MICHIGAN STATE UNIVERSITY | Global Center for Food Systems Innovation

AFRICA'S EMERGING FOOD SYSTEM TRANSFORMATION

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WHITE PAPER
2013 Series

USAID FROM THE AMERICAN PEOPLE

USAID Higher Education Solutions Network

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The authors gratefully acknowledge the financial support of the International Fund for Agricultural Development (IFAD) through its *Modernizing African Food Systems* grant to Michigan State University, and of the United States Agency for International Development through its funding for the *Global Center for Food System Innovation* and the Food Security III Cooperative Agreement.

Chapter 1: Introduction and Conceptual Approach

David Tschirley and Tom Reardon

1.1. Introduction

Since the end of World War II, every continent on earth has rapidly urbanized, with the worldwide urban population share rising from 29% in 1950 to 52% in 2010. This global pattern has been associated with and largely driven by simultaneous growth in agricultural productivity, which "pushed" people off the farm by allowing output prices to fall, and in manufacturing and services, which "pulled" people into the more remunerative activities found in cities and towns. Together, these processes drove dramatic increases in worldwide per capita income, which is always associated with higher urban shares in total population.

Over this period, official data indicate that no continent urbanized more rapidly than sub-Saharan Africa (SSA). The continent's urban population share rose by a factor of 3.2, from 11% in 1950 to 36% in 2010. Asia's urban population share during this period increased only 2.5 times (from 18% to 44%), and Latin America's 1.9 times, from 41% to 79%.

Yet through the late 1990s, this rapid urbanization in SSA took place in the midst of very poor performances in its agriculture and broader economy. From 1972 to 1998, World Bank Development Indicators data indicate that per capita incomes in SSA grew slower than any other area of the world: barely over half the percentage growth of South Asia, less than one-quarter that of developing East Asia, and only 28% of the world average. Predictably, indicators of broader economic change also lagged. Percentage growth in the market capitalization of listed companies in SSA from 1988 (the first year data are available) to 1998 was one-third that of South Asia and less than one-quarter of developing East Asia. Foreign direct investment increased nearly nine times in SSA from 1970 to 1998, but this compares to multiples of 153 in South Asia and 259 in developing East Asia. Again, no area of the world performed worse than SSA on this indicator. Agricultural productivity growth relative to other areas during this period was also very poor; the increase in cereal yields in SSA from 1972 to 1998 was less than 20% of that seen in developing East Asia and South Asia and only 29% of the global average. As a result of this dismal performance, the structural transformation of the economy that typically accompanies urbanization was largely absent in SSA. Through the late 1990s, we, thus, have the conundrum of rapid urbanization in Africa in the absence of what are widely regarded as its main drivers.

Africa's macroeconomic performance has improved dramatically since the late 1990s, with average growth of nearly 5% per year in real per capita incomes. Since 1998, per capita income growth in SSA has *exceeded* that in every area

of the world except for developing East Asia and South Asia, and it did not lag behind those regions by large margins. Even agricultural performance has improved, as measured by cereal yields; growth in these yields from 1998 to 2012 exceeded that in developing East Asia by 42%, nearly equaled growth in South Asia, and exceeded the world average by 22%. This growth has followed on a long-sought reversal in the decline in funding for agricultural R&D on the continent (Lynam et al, 2012).

The continent is also projected by the United Nations (UN) to continue urbanizing faster than any other in the world, with the urban population share nearly doubling from its current 26% to 51% by 2040. This growth will represent a catching-up to areas of the world that are more urbanized (have a larger share of their population living in rural areas) but less rapidly urbanizing (that share is growing less rapidly): East Asia, where the urban share is projected to rise from 54% to 76%, South Asia (32% rising to 47%), and Latin America and the Caribbean (79% rising to 85%). If urbanization and income growth in SSA continue near their recent levels, they will drive profound transformation in the continent's food system and in the level of physical wellbeing of its populace over the next several decades.

This transformation could be slowed or stalled by a variety of factors. Climate change could undermine the incipient increases in agricultural productivity that have been seen over the past decade. It could also raise the cost of supplying cities with the water and energy they need to grow, threaten large coastal populations with displacement from storms and sea level rise, and increase the cost of recovery from more serious weather events. Continued shocks to world commodity prices could threaten the food security of urban residents and raise the cost of social protection, funneling public investment away from the productivity enhancing investments that underpin sustained long-term growth. Poor governance could siphon public funds away from such investments into private hands, or drive policy and investment decisions that pursue short-run political advantage more than long-term growth and development.

Even if transformation progresses, its impact on the rate of poverty reduction will be heavily influenced by public policy choices related to economic openness, the enabling environment for private sector investment, the type and spatial pattern of public investment, and the quality of social protection programs. One of the key findings of recent research on urbanization is that its impact on poverty reduction is far greater when it occurs in a relatively decentralized fashion featuring robust growth in towns and smaller cities near production areas; such growth favors stronger growth linkages with rural areas and also makes a move to an urban – and economically better-off - existence more accessible to more rural households (Christiaensen, Weerdt & Todo, 2013; World Bank 2009).

This paper assumes that the major forces that have led to the turnaround in economic growth in SSA – ongoing now for well over a decade - will largely continue and that as a result, the region will continue to see positive growth and rapid urbanization. We, therefore, suggest that the economic and social transformations that in every area of the world have accompanied these dynamic processes will unfold with quickening pace on the continent. At the same time, we emphasize that public choices in governance, public investment, and policy enabling environments will heavily influence the pace and specific nature of the transformations. The overarching goal of this paper is to summarize the best available analysis and thinking to anticipate what these transformations might look like and what key challenges they pose for governments and development partners.

1.2. Conceptual Approach: The Five Transformations

The paper is built around the concept and empirical elaboration of the five food system transformations as first developed by Reardon (2013) and applied by him in Asia. These five interlinked transformations are taking place with gathering speed in developing countries' agrifood systems:

1. Rapidly rising urban populations, together with robust growth in per capita incomes,
2. Profound changes in consumption patterns (the diet transformation),
3. Rapid change in post-farm systems for processing, marketing, and regulating agrifood trade (the downstream and midstream food system transformation),
4. The rise of rural factor markets especially for agricultural services (the rural factor market transformation), and
5. Change in agricultural technology and in the size distribution of farms (the farm technology transformation).

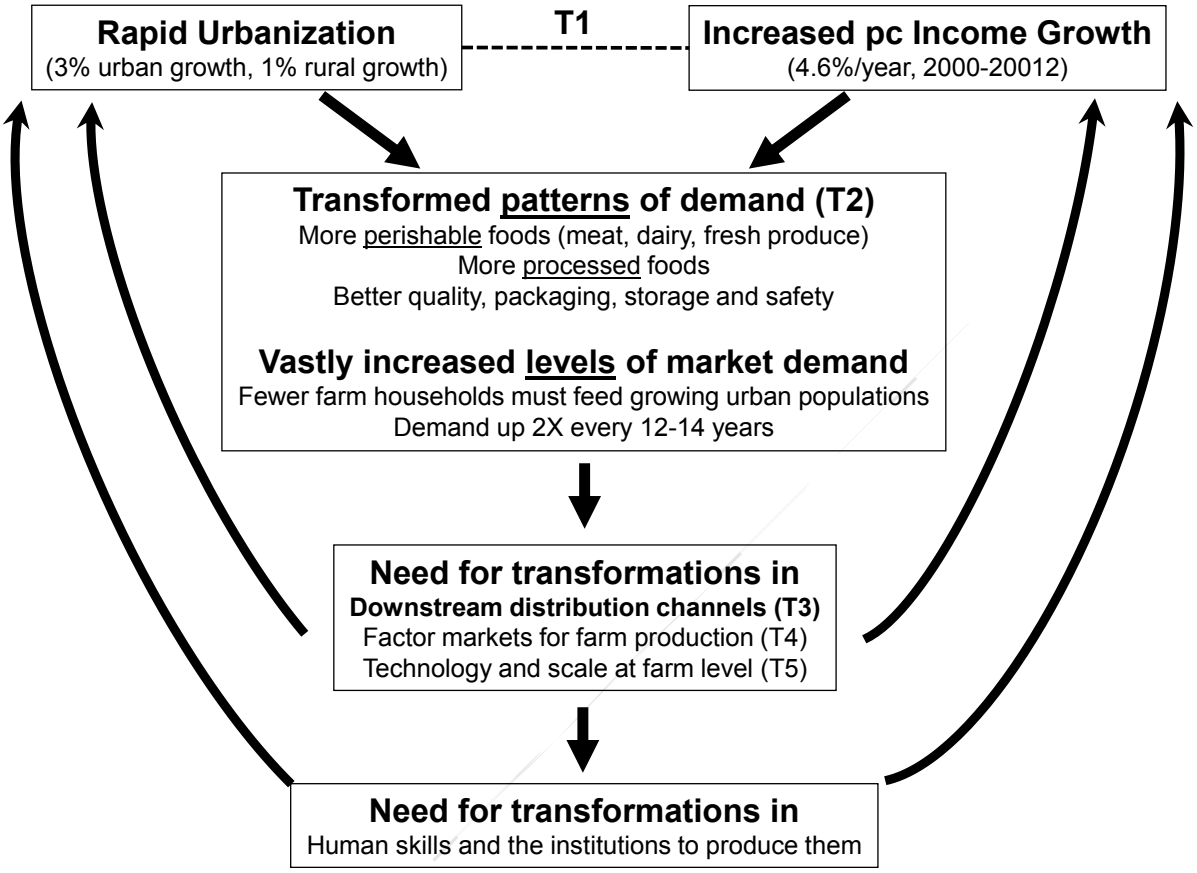
This paper focuses on the first three transformations - urbanization paired with income growth and their impact on the transformation of diets and the transformations in the "downstream" (retail) and "midstream" portions of the food system[1]. The conceptual approach is illustrated in Figure 1.1.

As noted above, SSA has been rapidly urbanizing for many years. Current estimates from the UN are that urban population growth in East Africa is over 4% per year, while in Southern Africa, which has higher urbanization levels, the growth is estimated at 2%. Overall, urban populations in the region are growing about 3% per year, but with great variability as these figures indicate. Rural populations, meanwhile, are estimated to be increasing only by 2% per year in East Africa and near zero in Southern Africa. Overall, rural populations

[1] Transformations 4 and 5 will be treated in a separate paper. This will include treatment of urban production agriculture. That paper will build directly on knowledge of the first thee transformations documented in this current paper.

are rising about 1% per year but, again, with much variation across countries and regions.

Figure 1. Transformation of developing country food systems: drivers, characteristics, and needed responses



Note: data on population and income growth are for developing Sub-Saharan Africa, World Bank. Income growth is per capita GNI in purchasing power parity terms

Before proceeding, we note that urbanization rates *per se* abstract from the "type of city" – that is whether its growth is linked or not to the surrounding rural area. This point applies the well-known concept of production and consumption linkages to consideration of the nature of town and city development (see Renkow 2007, who makes this link). On the one hand, the urban area may have developed either as emanation from those linkages, such as in the case of the growth of towns and cities in the Peanut Basin of Senegal, where the urban areas at least initially are built on clusters of services, upstream and downstream, to the agricultural areas. On the other hand, the urban area may develop as a relative enclave via the surrounding rural area (like "entrepot" cities such as Dar Es Salaam in Tanzania) or mining towns in

hinterland agricultural areas such as the Copper Belt in Zambia. In the latter case, urbanization per se may have little effect for the local agricultural area.

We note also that population shares alone underestimate the importance of urban populations in the overall food economy. Urban residents typically have lower shares of food expenditure in total household expenditure compared with rural residents but have sufficiently higher incomes that urban consumers spend more on food per person than do rural consumers. The Eastern and Southern Africa (ESA) region that is the primary focus of this paper has a relatively low urban population share, around 25%, but this urban 25% accounts for 53% of all market food purchases in the region.

Regardless of the specifics of the urbanization process (see chapter two for more on this), the high rates of urbanization seen in ESA, when paired with the income growth that has been seen over the past 15 years, results in dramatic changes in consumption. These changes are in the patterns of consumption – what people eat – and the level of consumption. With rising incomes and urbanization households eating more, they eat more fresh perishable and more processed foods, and this, together with the growth in numbers of people, delivers explosive growth in some types of foods (meat, dairy, some fresh produce items, wheat and wheat products, many new highly processed items), slow growth or even decline in others (maize and other coarse grains, roots and tubers), and vast increases over time in the total amount of food that the system has to produce, process, and distribute. It also drives greater demand for convenience, perceived quality and, eventually, perceived safety of the foods being consumed.

These two transformations – rapid urbanization (of whatever pattern and linkage with rural areas) paired with rapid income growth and the diet transformation that they drive – have profound implications for the rest of the food system. Current systems for producing, processing, distributing, and regulating food are inadequate in *kind*, not just in scale, to deliver the type and variety of foods that will be demanded 30 years hence by more urbanized and wealthier households. In Asia, there is a dual transformation going on in the downstream and midstream segments: the "modern revolution", driven importantly by foreign direct investment (FDI) and focusing first on retail and some processing, and the "quiet revolution" at first stage processing and wholesaling. This latter revolution takes place as local firms adapt to changing consumer demand and to the competition from the "modern" sector to increase their own scale of operation, provide new services, and find niches within which they can prosper in the rapidly changing system.

In SSA and ESA, the "modern revolution" of supermarket-driven retail modernization has received enormous study, while the "quiet revolution" has received very little. But, as we will see in this report, this quiet sector remains far and away the dominant sector in ESA food systems and will continue to

play a huge role for several decades even as its relative share of the market declines. Increasingly, analysts who wish to provide useful policy and programmatic advice must focus on both of these dynamics of change simultaneously; and given the lack of attention so far to the quiet revolution, this is in special need of study.

We close this chapter with four broad points about the transformations. First, they occur simultaneously and are related causally. As a result, change can be very rapid but predicting rates of change can be fraught with uncertainty. Second, policy and investment response, public and private, matter to the transformations. Policy that hinders private sector investment downstream in processing, packaging, distribution, and wholesaling (T3), or in provision of inputs and services to farmers (T4), or in scale of operation and technology use at farm level (T5) can slow transformations with unpredictable effects on the entire system. Lack of public investment in infrastructure for transport, marketing, energy (especially the electrical grid) and communications can have the same negative effects.

Third, the transformations have major implications for human skill needs. As a result, public investment in education, especially technical skills at secondary level but also tertiary technical, scientific, and policy/economics skills, is crucial to maintaining the momentum of the transformations and to channeling them in positive directions. Finally, the transformations are occurring at different rates across continents (Asia, especially East Asia, being the fastest, and SSA in general slower, though this may be changing), across countries within continents, and over space within countries. Within countries, the set of interlinked transformations is likely occurring most rapidly in areas close to urban centers. Understanding the heterogeneous and context-specific nature of these transformations is central to good policy and program design.

The paper is organized as follows. The rest of this introductory chapter lays out the five transformations that are the conceptual foundation for our analysis. Chapter 2 focus on urbanization itself, examining criticisms of the urbanization data and highlighting the patterns of change in urbanization levels, rates of growth, and spatial pattern of growth. Chapter three is built around a projection model that develops scenarios for the diet transformation in ESA from 2010 through 2040, quantifying the changes in patterns and levels of demand that are likely to be seen. Results from this chapter form the anchor around which the rest of the paper is built. Chapter four focuses on one serious negative consequence of the diet transformation – the nutrition transition in which populations that previously ate too few calories now eat too many calories, too many of which come from fat and sugars combined with too much salt and too few micronutrients. The negative health consequences of

this transition can be devastating. The chapter asks how SSA can learn from previous experience to avoid the worst aspects of the transition.

Chapter five focuses on the third transformation – changes in the downstream (retail) and midstream (wholesaling, processing, packaging, logistics), documenting what is known about the current status of the "traditional" and "modern" segments of the system and anticipating how they will change over the next 30 years. Chapter six then brings together information on one particular aspect of this third transformation: the level and orientation of FDI in Africa's food system from formal food sector companies of Western, African, and other emerging economy countries. It concludes that not nearly enough detail is known about what companies are making what investments and how their size and behavior are changing the food system in the region. Chapter seven concludes with a summary of key findings and brief highlighting of their implications for priority actions by USAID and other donors, and for high priority research to fill knowledge gaps where the best course of action is not known.

