are documented to have lower levels of productive resources than men (World Bank, 2009). Women tend to be systematically disadvantaged in terms of accessing and controlling key productive resources such as land, credit and agricultural inputs. According to the World Survey on the Role of Women in Development, published by the United Nations in 2009: "Agricultural extension services which include advisory services, information and training, and access to production inputs such as seeds and fertilizers are critical for increasing the productivity of farm activities. Despite their critical roles in agriculture, women farmers have largely been ignored by extension services in many areas." (UN, 2009). Agricultural productivity has been estimated to increase by as much as 20 percent when women are given the same inputs as men (World Bank, 2009).

Improved education and health are also likely to contribute to productivity gains. Limited farming knowledge is a key obstacle for both men and women in terms of applying appropriate agricultural techniques and technologies. The education of women is known to produce powerful effects on nearly every dimension of development, from lowering fertility rates to raising productivity, to improving environmental management. And poor health – in particular resulting from the high prevalence of HIV/AIDs, malaria and TB in many parts of sub-Saharan Africa – also directly affects the productivity of the active labour force in rural communities. A study by Yamano and Jayne (2004) in Kenya documented severe impacts of HIV/AIDS on the capacity of households to produce food, particularly in households where HIV/AIDS prematurely claims the lives of male household heads.

Conversely, food insecurity may be an important determinant of Africa's poor performance in several dimensions of human development, namely those related to income poverty, participation and empowerment, health, and education. For example, malnutrition increases susceptibility to and the severity of infections, and is thus a major cause of illness and death from disease, in fact the most important risk factor for the burden of disease in developing countries (Uthman, O.A., Aremu, 2008). There is good evidence also showing that micro-nutrient deficiency, which is widespread in sub-Saharan Africa, significantly impairs physiological and mental development, compromises immune systems, provokes birth defects, and consigns millions of people in Sub-Saharan Africa to lives lived below their physical and mental potential. Behrman (2008) and Hoddinott et al. (2008) provide further evidence of the relationship between child malnutrition and a number of economic and social outcomes. The causal effects may also be indirect – for example, when strategies to cope with hunger deplete assets and human capital usually, in a self-reinforcing spiral. This may in turn trigger conflicts over resource use thereby reversing hard won gains in human development.

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Food insecurities also exacerbate existing vulnerabilities and risks to which poor people are disproportionately exposed. Confirming much accumulated evidence, the FAO/ WFP State of Food Insecurity in the World 2009 report highlights how poor people cope with the burden of consecutive food and economic crises by reducing dietary diversity and spending on essentials such as education and health care. This has been addressed in the literature and policy debate as depletion of human capital, which often goes along with the shedding of other assets⁸. Increased food security could have a tremendous impact on human development simply by freeing up household resources for spending on other essential items such as education and health.

Areas for further research

Although several aspects of the complex interactions between food security and human development factors are well researched, there remain important knowledge gaps and the full picture is far from being well understood. One avenue of investigation is to systematically document the interactions between the determinants of food security and the most salient dimensions of human development as captured in the human development index (HDI), namely: (i) standard of living (measured by real income per capita); (ii) educational attainment (measured by adult literacy and the combined gross primary, secondary, and tertiary enrolment rate), and; (iii) longevity (measured by life expectancy at birth). But it will be necessary to go beyond the framework of the HDI to capture the full extent of food security-human development linkages.

It is also helpful to investigate the linkages in terms of the three key dimensions of food security, namely: food availability, accessibility, and utilization. Key guiding questions for further research may include the following: (i) how can human development contribute to and be strengthened through interventions to boost food production, (ii) how can continuous access to food by the poorest and most vulnerable be ensured, and; (iii) how does nutritional (in)security (impede) enable human development.

Regarding food availability, there is a rich literature on increasing Africa's agricultural productivity (e.g. World Bank, 2008; FAO, 2009; OECD, 2009). To complement this, more human development-oriented research would be helpful in addressing issues such as: (i) how education, health, gender and environmental factors affect and contribute to agricultural productivity; (ii) assessing the role and uptake of key scientific and technological solutions and institutional innovations in terms of their human development ramifications; (iii) considering how rural infrastructure, institutions (e.g. credit markets) and services (e.g. extension services) can enhance human development outcomes.

Regarding access to food, it is important to investigate both microeconomic determinants of access (for example, intra-household dynamics affecting the distribution of food, including

⁸ For example Christiaensen and Dercon (2007) and Dupas and Robinson (2009) provide evidence that standard mechanisms of risk sharing or consumption smoothing are not working in samples of households in Ethiopia and Kenya, respectively.

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gender relations), and the potential role of social protection in ensuring continuous access to food by the poorest and most vulnerable, not only during acute food crises but also in face of chronic food insecurity; this will thus be framed in the broader context of economic and social policies to build resilience to income and price shocks.

Food utilization (that is, nutritional outcomes) and human development outcomes are deeply linked. While agricultural growth has an important contribution to make to increasing food availability and accessibility, it does not necessarily address the problem of nutrition. For example, disease may hamper adequate nutrition even if access to food exists. Thus, it will be important to gain a better understanding of the links between dietary/ nutritional patterns and human development outcomes. Given the relevance of long-term effects, the problem of child malnutrition will be closely analyzed. Also, as women play central roles in food preparation and feeding and thereby providing nutrition for the family, there is value in exploring ways in which nutritional security can be enhanced by empowering women (e.g. through better education). The complex interactions of nutritional security and diseases – in particular HIV/AIDS, malaria and TB – should also receive special attention.

Adopting a human development approach to analyzing food security challenges in Africa entails a more systematic application of multi-disciplinary research methods. An approach that is distinctive from the primarily economic or sectoral approach taken in most major publications on food security in Africa. One aspect that is not currently well understood is how efforts to promote human development and food security in Africa can be better coordinated and combined so as to be mutually reinforcing. For this a better understanding is needed about the micro- and macro-level linkages and interactions between the determinants of food security and of human development outcomes in the Africa region.

This approach should also be taken to investigating food *systems*, encompassing agriculture, livestock and fisheries, as well as interlocking local and global food supply chains. The challenges of food security in Africa need to be understood within the critical context of a global food system that will need to be fundamentally overhauled in order to meet the challenges of producing for a growing and more demanding population, against ever tightening environmental and social pressures and constraints, while adjusting to major anticipated shifts in agro-ecological zones resulting from global warming.

Finally, more multi-disciplinary research is warranted, combining methods and insights from the natural and social sciences. This will allow for a rigorous treatment of cross-cutting gender, environmental, governance, HIV/AIDS and science and technology issues. Understanding how these issues interact with and affect the production, distribution, access to and utilization of food will be key to formulating effective food security responses.

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