Chapter 2: Urbanization in sub-Saharan Africa

Jason Snyder and David Tschirley[2]

2.1. Introduction

The focus of this paper is on describing the transformations that have taken place to date in the food systems of ESA and anticipating how they will proceed over the next two- to three decades. Yet, *how* urbanization and income growth take place will have important implications for the rate and pattern of these transformations. In this chapter, we, therefore, examine urbanization itself. The chapter has three purposes. First, we will summarize the best thinking on the African urbanization conundrum identified in the first chapter. Second, the chapter will critically examine the African urbanization counter narrative - recent critiques of the data on Africa's urbanization, including outright denials that rapid urbanization is taking place, and summarize the consensus on this issue. Finally, after concluding that the weight of analytical opinion is that, notwithstanding valid criticisms of the UN, rapid urbanization is a robust trend in SSA, we describe the level, rate, and spatial pattern of urbanization on the continent, identifying common patterns amidst great heterogeneity and highlighting the developmental implications of the spatial pattern that urbanization has recently followed.

2.2. The African Urbanization Conundrum

Many have questioned how SSA could have experienced steady and rapid urbanization since 1950 when economic performance declined dramatically in the 1960s through the mid-1990s. Fay and Opal (2000) examine a wide range of potential explanatory factors and come to no firm conclusions. One key observation they make, however, is that while the *levels* of urbanization and income are highly positively correlated, the *changes* in these levels are not. In other words, countries with high incomes invariably have relatively high levels of urbanization, but countries that have been urbanizing and then experience a sharp downturn in economic growth almost never stop urbanizing. This was the case throughout SSA from the 1960s into the 1990s, as past urbanization created its own momentum for continued urbanization.

Gollin, Jedwab and Vollrath (2013) explain the conundrum by noting that SSA's large endowment of natural resources has led governments to under-emphasize the development of manufacturing sectors that produce globally competitive tradable goods and are generally considered the primary pull factor of urbanization. Consequently, many African cities have become "consumption cities" with workers employed primarily in non-tradable (primarily service)

[2] We thank Kendra Levine for research assistance. We also thank the International Fund for Agricultural Development, through its Modernizing African Food Systems grant (MAFS) to MSU, for additional funding to make this work possible.

sectors, rather than "production cities" with most residents employed in manufacturing.

Other authors have demonstrated that climate change, irregular rainfall patterns, and other constraining geographic factors particular to Africa have pushed desperate rural farmers into the city. (Annez, Buckley & Kalarickal 2010; Barrios, Bertinelli & Strobl 2006). Barrios, Bertinelli and Strobl (2006) give a few reasons why SSA is particularly vulnerable to variable rainfall: agriculture as a share of GDP is higher than in other developing regions; the continent is less irrigated and more reliant on direct rainfall; agro-ecological conditions are less favorable leading to "low yield potential" – in tropical regions soils are fragile and temperatures are high, and in dryer areas soils are sandy leading to low moisture retention; and chronic diseases translate into decreased agricultural labor productivity in tropical areas. These authors use econometric analysis to show that SSA is the only developing continent where low rainfall is a statistically significant driver of urbanization, a relationship reinforced during the independence era as internal migration restrictions were lifted. Annez, Buckley and Kalarickal (2010) confirm these results and also show that measures of the artificiality of borders and ethnic fractionalization, both proxies for civil unrest, are significant and positive drivers of urbanization. They also deemphasize the role of "urban bias":

> *"The clearest finding from this work is that it is not subsidies and urban bias that are necessarily driving urbanization trends in Africa. There is strong evidence that exogenous climate conditions and civil unrest in the countryside in many countries are driving rural migrants to cities in many of the African countries. Deeply binding constraints on economic activity in the countryside have turned many cities in Africa into refuges."*

A third explanation of the conundrum lies in the observation that the push and pull factors of urbanization – agricultural productivity growth in rural areas and economic growth in the non-farm economy of rural and urban areas - are important mainly in the context of rural-to-urban migration. Yet, most research shows that such migration has not been the main contributor to urban population growth in Africa. Cohen (2004) shows that most urban growth recently on the continent has occurred by natural increase and by the reclassification of land near cities as urban, presumably as population densities rise in these areas. This contention is echoed by Beauchemin and Bocquier (2004) and by McGranahan et al (2009). Djurfeldt and Jirström (2013) summarize the literature and also conclude that natural increase and reclassification, not rural-to-urban migration, have become the predominant drivers of urban growth in SSA over the last 30 years. Part of the reason for this fact is that urban death rates are lower than in rural areas, but the rural-urban gap in fertility rates has been much smaller. These authors speculate that the reason birth rates are not dramatically lower in urban areas is that

"the youthful profile of migrants and their rural background has maintained rural reproductive behavior."

Summarizing, the literature attempts to explain Africa's urbanization conundrum in three ways. First, that the conundrum does not exist because the push and pull factors on which the conundrum is based are most relevant for rural-to-urban migration, and this factor has been a less important contributor to urbanization in Africa than in other continents. Second, that the unbalanced importance of natural resource endowments in many African countries has created "consumption" cities that depend less than cities in other areas of the world on growth in agriculture and the manufacturing sector. And, finally, that continued urbanization in the midst of slowdowns in growth is in fact the norm, not the exception, and that Africa is unusual only in the extended period of time over which this occurred.

2.3. The Urbanization Counter-Narrative

Potts (2012a, 2012b) is the leading advocate of the urbanization counter narrative in SSA. She argues that over the last few decades urbanization has significantly slowed on the continent and, in some cases, even reversed. One key basis for this contention is the observation that rural-to-urban migration has often been circular, with unsatisfied urban migrants moving back to the countryside. Potts and others have attributed the circular migration pattern to a variety of factors, including stagnant urban economic growth and increasing urban poverty levels, beginning with the oil price shocks of the 1970's, debt crises, and, subsequently, what they see as the deleterious effects of structural adjustment programs imposed by the International Monetary Fund (IMF) and the World Bank (Potts 2012a; Djurfeldt & Jirström 2013; Beguy, Bocquier & Zulu 2010).

Beguy, Bocquier & Zulu (2010) evaluate migration flows through two urban slums in Nairobi. They find that a majority of the inhabitants were short-term migrants who moved on quickly due to lack of amenities and opportunity; nearly half of those who left the slum moved back to rural areas, while the rest moved to other slums or to non-slum areas of Nairobi. Circular migration carried with it a gender dimension, with females being more likely to migrate in and out of slum communities than males. The importance of circular migration is consistent with the observation, noted in the previous section, that most urban growth is now taking place through natural increase, not rural-to-urban migration.

Using published census data and drawing upon other authors, Potts claims that Zambia, Cote d'Ivoire, Mali, and the Central African Republic have de-urbanized in the last two decades, while many other countries, including Sudan, Senegal, Ethiopia, Uganda, Malawi, and Mozambique, have urbanized very slowly. On the other hand, Potts acknowledges that some countries,

including Cameroon, Tanzania, and Kenya have "experienced more vigorous urbanization". Many countries are not included in her analysis, and she gives a variety of reasons, including the fact that some have historically been highly urbanized (South Africa, Congo, Botswana), a lack recent reliable census records (DRC and Angola), and a recent history of civil war (Sierra Leone and Liberia). But, she argues, her conclusions are relevant because the countries included in the analysis account for a population of approximately 500 million, more than half the population of the continent (Potts 2012b).

To reconstruct population estimates for Nigeria, Potts draws heavily from Africapolis (2008), a systematic study of West African urbanization supported by the French Development Agency. Africapolis (2008) integrates census and satellite data using geo-statistical techniques to generate alternative population estimates of urban areas, which they define as settlements with over 10,000 inhabitants. Furthermore, they estimate that Nigeria's urbanization level in 2010 was 30.6% and will grow only to 30.9% by 2020, much lower than the 49% and 55%, respectively, that the UN estimates[3]. For West Africa as a whole, they estimated the urbanization level in 2010 to be 33.6% and project it to grow to 34.6% by 2020, again much lower than the 44.6% and 50.5% estimated by the UN data (Africapolis Team 2008). A country level breakdown of the differences between the Africapolis data and the UN data can be seen in Figure 2.1. In 13 of the 14 countries that can be compared, Africapolis figures for urban population are lower than the UN figures; overall in West Africa, Africapolis estimates nearly 40 million fewer urban residents (98 million compared to 137 million) than the UN in 2010.

[3] Note that the UN defines urban as settlements of over 20,000 inhabitants (not the 10,000 used by Africapolis). This doesn't make much of a difference. In the Africapolis report it is noted that, even if using the UN definition, the urbanization rate in 2006 is estimated to be 30%, very close to its estimate of 30.6% for 2010.

Figure 2.1. West Africa Urban Population Numbers according to the UN data and Africapolis (Africapolis Team, 2008)

Urban population according to the UN (in thousands)

	West Africa	Benin	Burkina	Côte d'Ivoire	Ghana	Guinea	Guinea Bissau	Liberia	Mali	Mauritania	Niger	Nigeria	Senegal	Sierra Leone	Togo
	pop urb	pop urb	pop urb	pop urb	pop urb	pop urb	pop urb	pop urb	pop urb	pop urb	pop urb	pop urb	pop urb	pop urb	pop urb
1950	6 319	99	153	250	810	176	51	107	282	21	107	3 468	438	246	58
1960	12 224	215	214	629	1 657	327	75	196	444	61	177	6 845	754	392	159
1970	21 963	472	313	1 495	2 625	610	88	361	697	168	371	12 208	1 321	631	455
1980	36 735	1 014	601	3 081	3 550	1 080	140	657	1 122	411	778	20 311	2 100	942	687
1990	59 941	1 786	1 226	5 079	5 677	1 691	286	967	1 789	772	1 202	33 325	3 075	1 346	1 192
2000	**93 004**	**2 770**	**1 971**	**7 423**	**8 856**	**2 547**	**407**	**1 666**	**2 787**	**1 026**	**1 801**	**53 048**	**4 200**	**1 605**	**1 974**
2010	137 194	4 151	3 286	10 217	12 811	3 546	556	2 652	4 503	1 393	2 633	78 845	5 710	2 375	3 094
2020	193 415	6 081	5 424	13 771	17 336	5 373	825	3 972	7 207	1 887	4 208	109 772	7 743	3 318	4 534

Urban population according to Africapolis (in thousands)

	West Africa	Benin	Burkina	Côte d'Ivoire	Cape Verde	Ghana	Guinea	Gambia	Guinea Bissau	Liberia	Mali	Mauritania	Niger	Nigeria	Senegal	Sierra Leone	Togo
1950	4 661	89	82	142	10	470	97	26	46	23	107	0	40	3 032	358	91	49
1960	10 067	203	143	397	32	1 171	156	26	50	65	187	0	84	6610	655	158	130
1970	19 287	421	316	1 232	50	2 154	585	64	119	190	479	76	216	11 378	1 198	342	461
1980	32 081	1 120	705	2 762	75	2 993	1 068	159	129	484	977	306	519	17 235	2 176	630	748
1990	51 056	1 788	1 453	4 723	109	4 457	1 627	328	211	763	1 484	701	1 077	27 026	3 199	903	1 202
2000	**74 647**	**2 757**	**2 403**	**6 980**	**171**	**7 201**	**2 274**	**546**	**330**	**1 041**	**2 145**	**836**	**1 667**	**38 769**	**4 294**	**1 231**	**1 921**
2010	97 746	4 025	3 635	9 495	257	9 966	2 859	740	558	1 639	2 900	998	2 267	50 241	5 427	1 549	2 753
2020	124 830	5 217	4 801	12 064	343	12 997	3 465	969	760	2 016	3 713	1 166	2 827	61 823	6 568	1 912	3 568

It should be noted that the recent Africapolis report on East and Central Africa comes to the opposite conclusion for that region, i.e. that the urbanization level there is greatly underestimated by UN data (Africapolis Team 2010). Potts does not consider these conclusions in her critique of the urbanization narrative.

As can be inferred from the differences between the UN and Africapolis data in West Africa, a second basis for the urbanization counter-narrative is criticism of the UN data (Potts 2012a, Potts 2012b, Cohen 2004, Africapolis Team 2008, Bocquier 2005, Satterthwaite 2010). At least three criticisms have been made. The first is that there is a lack of recent, reliable, and consistent census data for SSA. The second criticism is that estimates are based exclusively on census data and are not verified by other methodologies, while the third criticism is that the UN's future projections are usually incorrect due to the use of old census data or a misspecified model. Each of these will be discussed in turn.

The UN relies on census data or another "official population estimate" to make its current year estimations. Many SSA country level censuses come out approximately every ten years. In Kenya, for example, the census is conducted in the 9th year of every decade, most recently in 2009. But, in some countries, the censuses are much less frequent. In Nigeria, the most recent census was conducted in 1991, and in 1963 before that (United Nations 2011, World Urbanization Prospects). Satterhwaite (2010) characterizes the situation thus:

> "*The lack of recent census data is particularly notable in sub-Saharan Africa – in part, because censuses are seen as expensive and international donors have been reluctant to support them. This means, however, that urban population statistics for many SSA*

nations for 2000 or 2005 are based on projections from census data, with the most recent census being in the 1980s or early 1990s."

The Africapolis West Africa report reiterates this message, stating that the current UN estimates are "based solely and uncritically on old data" (Africapolis Team 2008).

Potts (2012a), who makes a special study of Nigeria, argues that even the infrequent estimates of Nigeria's population are unreliable ("deeply contested"), and, often, the results are not made available in disaggregated form. She emphasizes that the census process is highly political with strong incentives by city authorities to exaggerate population numbers in order to attract a greater share of national resources.

The United Nations does not have a standardized definition of what constitutes "urban" but instead follows each country's definition. This approach has been criticized by a variety of authors (Satterthwaite 2010; Cohen 2004; Africapolis Team 2008). According to Satterthwaite (2010), the approach can create much inconsistency given that "the current population of most of the world's largest urban areas can vary by many million inhabitants, depending on which boundaries are used."

Cohen (2004) provides examples of this inconsistency. The threshold for "urban" in Benin has historically been 10,000 inhabitants, while the thresholds in Angola and Ethiopia have been 2,000 inhabitants. In other countries, other socio-economic factors are also considered in the criteria of "urban". For example, in Botswana, a settlement of 5,000 or more people is considered urban as long as at least three-quarters of the economic activity is nonagricultural.

The second criticism of UN urban population data is a lack of methodological diversity. Africapolis (2008) criticizes the data for relying only on census data without verifying the "material existence of these agglomerations" using satellite data or other sources. That is, the UN data is "purely statistical". In West Africa, this approach leads to an overestimation of the urban population, while in East and Central Africa, it leads to an underestimation (Africapolis Team 2008; Africapolis Team 2010). Africapolis's work is explicitly oriented to correcting this failing of the UN data.

The final criticism of the UN data is that their projections are incorrect, as shown by frequent revisions. Brockerhoff (1999) demonstrated that population projections to the year 2000 made in 1996 were often very different than projections to 2000 made in 1980. While the projections for Africa were both upwardly and downwardly revised for various countries, at a regional level, all of the projections were downwardly revised in 1996 except in West Africa. The most extreme case was Middle Africa, which was downwardly revised by 26%.

The basic problem was that "early projections of urban growth in African countries were based on too few reliable data sources to be taken seriously, or that these projections were subsequently nullified by unforeseen patterns of migration."

While it is expected that population projections will be updated as new data is made available, Potts argues that the earlier overestimates were systematic in nature: "The roots of the overestimations in this region lay in the extremely rapid urban growth experienced in many countries in the 1960s in particular, which for very many coincided with the ending of colonial rule" (Potts 2012b).

UN projections of future urban population share are also criticized. These projections are based on a two-step process. The first step involves calculating an average rate of change in the urbanization level between the two most recent censuses, which is used to project population going forward assuming a logistic growth pattern. In the second step, each country's urbanization level is normalized using a "world norm" regression equation. The urbanization level of each country is then linearly converged to a hypothetical global urbanization level (United Nations 2012).

Bocquier (2005) argues that the UN's model "systematically biases the urban estimates upward", and proposes instead the use of a polynomial model. She argues that the UN urban population projections for 2030 may be overestimated by up to 19% globally and by over 30% for Africa. Cohen (2004) argues along the same vein that "the UN urban projections have been most reliable for OECD and least reliable for countries in sub-Saharan Africa." He goes on to argue that the projections implicitly rely on assumptions of robust economic growth for decades to come, and that there is not enough discussion of uncertainty. This is echoed by Satterthwaite (2010) who argues that there is no reason to assume developing nations will continue to urbanize rapidly if they lack a "comparative advantage within the global economy".

Based on the research cited above, a view of slowing urbanization in SSA has gained some traction in the literature. Most analysts do not agree, however, that urbanization in general has stagnated. For example, Parnell and Walawege (2011) acknowledge Potts's contention that there are important regional differences in urbanization rates and that urbanization in "Africa has a long tradition of return migration, oscillating migration and circular migration – making it very difficult to detect or measure patterns of population settlement change over time." Yet, these authors still conclude that urbanization on the continent is an "unambiguous trend".

Beauchemin (2011) comes to a similar nuanced conclusion:

> *"Finally, it would be false to conclude that urbanization is generally declining in sub-Saharan Africa, although a slowdown in urban*

> *growth is clearly perceptible, due largely to a lesser contribution of migration. Furthermore, the commonly held notion of an 'explosive' urbanization process is challenged by several regional or national case studies, which show that urban-to-rural migration is increasing, while rural-to-urban migration is tending to decline..."*

Potts does not account for the Africapols report on East and Central Africa (Africapolis Team 2010), which directly contradicts the general conclusion that the UN data is an overestimate. Potts also does not highlight the conclusion in the Africapolis report on West Africa (Africapolis Team 2008) that overall, urban growth is robust:

> *"481 new agglomerations will cross the threshold of urban between 2000 and 2020. By then, West Africa will have as many agglomerations as North America. In 2020, the urban population of the 16 countries of the region will thus reach 124 million inhabitants compared to 74 million in 2000… Even if the projections based on the Africapolis database provide lower urbanization rates than those generated by the UN database, it does not follow that urban growth in Africa will be weak. On the contrary, its rate will remain one of the strongest, perhaps the strongest growth rate in the world."*

Despite its deficiencies, the UN data is still the most complete and accessible database available. The Africapolis data benefits from a geo-statistical approach, but its data is currently difficult to access at a country level.

We conclude from this review that urbanization is occurring in SSA and is high enough, when combined with the income growth of the past 10-15 years, to drive major transformations in food systems. Estimates for individual countries will have some error and, possibly, an upward bias in West Africa and downward bias in East and Central Africa. They should, therefore, not be interpreted as precise estimates but as indicators of the direction and general dimension of change.

2.4. Patterns of Urbanization

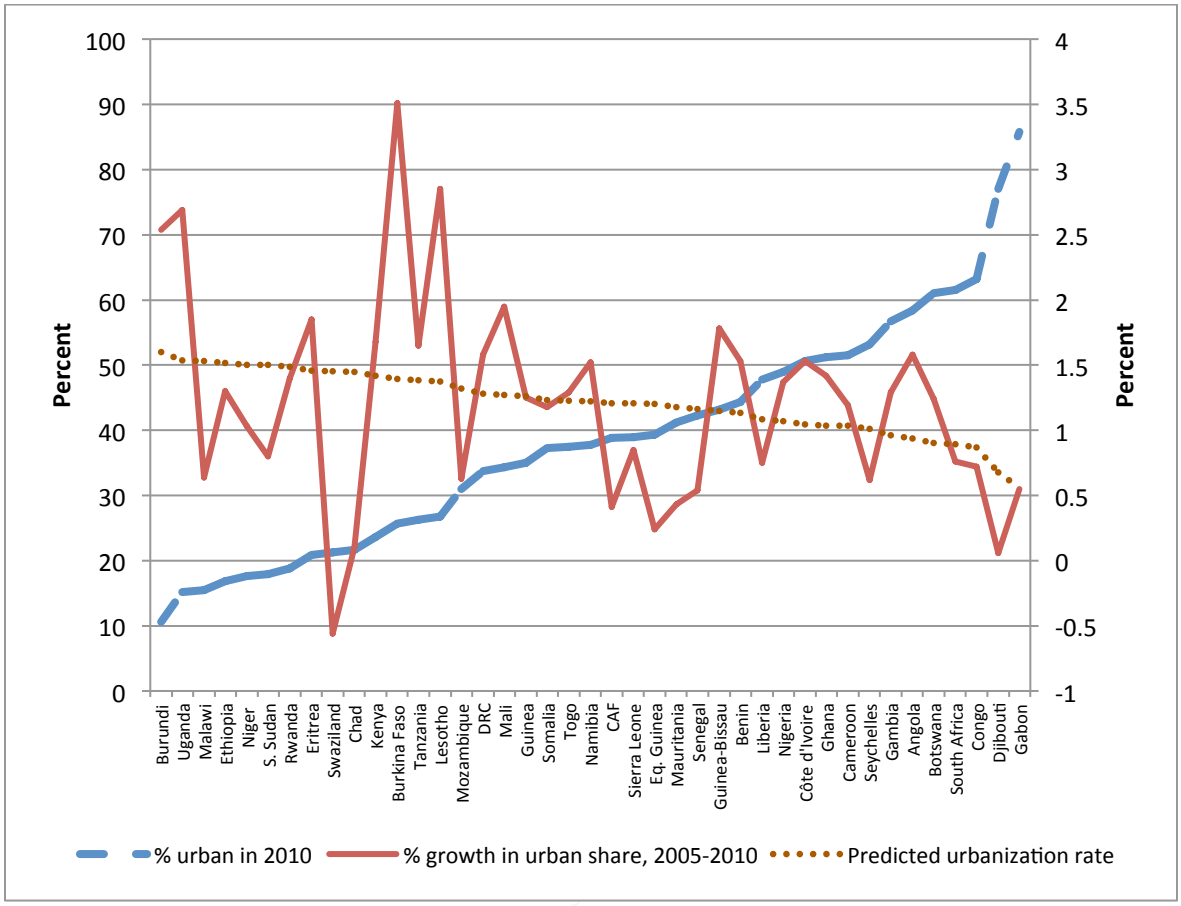
The dominant source of data on urbanization is the United Nations World Urbanization Prospects (http://esa.un.org/unup/). We use these data in this chapter. Our terminology is as follows. *Urbanization* refers to a rising share of urban population in total population; a country is urbanizing if year-over-year a larger share of its population is living in urban rather than rural areas. The *level* of urbanization is the share of a country or region's total population that resides in urban areas at a point in time. The *rate* of urbanization is the annual growth rate of that share, i.e., the percent by which the urbanization level is increasing each year. Finally, we focus on one key spatial dimension of urban population growth, its centralization, understood as the extent to which urban

population growth is taking place in many or few cities and towns. Since there is no uniquely accepted definition of concentration, we use three indicators: (1) the share of a country's total urban population that resides in its largest city; (2) the shares that reside in large cities (over 1 million), large towns and smaller cities (100,000 to 1 million), and smaller towns (below 100,000); and (3) a Herfindahl Index that computes the concentration of urban population across all settlements above a defined size.

2.5. Urbanization Levels and Rates

Figure 2.2 orders all countries of continental SSA in ascending value of their urbanization level in 2010, and graphs this along with their observed urbanization rate from 2005 to 2010 and their predicted urbanization rate from a linear regression on urbanization level. Three patterns stand out. First, African countries show enormous variation in their level of urbanization, from 10% (Burundi) to nearly 90% (Gabon). Second, the urbanization rate shows a statistically significant negative relationship ($p=0.05$) with urbanization level, with the predicted urbanization rate falling from 1.6% to about 0.56% across these countries. This means that urban populations grow more slowly in percentage terms the higher they are as a share of total population. This negative relationship is fully expected. Because we calculate urbanization rate as the growth rate of a share, its mean across a number of countries must necessarily decline as the share increases; countries with low urbanization levels can (if other drivers are in place) see that level rise rapidly over time, while countries that have already reached high levels of urbanization necessarily cannot experience the same sustained and rapid rises.

Figure 2.2. Urbanization level, rate, and predicted rate in SSA



Source: Author computation from World Urbanization Prospects data (http://esa.un.org/unup/unup/index.html)

The third pattern is that this statistically significant and predictable relationship, nevertheless, shows great variability, with countries of similar urbanization level sometimes showing dramatically different urbanization rates. To give only one example, Chad's urbanization level is slightly lower than that of Burkina Faso, but the latter has a dramatically higher urbanization rate.

Finally, the variability in this relationship is much greater at lower levels of urbanization, as shown by the larger fluctuations of actual around predicted urbanization rate on the left side of the graph, fading into a fairly close relationship on the right side. This high dispersion around predicted urbanization rate at low levels of urbanization highlights the role of other drivers in the urbanization process: largely, rural societies can urbanize quite rapidly if the right drivers are in place but can remain heavily rural for

extended periods if those drivers are absent or weak. We discuss these drivers below.

Regional patterns are apparent in the urbanization data. East Africa is the least urbanized and West Africa and Southern Africa the most: in 2010, only 23% of the population in East Africa lived in urban areas, while in West Africa, this level was 44%, and in Southern Africa, it was 59%. Yet, great variability also exists within regions. For example, within West Africa Niger's urban share was 18% in 2010, while in Gambia, it was 57%. In East Africa, Ethiopia's urban share was 17%, while in Zambia, it was 39%. As might be predicted from the discussion above, Southern Africa, with the highest urbanization level, has the lowest urbanization rate, at 0.8% between 2005 and 2010. Urbanization rates in East, West, and Middle Africa all lie very close to 1.3%. Again, national variability exists within these regional trends. For example, in East Africa, Kenya's urbanization rate from 2005 to 2010 was 1.7%, while in Mozambique, it was only 0.6%. In Southern Africa, Botswana's rate was 1.2%, while in South Africa, it was 0.76%.

2.6. The Spatial Pattern of Urbanization

The spatial pattern of urbanization in SSA is important in the discussion of policy. Cohen (2004) criticizes how the UN population reports are often interpreted by decision makers and the general public to mean that soon, most people in Africa will live in mega-cities. He points out that an important and often overlooked aspect of urban growth is the development of smaller market towns, along with transportation and communication networks that blur the rural/urban divide and make it difficult to consistently define "urban". Ruhiiga (2013) makes similar points in a study of urban agglomeration trends in East Africa. He documents the quantitative importance of growth of towns and smaller cities and notes that they are diversifying their economic base and generating strong linkages to rural areas. We will see below that, across the continent, the growth of such towns and smaller cities has been a major contributor to urbanization in Africa over the past few decades.

Christiaensen, Weerdt & Todo (2013) and World Bank (2009) echo many of these points, showing that diversification of the rural non-farm economy and development of secondary towns has more positive effects on poverty reduction and inclusive growth than highly centralized urban growth. These points are important in the development debate in light of the growing inequality that characterizes much current African economic growth and the very wide and growing disparities in income at this point between urban and rural areas.

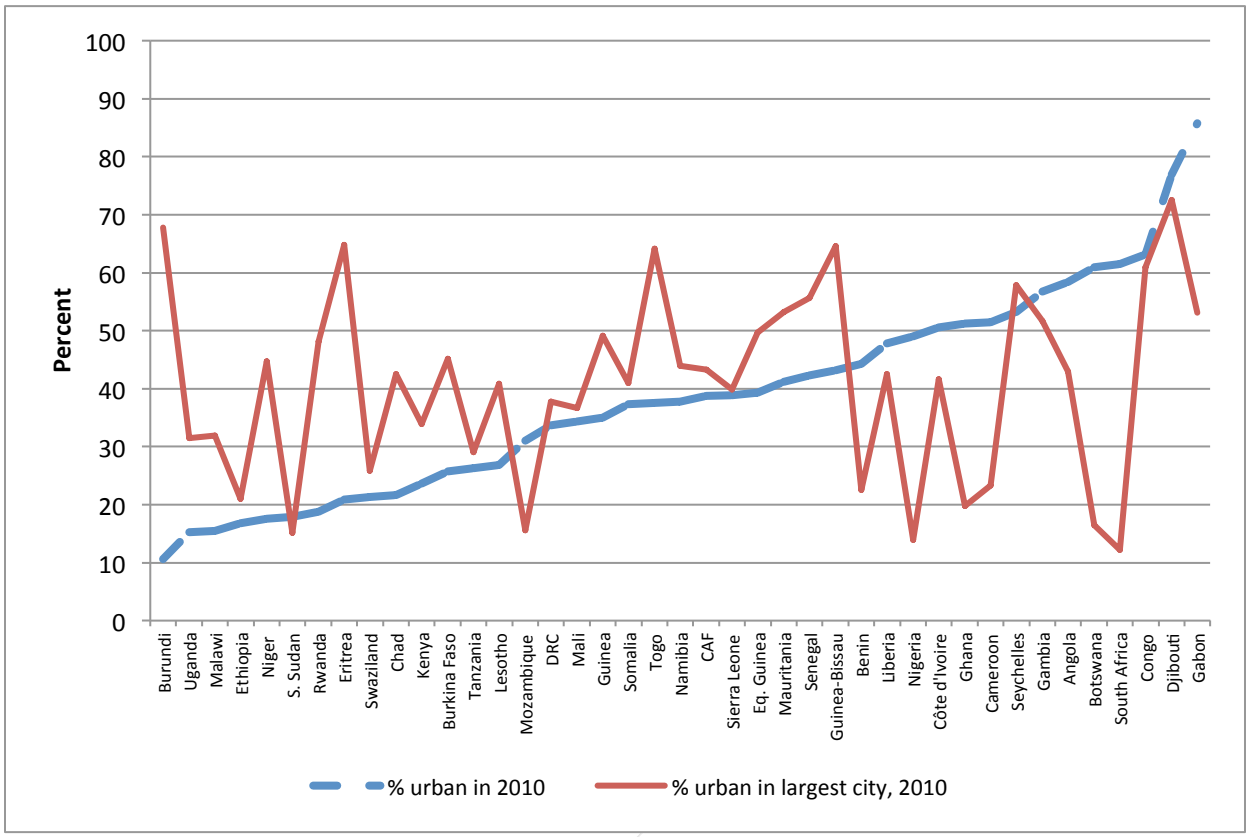
Our three measures of the centralization of urban population are the share of total urban population in the largest city, a Herfindahl Index computed across all towns above 20,000, and the share of urban population in three sizes of settlement: towns less than 100,000, larger towns and cities between 100,000 and 1,000,000, and cities above 1,000,000.

Box 2.1. The changing role of women in migration

Male migration has historically been the predominant form of migration in developing countries. This has been especially true of the circular migration seen so much in SSA. In many parts of the continent, however, women are now, more than ever, migrating as a means of meeting their own economic needs rather than migrating to join a husband and family (Adepoju 2006). The feminization of migration has also stemmed from the demand for services including that of domestic workers and other professions typically dominated by women. Still other studies have shown that in northern Tanzania, for example, the opportunities for migration appear to be especially important for marginalized women.

Figure 2.3 graphs the level of urbanization against the percentage of the urban population in the largest city. This percentage varies greatly, with five countries having 20% or less of their urban population residing in the largest city, and six countries where 60% or more reside in the largest city. However, we find no apparent relationship between the two variables; both highly urbanized and mostly rural countries appear equally likely to show high or low concentration of their urban populations. This pattern too highlights the important role of other drivers of the spatial pattern of urban population growth. Crucially, these drivers include the pattern of public investment in roads, water supply, electrification, and sanitation.

Figure 2.3. Urbanization level vs. share of urban population in largest city in SSA



Source: Author computation from World Urbanization Prospects data (http://esa.un.org/unup/unup/index.html)

The Herfindahl Index is:

$$HI = \sum_{i=1}^{N} (s_i)^2$$

where s_i refers to the share of a given city or town in total urban population, N is the total number of cities and towns, and $\sum_{i=1}^{N} s_i = 1.0$. HI varies from a value of zero, indicating that urban population is spread across many different cities of nearly equal size and small share indicating, to 1.0, indicating that all urban population is concentrated in one city.

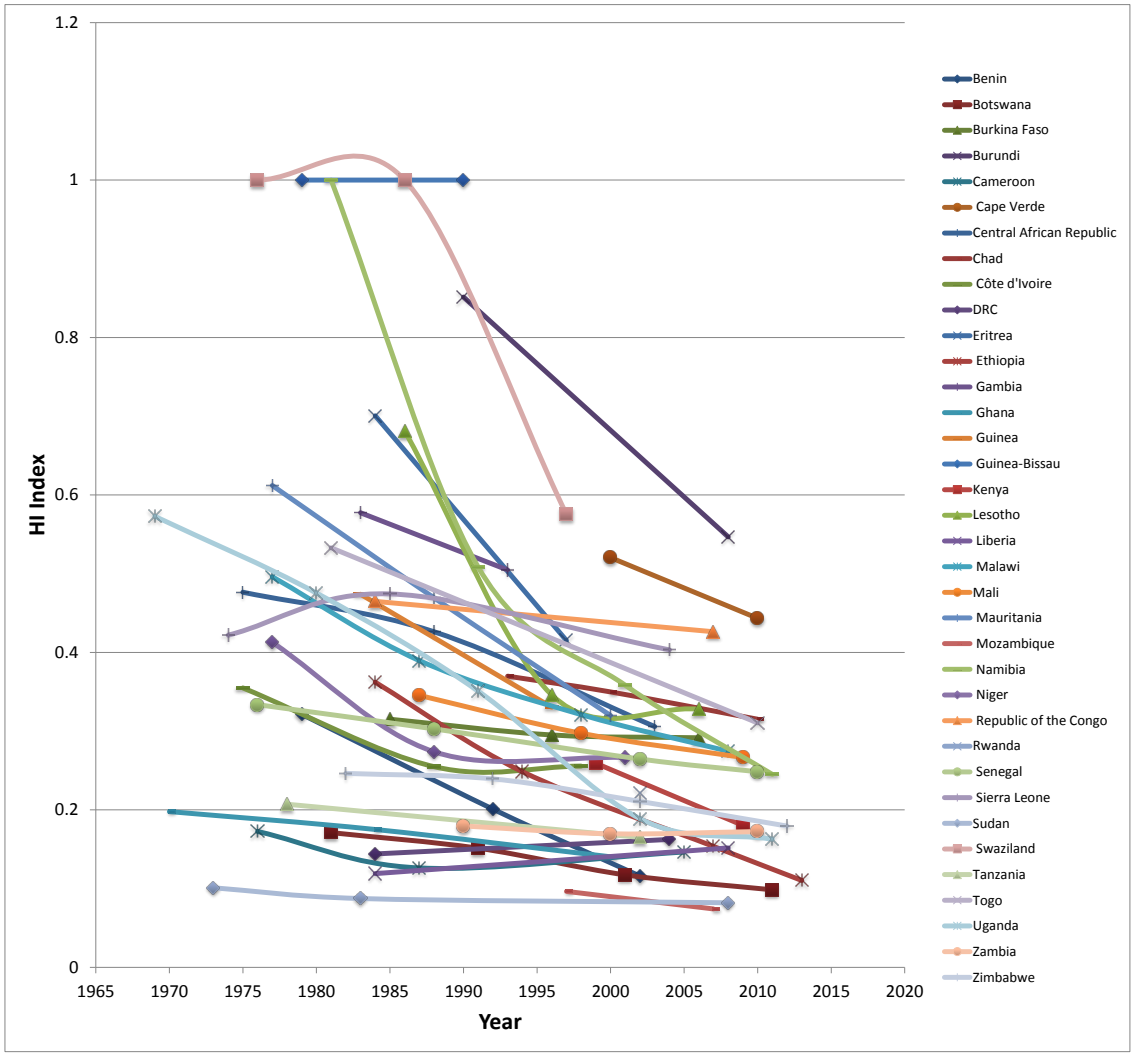
We use data from citypopulation.de to construct our index. This site brings together population data on all settlements above defined sizes in countries across the world, using primarily census data. We use all census years in which the data appear to be complete and apply a minimum size cut-off of 20,000 inhabitants in order to apply the same standard to all countries (20,000 is the highest cutoff seen in the data).

Figure 2.4 plots the Herfindahl Index for all survey years of all countries that had at least two years of data in the citypopulation.de database. Two patterns stand out. First, across the group of countries, as a whole, the index demonstrates a strong negative trend over time. This means that urban settlement patterns are becoming less centralized. Second, the indices show strong convergence over time, with the countries with the highest indices (i.e., the most centralized urban populations) declining the most (becoming markedly less centralized in their urban settlement pattern), while those with the lowest starting indices remain nearly flat. For example, compare Namibia and Swaziland with Sudan and Ghana. The first two started with highly centralized urban populations and became much less centralized, while the latter two had a decentralized pattern from the beginning and became very slightly more decentralized. In between these groups is a country like Uganda, which started in the middle of the pack and declined in concentration along with most other countries.

Simple regression analysis sugg,ests, however, that this pattern is not a function of time *per se* but of the total size of the country's urban population, which has risen over time (Table 2.1). Controlling for urbanization level and year, we find that this measure of centralization of the urban population is strongly negative associated with the country's total urban population. The insignificant coefficient on urban share in the regression also reinforces our finding from the graphical analysis, showing that centralization shows no relationship to a country's urbanization level.

Our final analysis of the spatial pattern of urbanization focuses on the distribution of urban population across settlements of various sizes. For all census years for all countries available on citypopulation.de, we compute population and urban population share in cities of three size classes (20,000 – 100,000, 100,001 to 1,000,000, and over 1,000,000) and plot them against time (Figures 2.5-2.7). We use 20,000 as the cutoff to be consistent across all countries: countries use various cutoffs to define an urban settlement, with 20,000 being the highest. Three patterns stand out. First, in the plot of towns of 20,000 to 100,000, countries that had no cities above 100,000 in their first survey year and who, therefore, had a 100% share in this smallest category (Namibia, Botswana, Lesotho, and Cape Verde), saw that share drop sharply as the cities grew beyond this size limit. Second, other than these few countries, the urban share of cities in this category remained roughly constant over time across the vast majority of countries, with all of them bunched between about 10% and 50% throughout the period.

Figure 2.4. Herfindahl indices of the urban settlement populations in SSA, 1970 - 2012



Source: Author's elaboration with data from citypopulation.de

Table 2.1. Regression results explaining Herfindahl Index of centralization of urban settlement in SSA

Variable	Coefficient	P value
Urban share in total population	-0.092	0.407
Total size of urban population	-2.64 e-08	0.000
Year	-.000722	0.685
Constant	1.838	0.604

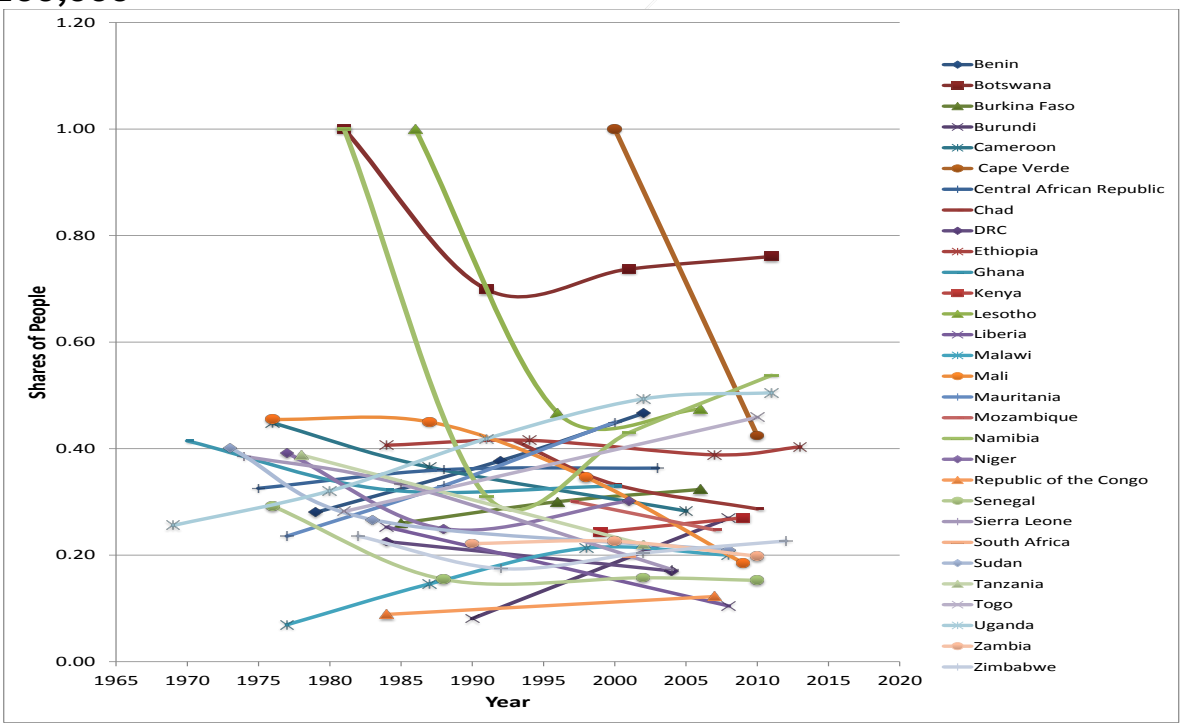
Adj R sq = 0.225. # of obs = 79. Span of years included in analysis: 1969 to 2013. Dependent variable = Herfindahl Index of concentration of urban population.

Source: citypopulation.de

Third, in the plot of the largest size category (over 1,000,000; Figure 2.7), six of the eight countries with at least two years of data saw a decline in the share of urban population in these large cities. In all six cases, nearly all the decline was taken up by cities in the 100,000 to 1,000,000 category, with smaller cities and towns below 100,000 maintaining a steady share. These patterns echo Ruhiiga (2013) and are consistent with the story emerging from our other two indicators, that as urban populations grow over time, the urban settlement pattern is becoming less centralized.

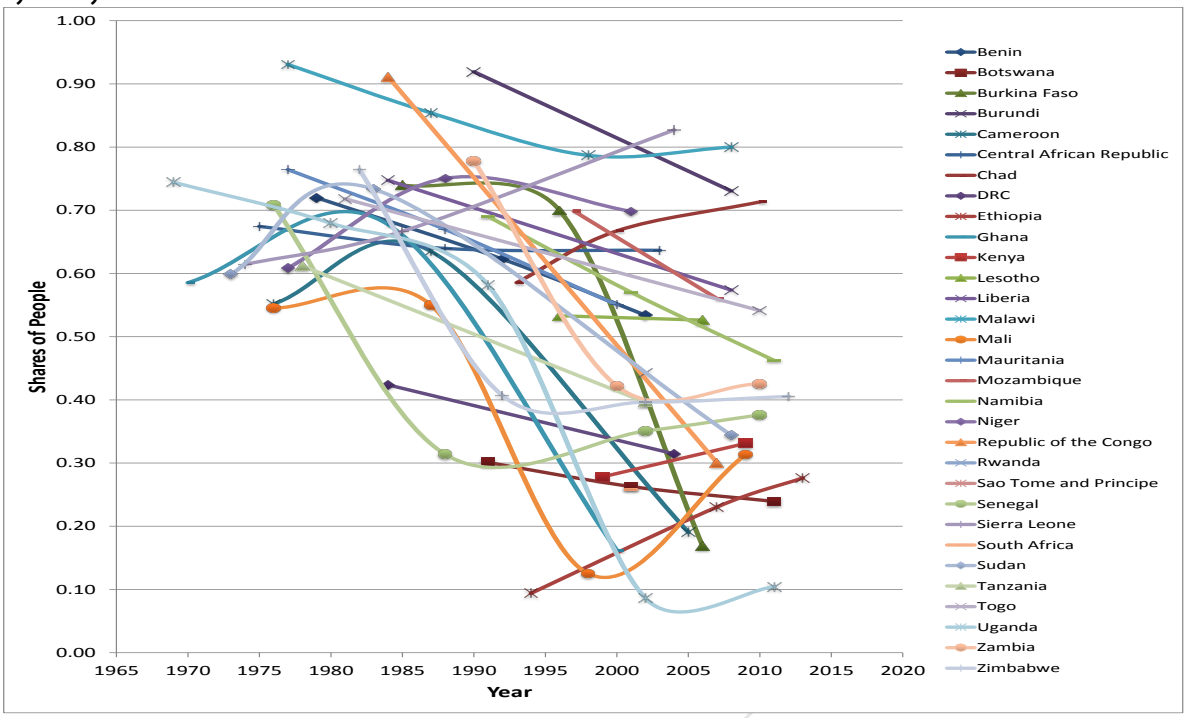
Summarizing across our analyses of the spatial pattern of urbanization in SSA, we've found from two different measures that centralization of a country's urban population shows no relationship to the country's level of urbanization; other factors drive whether a country experiences centralized or decentralized growth. We've also found that urban populations have become more decentralized over time in SSA; growth in smaller cities and towns has typically exceeded that in cities with populations above 1,000,000. This has to be considered a positive pattern in light of earlier cited findings of Christiaensen, Weerdt & Todo (2013) and World Bank (2009) about the positive equity effects of more dispersed urban growth.

Figure 2.5. Share of urban population in towns and cities of 20,000 to 100,000



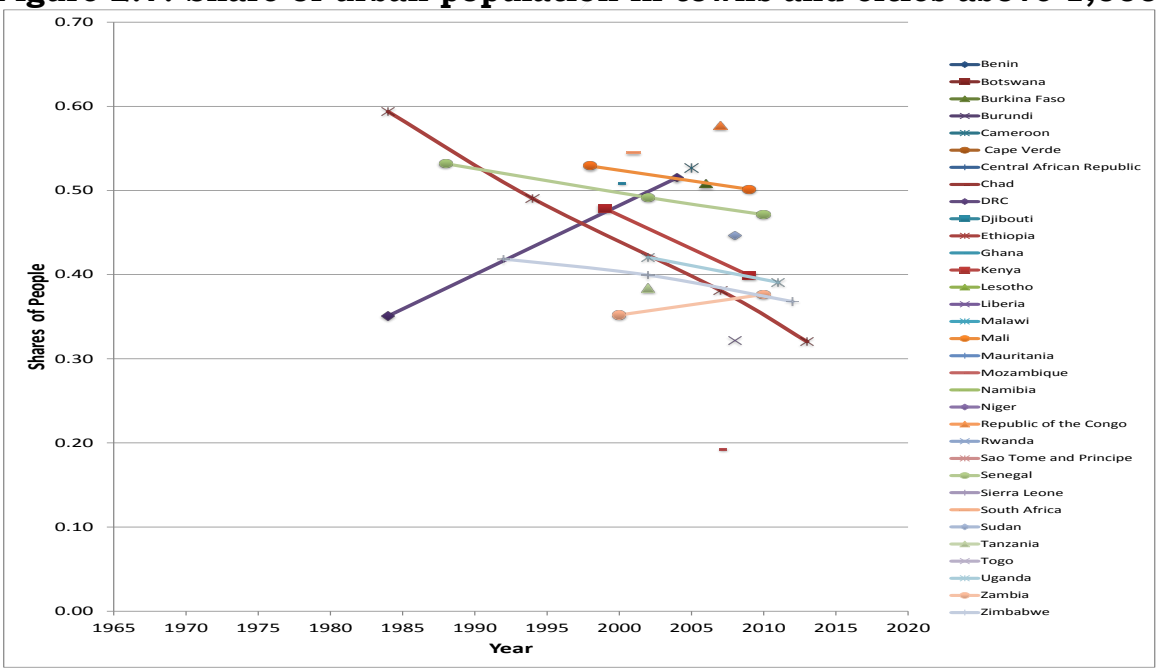
Source: Author's elaboration with data from citypopulation.de

Figure 2.6. Share of urban population in towns and cities of 100,001 to 1,000,000



Source: Author's elaboration with data from citypopulation.de

Figure 2.7. Share of urban population in towns and cities above 1,000,000



Source: Author's elaboration with data from citypopulation.de

Note that this does not mean, however, that large cities are not proliferating; the number of cities of more than 1,000,000 inhabitants in Africa rose from two in 1950 to 50 in 2010 and is projected to rise to 93 by 2025. Rapid urbanization in Africa is characterized by the simultaneous rise of large cities, the spread of the rising urban population across more towns and smaller cities and, as shown by Figure 2.7, the declining weight of the largest cities in total urban population, in favor of smaller cities and towns. This is a positive trend from two standpoints: increasing the accessibility of urban areas to potential rural migrants who want to move to pursue economic opportunity and linking rural areas more effectively to urban areas to promote the rural non-farm economy and rural growth linkages.

Chapter 3: The Diet Transformation: Projecting Changes in Food Demand in East and Southern Africa through 2040

David Tschirley, Michael Dolislager, and David Ortega[4]

3.1. Introduction

The diet transformation is driven by income growth and changed habits that accompany urbanization, and is characterized by a move away from starchy staples towards a wide range of other food products, especially fresh perishable products and processed food (Bennet's Law). As documented in Chapter 1, urbanization has been very rapid in SSA for at least 60 years, and income growth has increased dramatically since the late 1990s. The conditions are in place for a gathering transformation in food consumption habits on the continent.

This chapter explores this topic. We, first, describe recent food consumption patterns in East and Southern Africa, taking advantage of household level income-expenditure data sets in Mozambique, Tanzania, Uganda, Ethiopia, and South Africa. We highlight differences across countries, across rural-urban residence, and across levels of income. By including South Africa in the analysis – a country with far higher incomes and much greater transformation of its food system than its neighbors to the north – we develop initial expectations regarding how patterns in other countries of the region might change over time. We, then, present the Rest of Africa Maize Mixed food staple zone (FSZ) and describe current average consumption patterns of households at differing income levels across that zone. This becomes the basis for the simulation model that we use to project scenarios of diet change over the next 30 years across the zone. In the final section, we discuss other qualitative changes in demand likely to occur over the next 30 years that were not incorporated into the projection model and anticipate the rate at which they will occur.

3.2. Current Food Consumption Patterns in ESA

The countries of ESA are Namibia, South Africa, Swaziland, Lesotho, Botswana, Zimbabwe, Mozambique, Zambia, Malawi, Tanzania, Burundi, Rwanda, Kenya, Uganda, South Sudan, and Ethiopia. We present data on recent food consumption patterns in five of these countries that account for two-thirds of the region's population: South Africa, Mozambique, Tanzania, Uganda, and Ethiopia. Table 3.1 presents income and population data for each of these countries. Annual per capita purchasing power parity incomes in all but South Africa lie within a narrow range of $920 to $1,420, and urban

[4] We thank the International Fund for Agricultural Development (IFAD), through its Modernizing African Food Systems grant (MAFS) to MSU, for additional funding to make this work possible.

population shares are all 31% or lower. South Africa stands out with a mean income roughly 10 times that of the others and an urban population share of over 61%.

Table 3.1. Population and income data for countries of ESA for which LSMS data is analyzed in this report

Country	Population (2010; '000s)	% Urban Population	Mean Purchasing Power Parity income, 2010 (World Bank)
South Africa	Rural: 19,278 Urban: 30,855 Total: 50,133	61.5%	$10,280
Mozambique	Rural: 16,149 Urban: 7,241 Total: 23,390	31%	$920
Tanzania	Rural: 33,057 Urban: 11,784 Total: 44,841	26.2%	$1,420
Uganda	Rural: 28,358 Urban: 5,067 Total: 33,325	15.2%	$1,240
Ethiopia	Rural: 69,050 Urban: 13,900 Total: 82,950	16.8%	$1,030

Figures 3.1 and 3.2 show mean food expenditure shares in the five countries with two unique aggregations of consumed foods. Figure 3.1 classifies all production items collected in the LSMS surveys by consumed own production or purchased, then classifies purchased items by processing level: unprocessed (e.g. whole maize grain or cassava), processed in small-scale informal establishments (e.g. dried cassava), and two levels of processing in larger-scale processing facilities[5]. An example of the "formal low" category is maize meal, nearly all of which in the region is processed in large-scale mills but which does involve much value-added. Examples of the "formal high" category are breakfast cereals, canned or bottled beverages, and others whose processing and packaging involves much more value added. Figure 3.2 groups all foods into seven food groups. The values in each graph are the % of total expenditure on food that is spent on the various categories of food. Henceforth, we refer to these as our food item groupings, by processing level and by food group.

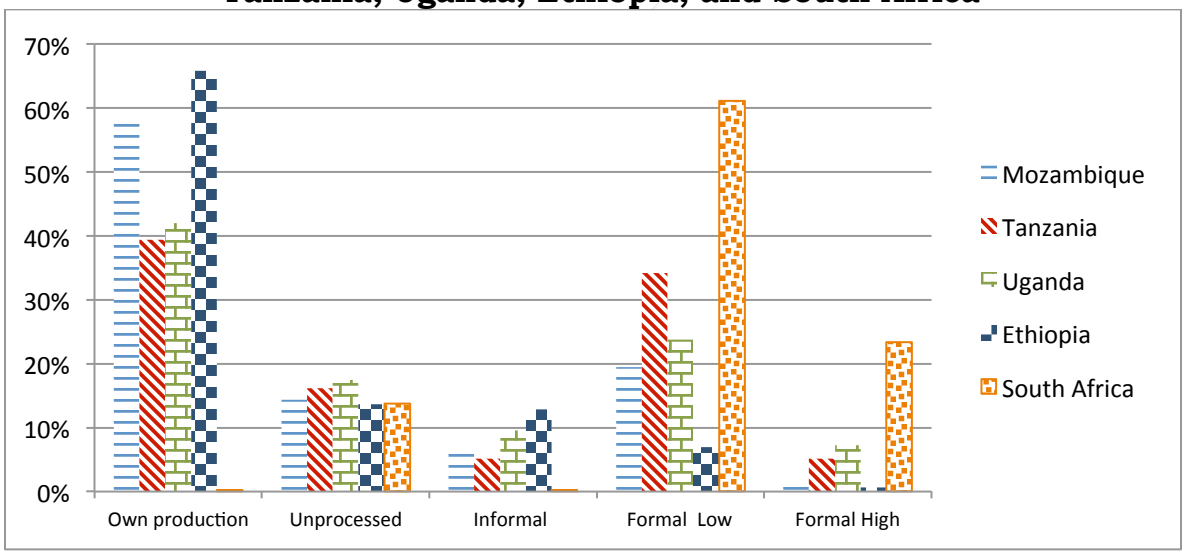
Focusing first on the four countries other than South Africa, five points stand out. First, consumption from households' own production takes the largest

[5] See the methodological document for a mapping of all food items from the LSMS surveys into these categories.

single share in every country, reflecting primarily the large percent of households that live in rural areas and also some consumption from own production among the urban poor. Second, given that food consumed out of own production is considered unprocessed[6], between about 50% (Tanzania) and 80% (Ethiopia) of all food expenditure is on unprocessed food in the four countries. Third, formal processing dominates informal in three of the four countries; only in Ethiopia does informal predominate. In all countries, however, the formal processing is largely of low value-added items; shares of the "formal high" category range from about 1% to 11% compared to 7% to 31% for "formal low."

Fourth, starchy staples (cereals, roots, and tubers) occupy from nearly half to more than half of all expenditures in all four countries. Finally, animal sources of protein (meat, milk, eggs, and fish) have the second highest budget share in every country but lie well below 20% in all cases – typically about one-third the level of starchy staples. These patterns are all expected given what we know about the still low urbanization and income levels of these countries. The one pattern that might be considered surprising is the minimal share of informally processed foods, but this result is driven largely by the importance of maize meal in the diet in these countries and the long-established market penetration of large milling companies in that sector.

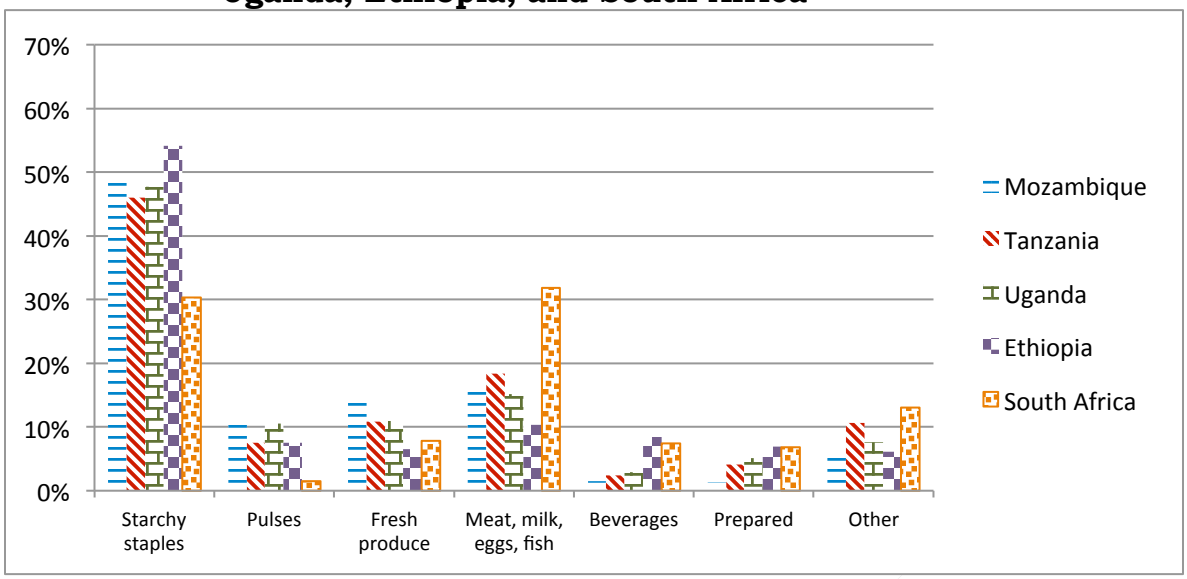
Figure 3.3. Food budget shares by processing level in Mozambique, Tanzania, Uganda, Ethiopia, and South Africa



Source: Authors calculations from latest available LSMS data sets. Years are 2002/03 and 2008/09 for Mozambique (pooled), 2008/09 and 2010/11 for Tanzania (pooled), 2009/10 for Uganda, and 2004/05 for Ethiopia.

[6] If it is processed at home, this would typically involve simple physical transformation done by hand with without addition of additives.

Figure 3.4. Food budget shares by food group in Mozambique, Tanzania, Uganda, Ethiopia, and South Africa



Source: Authors calculations from latest available LSMS data sets. Years are 2002/03 and 2008/09 for Mozambique (pooled), 2008/09 and 2010/11 for Tanzania (pooled), 2009/10 for Uganda, and 2004/05 for Ethiopia.

South Africa (the right-most bar in each grouping in the two figures) provides a stark contrast. Perhaps the most dramatic shift regards consumption of processed foods: informal processing nearly disappears; both types of formal processing more than double relative to its poorer neighbors, and overall, consumption of processed items increases to an 85% budget share, from a range of 20% (Ethiopia) to 47% (Tanzania) in the other countries. Consumption of own production also nearly disappears. While this may reflect some data collection errors, the direction of change is fully expected based on the low rural population share in RSA and the heavy market reliance among these rural households, which is driven by the fact that their incomes are far higher than rural residents in the other countries.

The type of commodities consumed also differs greatly between South Africa and the other countries. Food budget shares for starchy staples and pulses are sharply lower; they are slightly lower for fresh produce, and budget shares for proteins (meat, milk, eggs, fish) are about double those in the other countries. While not a blueprint for the future of the other countries, patterns in South Africa are consistent with widely observed patterns in other areas of the world as incomes rise and do provide a window into the direction of change of consumption patterns in these other countries.

3.3. The "Rest of Africa" Maize-Mixed Food Staple Zone

Staple consumption patterns vary across the continent depending in part on agro-ecological conditions and related cropping patterns, influenced also by

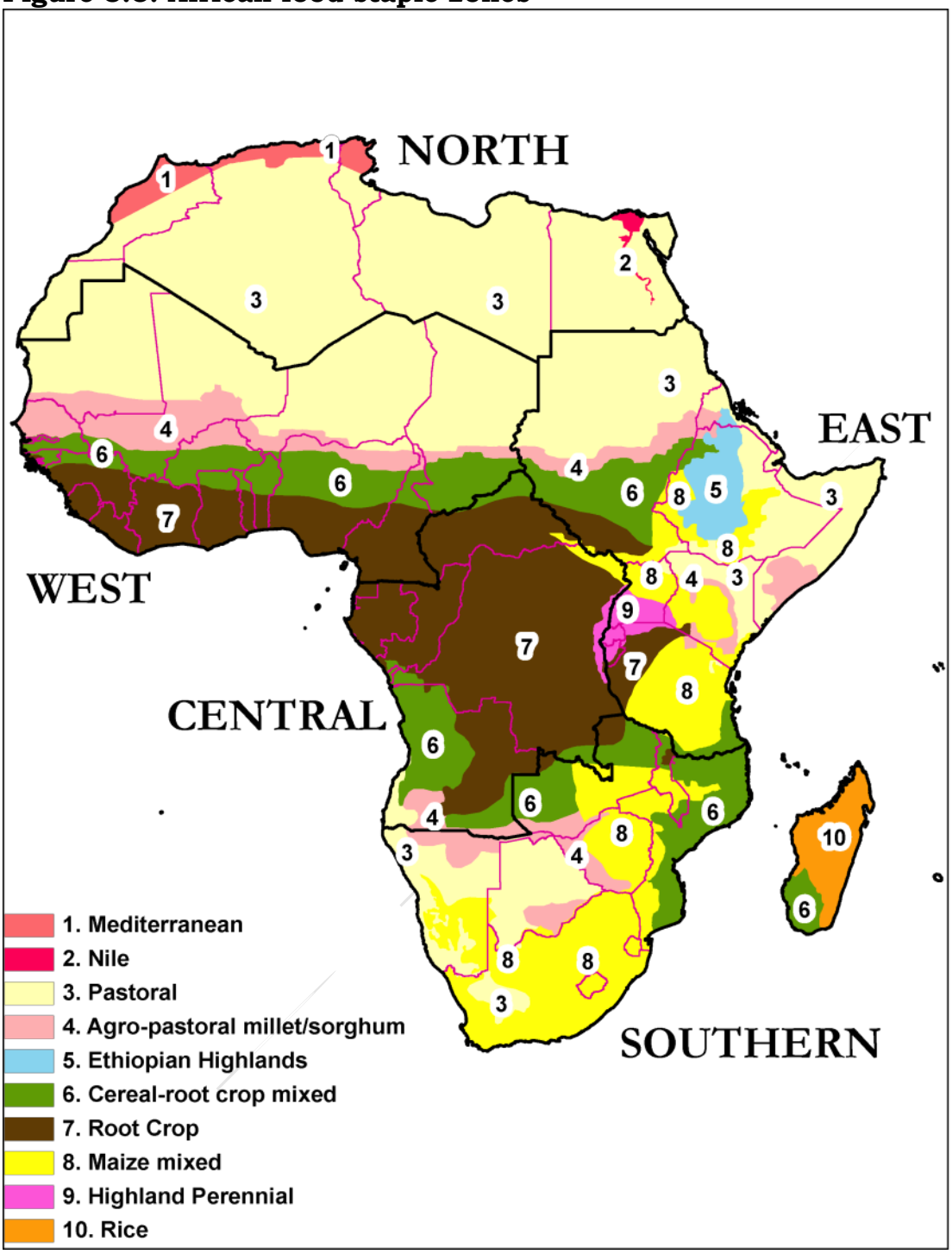
history.[7] For example, the share of maize in total food consumption ranges from 3% to only 6% in West and Central Africa, but from 11% to 21% in East and Southern Africa. Cassava's share ranges from 21% to 44% in West, Central, and East Africa but is only 6% in Southern Africa and 3% in the Sahel. Yam consumption shares are well over 10% in Coastal West Africa, Nigeria, and the Horn of Africa, but nowhere else on the continent do they exceed 1%. We have systematized these differences to define 10 "Food Staple Zones" across the continent (Figure 3.3; Haggblade et al. 2012). These sharp differences in staple consumption patterns suggest that the trajectory of change in consumption patterns may also differ across zones. Understanding what these differences might be and what they might imply for the types of skills that are needed is one important element in any forward-looking exercise.

The Maize Mixed FSZ is the largest in ESA, both spatially and in terms of population. In 2010, this FSZ held 49% of the region's population, with no other zone holding more than 17%. Major cities of the region, including Maputo, Lusaka, Blantyre and Lilongwe, Dar es Salaam, and Nairobi all lie within this FSZ. We, therefore, focus on this zone in this analysis and use it to highlight how current consumption patterns differ widely by whether a household resides in urban or rural areas and by the households' level of income. In what follows, we use LSMS data from the four poorest countries in Table 3.1 (all but South Africa) to characterize consumption patterns in this FSZ, calling it Rest of Africa Maize Mixed to highlight that we are not doing the projections for South Africa. From each data set, we use only those households who reside in this FSZ, as shown in the map, and we weight all results by population. Though not strictly statistically representative of the zone, the portion of the population in these countries that resides in this FSZ accounts for 52% of the total population of the FSZ and is spread over the FSZ from far south (southern Mozambique) to far north (Ethiopia).

Figures 3.4-3.7 present food budget shares across income terciles of these four countries, using the same food classifications as described above. Terciles first order all households from lowest to highest income, then divide all households into three groups, each with one-third of the total population. Tercile 1 has the lowest incomes, while tercile three has the highest. Figures 3.4 and 3.5 focus on rural households, while Figures 3.6 and 3.7 focus on urban households.

[7] For example, while much of southern Africa receives too little rainfall to be optimal for maize, it is a dominant staple due to historical factors related to its introduction during the colonial era.

Figure 3.5. African food staple zones

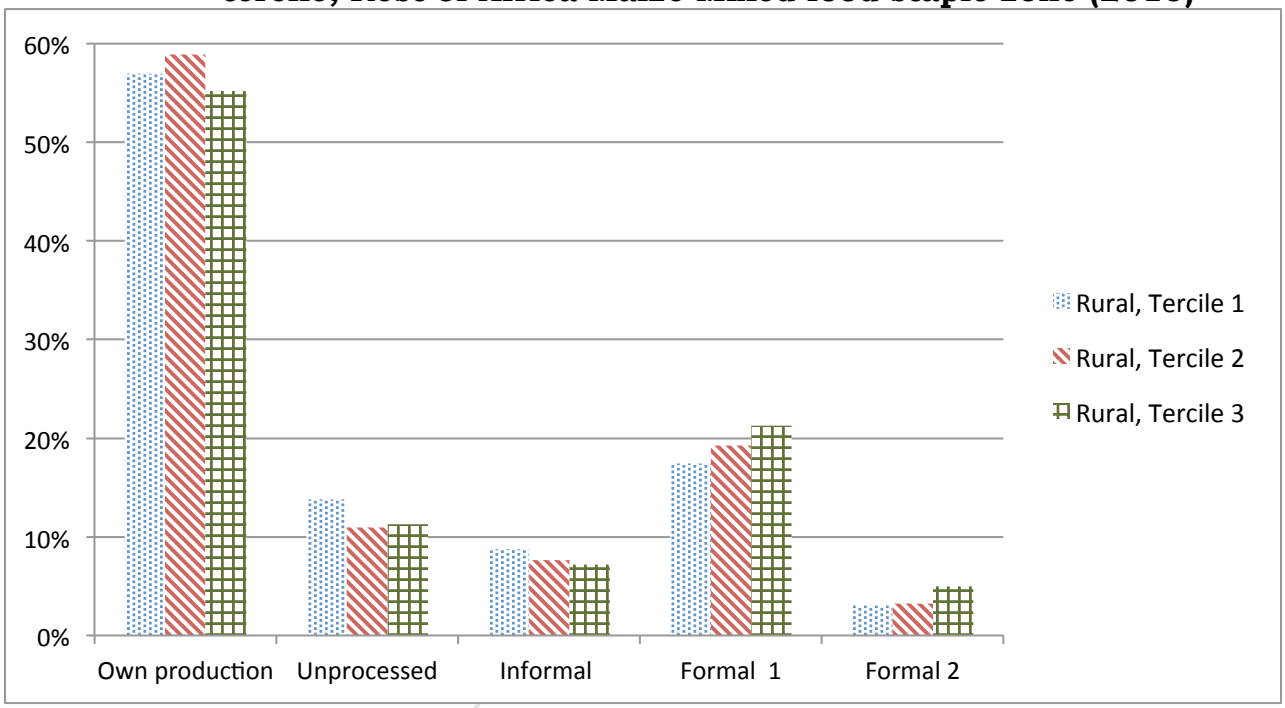


Source: Adapted from FAO (2000). www.**fao.org**/docrep/x8200e/x8200e05.htm

Two patterns stand out in rural areas. First, budget shares fall slightly as incomes rise for consumed own production and, among purchased items, for unprocessed food and informally processed food. Shares rise consistently with income for formally processed foods, whether of low or high value added (Figure

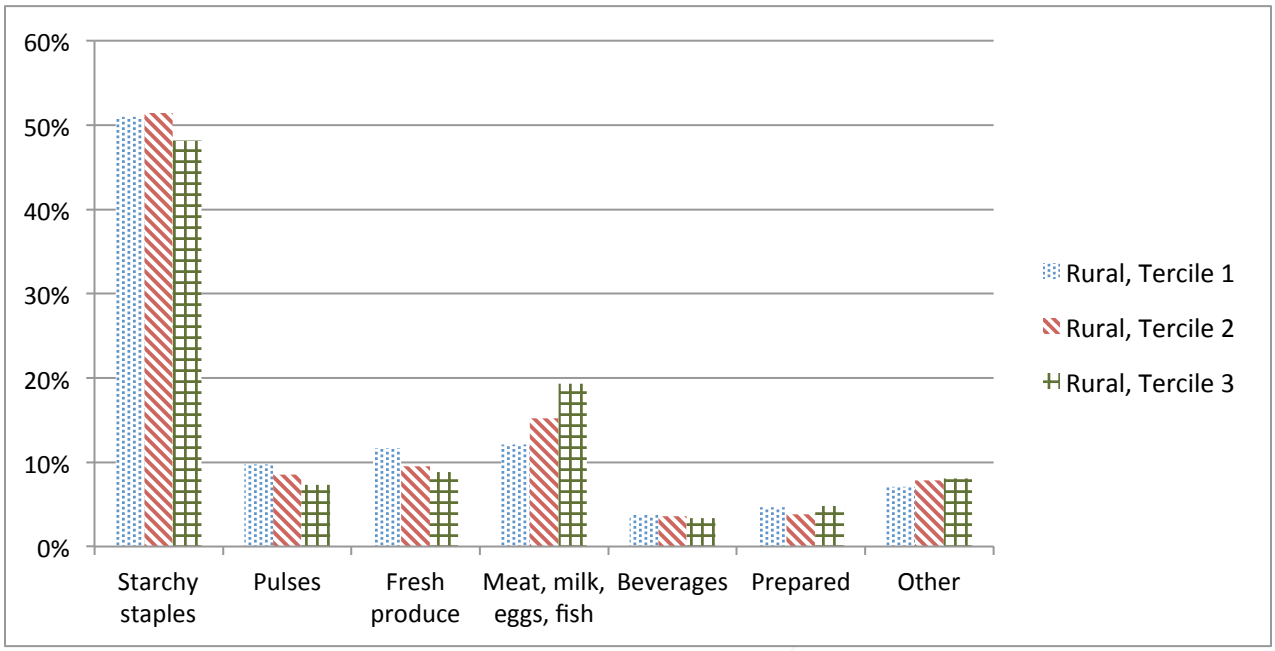
3.4). The percentage rise in the third tercile is especially strong for high value added formal processing, but the shares on these items remain low. Second, across food groups, budget shares fall with rising incomes for starchy staples, pulses, and fresh produce, rise slightly for beverages and other foods, and rise sharply for animal protein sources and for prepared food consumed away from home (Figure 3.5). Overall, starchy staples consumed out of own production dominate even for the richest one-third of rural households (the top tercile).

Figure 3.5. Rural food budget shares by processing level and income tercile, Rest of Africa Maize Mixed food staple zone (2010)



Source: Authors calculations from latest available LSMS data sets. Years are 2002/03 and 2008/09 for Mozambique (pooled), 2008/09 and 2010/11 for Tanzania (pooled), 2009/10 for Uganda, and 2004/05 for Ethiopia. Results weighted by population.

Figure 3.6. Rural food budget shares by food group and income tercile, Rest of Africa Maize Mixed food staple zone (2010)

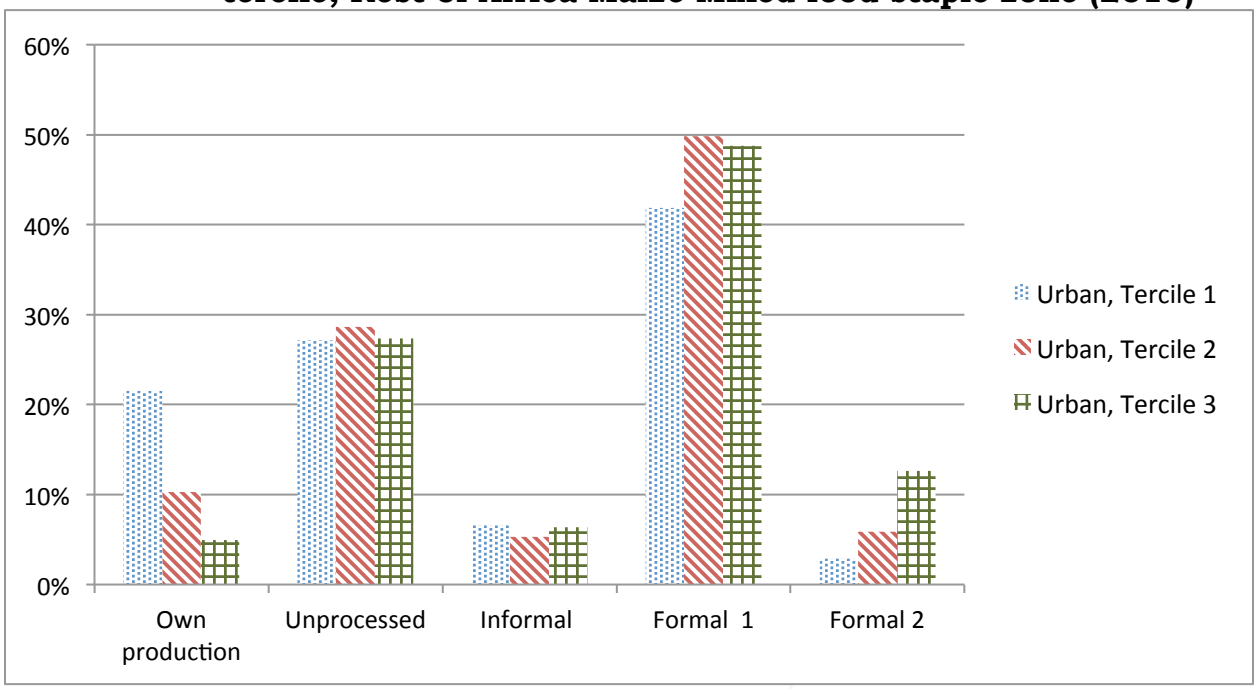


Source: Authors calculations from latest available LSMS data sets. Years are 2002/03 and 2008/09 for Mozambique (pooled), 2008/09 and 2010/11 for Tanzania (pooled), 2009/10 for Uganda, and 2004/05 for Ethiopia. Results weighted by population.

Urban households show dramatically different consumption patterns from rural households (figures 3.6 and 3.7). We highlight five patterns. First, formally processed foods (Formal 1 + Formal 2) dominate consumption at all income levels and rise with income. Bottom tercile households direct nearly 50% of their food spending to such foods, with this share rising to nearly 70% for top tercile households. This compares to shares of 22% to 28% in rural areas – less than half the levels in urban areas; urbanization clearly drives a sharp increase in the consumption of formally processed foods. Second, the share of processed foods with high value added rises sharply with income, from about 8% for the bottom tercile to about 33% for the top. Budget shares for low value added formally processed foods and informally processed change very little with income.

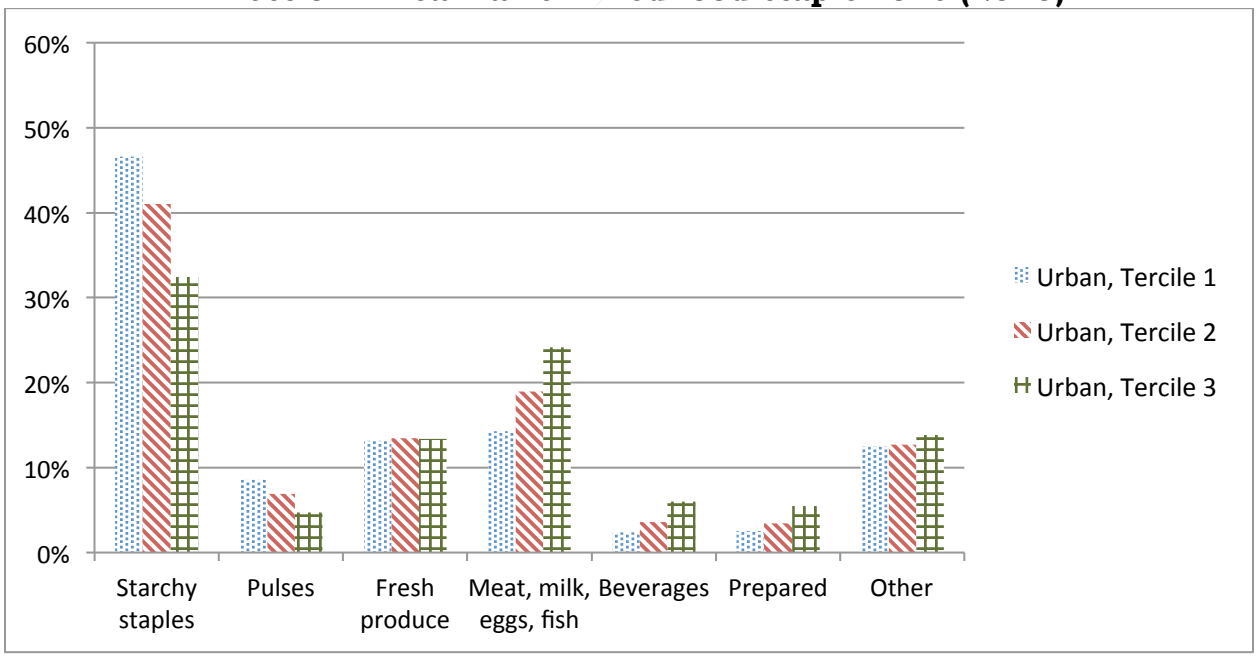
Third, consumption out of own production is important for the poorest one-third of urban residents, with a 20% expenditure share, but this drops to about 4% for the top one-third. Fourth, expenditure shares on starchy staples fall rapidly with income, while shares of meat, milk, eggs, and fish rise almost as rapidly. This latter food category absorbs the highest expenditure share of any food group among the top tercile of households. Finally, expenditure on animal protein sources nearly equals that on starchy staples among the top tercile households.

Figure 3.7. Urban food budget shares by processing level and income tercile, Rest of Africa Maize Mixed food staple zone (2010)



Source: Authors calculations from latest available LSMS data sets. Years are 2002/03 and 2008/09 for Mozambique (pooled), 2008/09 and 2010/11 for Tanzania (pooled), 2009/10 for Uganda, and 2004/05 for Ethiopia. Results weighted by population.

Figure 3.8. Urban food budget shares by food group and income tercile, Rest of Africa Maize Mixed food staple zone (2010)



Source: Authors calculations from latest available LSMS data sets. Years are 2002/03 and 2008/09 for Mozambique (pooled), 2008/09 and 2010/11 for Tanzania (pooled), 2009/10 for Uganda, and 2004/05 for Ethiopia. Results weighted by population.

The changing consumption patterns seen today across rural and urban areas, and across income terciles, provide a window into future consumption patterns in the region. Examining today's consumption patterns in South Africa provides another such window, since the shifts across income levels within these four countries are quite similar to what we see when comparing mean values for those countries against South Africa.

3.4. The Projection Model

This section provides a non-technical overview of the projection model; for detailed information on the development and structure of the model, see the separate methodological report.

3.4.1. Structure and Data

The model projects the evolution of average food budget shares and total expenditure over the dimensions discussed above: processing level and food group. The food groups used in the projection, however, are more disaggregated than those above, with 23 groupings rather than seven. See the methodological paper for the listing and definition of all groups. All projections are broken down by rural/urban and, within each, by income tercile. Terciles are computed separately for urban and rural areas. The structure of the model is shown in Figures 3.8 and 3.9. This portion of the chapter explains those components and the data and calculations that went into them.

The share of each country in the FSZ's total population: We computed these figures using Landscan shape files on spatial population distribution, overlayed on a GIS file of FSZ boundaries created by GIS specialists in MSU's Food Security Group. These figures were then used as weights in combining all country-level data into FSZ level estimates.

Food item aggregations: As explained above, we used two types of grouping: by processing level and by food group. Processing level groups are as follows:

- Own Production: Consumed food items that were produced by the individual consumer;
- Unprocessed foods: Food items such as maize grain or fresh fruits or vegetables that were purchased in unprocessed form. Our definition of processing involves any physical transformation of the commodity, from simple milling of maize grain into maize meal through to high value added products such as soft drinks, beer, breakfast foods, and others;

Figure 3.9. Structure of consumption projection sheet (1)

Scenario	**Rest of Africa Maize Mixed**						
FSZ:	**Rural - Tercile 1**						
Expenditure Growth rate:	**6%**						
Inequality:	**0.67**						
Urban Bias:	**0.67**						
	Rest of Africa Maize Mixed						
	2010	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
Population							
Rural	93,007,558	103,762,283	114,890,677	125,513,624	135,644,875	145,196,315	154,079,217
Urban	31,003,697	38,383,269	47,609,194	58,809,753	72,395,287	88,708,246	107,903,419
Total	124,011,255	142,145,552	162,499,872	184,323,377	208,040,162	233,904,561	261,982,636
Pc Expenditure quintiles							
National	Per Capita Daily Expenditure						
tercile 1	$0.68	$0.99	$1.44	$2.10	$3.04	$4.39	$6.34
tercile 2	$1.34	$1.84	$2.53	$3.48	$4.77	$6.52	$8.90
tercile 3	$3.68	$4.79	$6.23	$8.08	$10.47	$13.55	$17.49
Rural							
tercile 1	$0.62	$0.94	$1.42	$2.15	$3.26	$4.96	$7.54
tercile 2	$1.14	$1.62	$2.30	$3.27	$4.65	$6.62	$9.46
tercile 3	$2.75	$3.64	$4.84	$6.42	$8.53	$11.34	$15.11
Urban							
tercile 1	$0.88	$1.18	$1.56	$2.06	$2.74	$3.64	$4.85
tercile 2	$1.93	$2.46	$3.13	$3.97	$5.04	$6.42	$8.20
tercile 3	$6.46	$7.81	$9.47	$11.48	$13.92	$16.90	$20.56
LSMS Country Represented							
Ethiopia	23.97%	23.32%	22.56%	21.77%	20.92%	19.99%	19.05%
Mozambique	5.92%	5.79%	5.65%	5.53%	5.40%	5.25%	5.10%
Tanzania	39.59%	39.86%	40.31%	40.77%	41.27%	41.87%	42.55%
Uganda	30.52%	31.03%	31.48%	31.93%	32.42%	32.89%	33.30%
Expenditure elasticity of demand							
By processing level							
Own production	1.40	1.26	1.12	0.99	0.85	0.71	0.57
Unprocessed	0.62	0.60	0.57	0.54	0.51	0.48	0.46
Informal	1.01	0.90	0.78	0.67	0.56	0.45	0.33
Formal 1 (was 1&2)	0.98	0.93	0.88	0.83	0.79	0.74	0.69
Formal 2 (was 3)	2.04	1.87	1.71	1.55	1.39	1.23	1.06
Non-food	1.05	1.07	1.08	1.10	1.11	1.13	1.14
By commodity type							
Wheat products	2.33	2.01	1.69	1.38	1.07	0.75	0.43
Maize & maize products	0.99	0.86	0.74	0.62	0.49	0.37	0.25
Sorghum plus millet & other cereals	1.02	0.98	0.94	0.90	0.86	0.81	0.77
Rice (Milled Equivalent)	2.23	1.92	1.63	1.33	1.03	0.73	0.43
Cassava	-0.21	-0.20	-0.19	-0.18	-0.16	-0.15	-0.14
Yams, potatoes, other roots and tubers	1.24	1.10	0.96	0.81	0.67	0.53	0.38
Plantains	1.19	1.02	0.86	0.70	0.54	0.38	0.22
Sugar and sweets	1.26	1.12	0.99	0.86	0.73	0.59	0.46
Pulses	1.28	1.12	0.95	0.79	0.63	0.46	0.30
Oilcrops and vegetable oils	1.31	1.16	1.02	0.87	0.72	0.58	0.43
Staple veggies (tomato, onion, green leafy, cabbage	1.05	0.94	0.84	0.73	0.62	0.52	0.41
Other veggies (okra, green beans)	-0.20	-0.07	0.06	0.19	0.31	0.44	0.57
Fruit	1.38	1.32	1.27	1.21	1.15	1.10	1.04
Non-alcoholic beverage (tea, coffee, cocoa, juices, s	1.29	1.20	1.11	1.03	0.94	0.85	0.76
Alcoholic beverages (beer, wine, spirits, fermented	0.79	0.84	0.89	0.94	0.99	1.04	1.09
Beef, fresh and frozen	1.60	1.51	1.42	1.33	1.24	1.15	1.05
Poultry, fresh and frozen	1.77	1.59	1.42	1.25	1.08	0.90	0.73
Meat, Other fresh including offals	1.78	1.64	1.50	1.37	1.23	1.09	0.96
Milk & animal fats	1.21	1.12	1.03	0.94	0.85	0.77	0.68
Eggs + (Total)	2.30	2.05	1.81	1.57	1.33	1.09	0.85
Fish	0.85	0.80	0.76	0.71	0.66	0.62	0.57
Prepared foods consumed away from home	1.80	1.72	1.64	1.56	1.48	1.40	1.33
Other foods (spices, treenuts,	0.45	0.53	0.61	0.68	0.76	0.84	0.92

Figure 3.10. Structure of consumption projection sheet (2)

Starting Avg Budget Shares (of totexp)							
By processing level							
Own production	39.57%	43.13%	45.57%	46.91%	46.98%	45.58%	42.48%
Unprocessed	9.63%	7.85%	6.44%	5.29%	4.34%	3.57%	2.94%
Informal	6.04%	5.68%	5.23%	4.70%	4.12%	3.51%	2.88%
Formal 1 (was 1&2)	12.12%	11.24%	10.41%	9.65%	8.95%	8.31%	7.74%
Formal 2 (was 3)	2.15%	3.05%	4.12%	5.40%	6.89%	8.54%	10.20%
Non-food	30.48%	29.06%	28.23%	28.06%	28.72%	30.48%	33.76%
By commodity type							
Wheat products	1.00%	1.77%	2.61%	3.43%	4.06%	4.32%	4.07%
Maize & maize products	17.06%	16.41%	15.04%	13.26%	11.28%	9.23%	7.21%
Sorghum plus millet & other cereals	5.36%	5.22%	5.00%	4.73%	4.46%	4.20%	3.93%
Rice (Milled Equivalent)	1.83%	3.06%	4.35%	5.54%	6.42%	6.73%	6.29%
Cassava	4.78%	2.88%	1.77%	1.09%	0.67%	0.41%	0.25%
Yams, potatoes, other roots and tubers	3.61%	3.86%	3.88%	3.73%	3.44%	3.03%	2.54%
Plantains	1.78%	1.86%	1.82%	1.69%	1.49%	1.25%	0.99%
Sugar and sweets	1.96%	2.10%	2.14%	2.08%	1.95%	1.76%	1.51%
Pulses	6.77%	7.37%	7.46%	7.18%	6.57%	5.71%	4.67%
Oilcrops and vegetable oils	1.74%	1.92%	1.98%	1.94%	1.83%	1.65%	1.42%
Staple veggies (tomato, onion, green leafy, cabbage	3.85%	3.80%	3.59%	3.28%	2.92%	2.51%	2.09%
Other veggies (okra, green beans)	3.18%	1.93%	1.24%	0.83%	0.58%	0.43%	0.34%
Fruit	1.08%	1.22%	1.34%	1.45%	1.55%	1.66%	1.77%
Non-alcoholic beverage (tea, coffee, cocoa, juices, s	1.37%	1.49%	1.56%	1.59%	1.58%	1.55%	1.48%
Alcoholic beverages (beer, wine, spirits, fermented	1.25%	1.11%	1.00%	0.93%	0.88%	0.87%	0.88%
Beef, fresh and frozen	1.32%	1.64%	1.93%	2.22%	2.52%	2.80%	3.06%
Poultry, fresh and frozen	1.15%	1.55%	1.90%	2.21%	2.44%	2.56%	2.54%
Meat, Other fresh including offals	1.11%	1.50%	1.87%	2.24%	2.59%	2.90%	3.11%
Milk & animal fats	2.87%	3.02%	3.05%	3.01%	2.90%	2.75%	2.53%
Eggs + (Total)	0.10%	0.17%	0.26%	0.35%	0.45%	0.53%	0.58%
Fish	1.84%	1.68%	1.50%	1.32%	1.16%	1.01%	0.87%
Prepared foods consumed away from home	3.25%	4.42%	5.70%	7.20%	8.99%	11.16%	13.67%
Other foods (spices, treenuts,	1.24%	0.97%	0.78%	0.65%	0.55%	0.49%	0.46%
Expenditure	$0.62	$0.94	$1.42	$2.15	$3.26	$4.96	$7.54
By processing level							
Own production	$0.24	$0.41	$0.65	$1.01	$1.53	$2.26	$3.20
Unprocessed	$0.06	$0.07	$0.09	$0.11	$0.14	$0.18	$0.22
Informal	$0.04	$0.05	$0.07	$0.10	$0.13	$0.17	$0.22
Formal 1 (was 1&2)	$0.07	$0.11	$0.15	$0.21	$0.29	$0.41	$0.58
Formal 2 (was 3)	$0.01	$0.03	$0.06	$0.12	$0.22	$0.42	$0.77
Non-food	$0.19	$0.27	$0.40	$0.60	$0.94	$1.51	$2.55
By commodity type							
Wheat products	$0.01	$0.02	$0.04	$0.07	$0.13	$0.21	$0.31
Maize & maize products	$0.11	$0.15	$0.21	$0.29	$0.37	$0.46	$0.54
Sorghum plus millet & other cereals	$0.03	$0.05	$0.07	$0.10	$0.15	$0.21	$0.30
Rice (Milled Equivalent)	$0.01	$0.03	$0.06	$0.12	$0.21	$0.33	$0.47
Cassava	$0.03	$0.03	$0.03	$0.02	$0.02	$0.02	$0.02
Yams, potatoes, other roots and tubers	$0.02	$0.04	$0.06	$0.08	$0.11	$0.15	$0.19
Plantains	$0.01	$0.02	$0.03	$0.04	$0.05	$0.06	$0.07
Sugar and sweets	$0.01	$0.02	$0.03	$0.04	$0.06	$0.09	$0.11
Pulses	$0.04	$0.07	$0.11	$0.15	$0.21	$0.28	$0.35
Oilcrops and vegetable oils	$0.01	$0.02	$0.03	$0.04	$0.06	$0.08	$0.11
Staple veggies (tomato, onion, green leafy, cabbage	$0.02	$0.04	$0.05	$0.07	$0.10	$0.12	$0.16
Other veggies (okra, green beans)	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02	$0.03
Fruit	$0.01	$0.01	$0.02	$0.03	$0.05	$0.08	$0.13
Non-alcoholic beverage (tea, coffee, cocoa, juices, s	$0.01	$0.01	$0.02	$0.03	$0.05	$0.08	$0.11
Alcoholic beverages (beer, wine, spirits, fermented	$0.01	$0.01	$0.01	$0.02	$0.03	$0.04	$0.07
Beef, fresh and frozen	$0.01	$0.02	$0.03	$0.05	$0.08	$0.14	$0.23
Poultry, fresh and frozen	$0.01	$0.01	$0.03	$0.05	$0.08	$0.13	$0.19
Meat, Other fresh including offals	$0.01	$0.01	$0.03	$0.05	$0.08	$0.14	$0.23
Milk & animal fats	$0.02	$0.03	$0.04	$0.06	$0.09	$0.14	$0.19
Eggs + (Total)	$0.00	$0.00	$0.00	$0.01	$0.01	$0.03	$0.04
Fish	$0.01	$0.02	$0.02	$0.03	$0.04	$0.05	$0.07
Prepared foods consumed away from home	$0.02	$0.04	$0.08	$0.16	$0.29	$0.55	$1.03
Other foods (spices, treenuts,	$0.01	$0.01	$0.01	$0.01	$0.02	$0.02	$0.03

- Informal Processing: Food items that have been processed via an informal channel. This classification required judgment focused primarily on the scale of operation. Examples include food sold by street vendors, fish dried artisanally by fishermen, or locally ground cassava;
- Formal Processing – Low: Food items which have been minimally processed through a larger-scale processing technology. This includes butchered fresh meat, breads, washed imported rice, and factory ground maize meal, among others. Meal ground in small hammer mills – if the questionnaire indicated this - was classified as informal;
- Formal Processing – High: Food items that have received higher value added in larger-scale processing. These include breakfast cereals, restaurant foods, manufactured alcoholic beverages and soft drinks, and others.

Note that there are potential differences in the processing allocation of similarly titled food items across multiple data sets. An example is sour milk. In South Africa, we classified this as "Formal Processing – High" while in Mozambique we classified it as "Informally Processed" based on knowledge of how the item is primarily processed within each country.

Certain data sets include specifications of where foods were purchased for consumption and even designated foods as prepared foods for consumption away from home. We took advantage of the additional specification in these cases, while in other cases, we had to allocate certain items based on the food item titles which were given.

The 23 food groups are designed to generate more detailed expectations regarding the evolution of consumption patterns over time. Many food items such as maize grain or various fruits and vegetables can be easily allocated to one food group. Other items such as bread or ketchup require more explanation of the commodity groupings to properly allocate the items. Many products have multiple food ingredients that would fall into different groupings; in these instances, the items are allocated according to the primary ingredient of the product. Therefore, for example, bread is put in the "wheat" group. Details are in the methodological document. A few issues of note are as follows:

- "Staple Vegetables" include tomatoes, onions, cabbages, and green leafy vegetables such as lettuce and spinach. "Other Vegetables" include all other vegetables. This distinction was based on knowledge of consumption levels of different vegetables and the dominance over many countries of these items in vegetable consumption;
- "Sweets" include candies and sugar-based items. Jams and marmalades are sweet but are allocated within the "Fruit" grouping as their primary input is fruit;
- Although fruit and vegetable juices are non-alcoholic beverages, we allocate them according to their primary input; therefore, these are "Fruit" and "Other Vegetables";

- "Prepared foods consumed away from home" was given its own group, given the impossibility of knowing what kind of food was consumed;
- Condiments were allocated to the "Other Foods" category;
- "Other Foods" is a miscellaneous category containing items that do not clearly belong to one of the other categories. Spices, soups, frozen dinners, and condiments are among the items that were placed in this category.

Population: We used rural and urban populations and projections from 2010 to 2040 from the United Nations (see Chapter 2 for a discussion of these data).

Real per capita total expenditure: All expenditure values are in real per capita US dollars in purchasing power parity terms, using constant 2005 international dollars. When the latest data for a given country are prior to 2010, total expenditure values are brought to 2010 levels using an assumed annual growth rate of 2%. A two-step process was used to calculate these numbers for each rural and urban expenditure tercile. First, the World Bank's PovcalNet online database was used to compute national tercile incomes for each country in the FSZ. This data base provides national mean total expenditure and expenditure shares by 20-tile of the income distribution (successive 5% slices of the population) for dozens of countries, computed from these countries' LSMS survey data. A 20-tile mean total expenditure breakdown is calculated for the FSZs by taking a population-weighted mean (using the share of each country's total population within the FSZ) of all countries within the FSZ. These FSZ level 20-tiles of mean total expenditure are aggregated into terciles. In a second step, and because PovcalNet reports only national figures not broken by rural/urban, we computed rural/urban total expenditure ratios in the LSMS data sets for our four countries and applied these ratios to estimate rural/urban incomes for each tercile in the FSZ.

Expenditure elasticities: Bennett's Law states that expenditure elasticities decline as total expenditure rises; households with higher incomes spend less of each additional dollar on food and more on non-food items. Properly estimating by how much these elasticities decline with income becomes very important when projecting consumption patterns out 30 years with growth rates of total expenditure that range from 2% per year to 6% per year (see below for definitions of scenarios). Incomes over this time increase by, respectively, 1.8 times and 5.7 times at these annual growth rates. To generate reliable estimates for our purposes, we used LSMS data from all five countries in Table 3.1 – including South Africa. Inclusion of the latter was crucial to provide a range of income sufficient to generate good elasticity estimates for the incomes reached near the end of our projection period. We followed a three-step procedure. First, for each category in the two food item groupings (by processing level and by food group), we computed twelve midpoint arc elasticities: one for each total expenditure tercile in rural and urban areas, separately for the Rest of Africa Maize Mixed FSZ and for South Africa (3

terciles x 2 x 2 = 12). For each category, we then estimated a simple linear-log relationship between elasticities and income level separately for rural and urban areas; each regression thus had six observations. Finally, we used the predicted elasticities from this linear-log regression for the elasticities in the projection model. Five processing groups, a single non-food group, and 23 food groups, generated 29*6=174 estimated elasticities.

The essential gains from this approach are that (1) the regression captured the non-linear relationship that typically exists between elasticities and income – elasticities fall with income but this decline typically slows as incomes rise beyond some level – and (2) it did so over a range of income that included the highest projected incomes in the FSZ. For example, even at the top scenario growth rate of 6% per year, mean daily per capita income in the top tercile of rural areas rises only to US$8.83, compared to US$15.59 in South Africa's rural third tercile today. In urban areas of the FSZ, the top tercile under 6% growth rises to US$46.39 compared to US$58.71 in the top urban tercile in RSA today.

Starting average budget shares: We use LSMS data from the four non-RSA countries to compute two sets of budget shares for each of the 174 categories explained above in the elasticity discussion: the share of the group in total food- and non-food expenditure and its share in food expenditure only. These are aggregated to the FSZ using the population weighting factors discussed above.

Expenditure by category: Total per capita expenditure for each of the 174 groups is computed in real per capita purchasing power terms for 2010 from the 4-country LSMS data, using the same weighting scheme as for all other FSZ level figures.

3.4.2. Scenarios

Through a process of scenario thinking, three key drivers of uncertainty were identified and based on these uncertainties four plausible scenarios where developed. The three key uncertainties are the rate of growth in real per capita expenditure, the distribution of that growth across terciles (inequality of growth), and its distribution across rural and urban areas (urban bias). The four scenarios and the settings of each of these variables are shown in Table 3.2.

Business as Usual (BaU) is based on patterns observed in SSA over the past decade. During this time, real per capita GNI in purchasing power parity has grown about 5% per year on the continent (World Bank). While robust, available evidence indicates that this growth has been most concentrated in urban areas and has accrued primarily to those in the upper reaches of the income distribution. We define *inequality increasing growth* as growth in which

the upper tercile of the income distribution enjoys 50% greater annual percentage growth than the bottom tercile (e.g., 6% vs. 4%, or 3% vs. 2%). *Inequality decreasing growth* reverses this pattern: the lowest tercile enjoys 50% higher annual percent growth than the upper tercile. We define *positive urban bias* as growth in which urban households enjoy 50% greater annual percentage income growth than rural households, independent of any distribution effects across income levels.

Table 3.2. Simulation Scenarios

Scenario	Mean Per Capita Income Growth	Inequality of Growth	Level of Urban Bias
Business as Usual (BaU)	5%	Increasing	Positive
BaU with unfavorable environment	2%	Increasing	Positive
Equitable Growth	6%	Decreasing	Neutral
Equitable Growth unfavorable environment	4%	Decreasing	Neutral

BaU with macro shock assumes the same pattern of growth (inequality increasing with positive urban bias) but with unfavorable macro-economic and other conditions that reduce average annual growth to 2% per capita in real terms.

Equitable Growth (EG) assumes that African governments adopt policy and public investment approaches that drive broader distribution of income gains, both across the income distribution and across rural and urban areas. Specifically, we assume that growth becomes (1) inequality decreasing, with average yearly percentage growth in the bottom tercile 50% higher than in the top tercile, and *urban bias neutral*, with rural and urban areas enjoying the same annual percentage income growth. Due to widely appreciated factors that tend to drive higher income growth in urban than in rural areas (World Bank, 2009), we believe that a negative urban bias – higher income growth in rural than in urban areas – is unrealistic under any reasonable set of policies and public investment priorities. Finally, we assume in this scenario that average income growth is slightly higher than in BaU – 6% vs. 5% - based on research that suggests that policies and public investments that promote more equitable growth and asset distribution can also drive higher average growth (Barro 2000; Ravallion and Chen 2002; Timmer 2004).

3.4.3. Results and Discussion

This section first presents results on income levels and distribution in 2010 and 2040 under the four scenarios outlined in Table 3.2. It then focuses on

the implications of each scenario for (a) changing consumption patterns as captured by food budget shares, and (b) changes in the total real value of food expenditures in the FSZ, driven by changing patterns and levels at the household level, by rising populations, and by the urbanization of those populations.

Incomes: Table 3.3 presents incomes and income ratios for actual data in 2010 and for 2040 projections in the four scenarios. The income ratios are rural-to-urban and national first tercile to national third tercile, presented for the Rest of Africa Maize Mixed FSZ and for current (2010) values in RSA for comparison. Several points stand out. First, income distribution in the FSZ is currently much less unequal than in RSA. Bottom tercile households nationally have 19% of the income of top tercile households, compared to only 7% in RSA, and rural households in the FSZ have nearly half the average income of urban households, compared to less than one-third in RSA. Second, under a BaU strategy, inequality in 2040 will be similar to what it is today in RSA; if growth falters in this strategy (BaU with Unfavorable Environment), inequality will still increase but not by as much. Income levels, however, will be far lower. Under an Equitable Growth strategy, income distribution will by construction be far more equal: rural households will slightly raise their share of income, and the share accruing to bottom tercile households will nearly double from BaU.

Finally, real incomes of the poorest will grow very little from 2010 to 2040 under BaU if the environment for economic growth turns unfavorable; first tercile incomes will rise barely 50% nationally and only about 30% in rural areas. In the meantime, growth in bottom tercile incomes under the two Equitable Growth scenarios is dramatic, with rises of between about 4.5 and 9.5 times nationally. Figure 3.10 presents income results by national tercile.

Consumption Patterns (Food Budget Shares): Table 3.4 and Figures 3.11-3.16 present food budget share results to capture changing patterns of consumption. Table 3.5 and Figures 3.17-3.22 then present total daily expenditure in the FSZ to capture the changing levels of consumption. Together, these scenarios on changing patterns and levels of consumer demand speak to the midstream and downstream transformations – the profound changes in processing, packaging, wholesaling, and retailing - that need to take place in response to urbanization and income growth. Each graph presents results for 2010 along with two scenarios: BaU and BaU with unfavorable environment, and EG and EG with unfavorable environment.

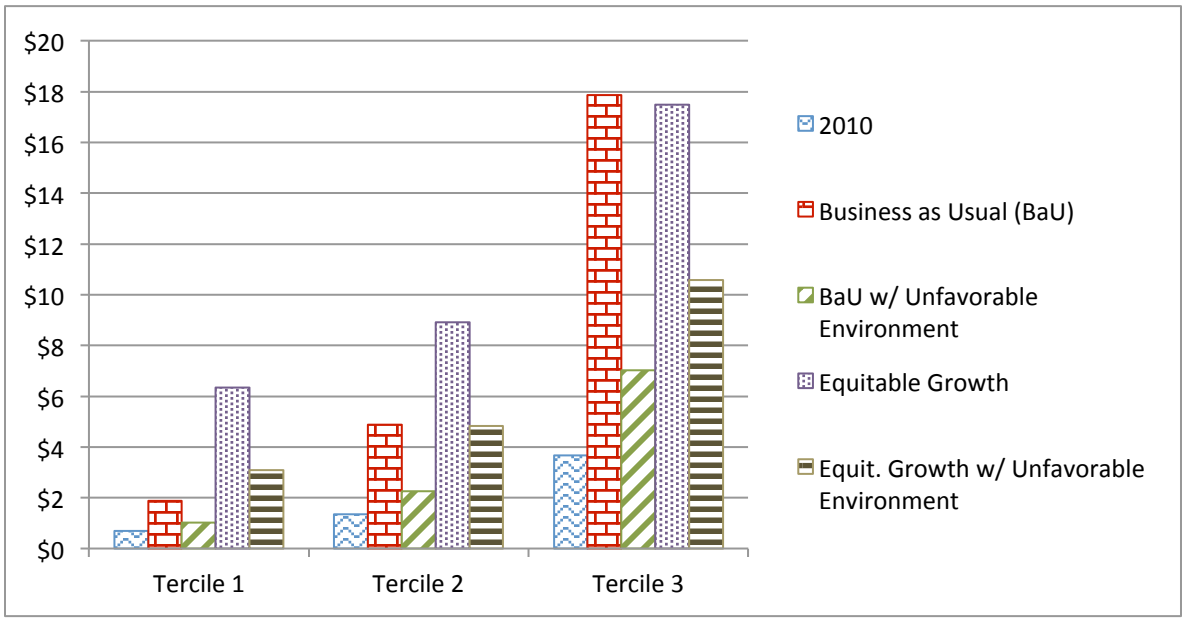
Table 3.3. Income levels in 2010 and in 2040 under four scenarios

		2040			
	2010	Business as Usual (BaU)	BaU w/ Unfavorable Environment	Equitable Growth	Equitable Growth w/ Unfavorable Environment
National					
tercile 1	$0.68	$1.87	$1.03	$6.34	$3.09
tercile 2	$1.34	$4.89	$2.27	$8.90	$4.83
tercile 3	$3.68	$17.87	$7.02	$17.49	$10.57
Rural					
tercile 1	$0.62	$1.21	$0.79	$5.39	$2.63
tercile 2	$1.14	$2.65	$1.54	$6.91	$3.75
tercile 3	$2.75	$7.19	$3.77	$11.25	$6.80
Urban					
tercile 1	$0.88	$2.74	$1.36	$7.69	$3.75
tercile 2	$1.93	$7.98	$3.30	$11.75	$6.37
tercile 3	$6.46	$33.29	$11.71	$26.39	$15.95
Ratios					
RoAMz Mixed					
Rural/Urban	0.49	0.25	0.37	0.51	0.51
T1/T3	0.19	0.10	0.15	0.36	0.29
Current RSA					
Rural/Urban	0.30				
T1/T3	0.07				

Source: Author calculations from projection model

The first major pattern is that the overall food budget share falls in every scenario but not dramatically. Even in BaU and its 5% growth, and EG and its 6% growth, the share of food in total expenditures falls only from 58% to 38% and 44%, respectively (Figures 3.11 and 3.12). These are meaningful declines but, as seen below, population and income growth drive very large increases in total demand. The differences between the BaU and EG scenarios are not large at this level of aggregation.

Figure 3.11. National income levels by tercile, 2010 compared to 2040 under four scenarios



Source: Author calculations from projection model

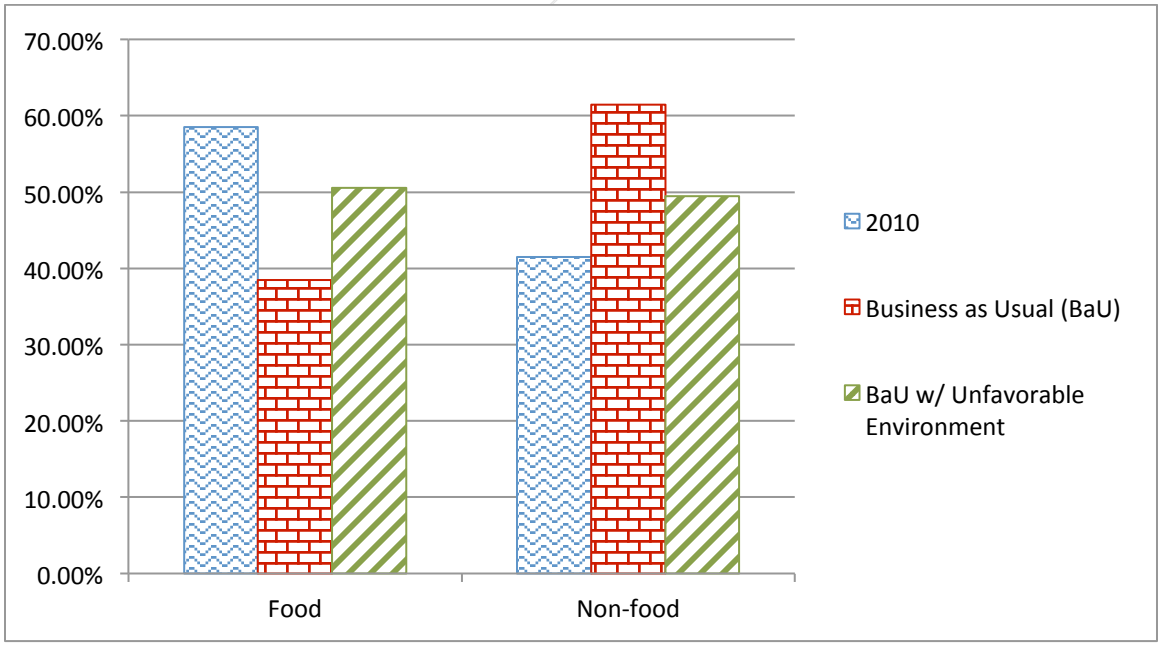
Table 3.4. Food budget shares by food item groupings in 2010 and in 2040 under four scenarios

		2040			
	2010	Business as Usual (BaU)	BaU w/ Unfavorable Environment	Equitable Growth (EG)	EG w/ Unfavorable Environment
By processing level					
Own production	39.7%	25.5%	28.5%	34.0%	33.6%
Unprocessed	17.1%	18.6%	19.7%	15.1%	16.7%
Informal	7.1%	3.9%	5.7%	3.7%	4.7%
Formal 1	29.9%	36.7%	36.4%	32.7%	33.7%
Formal 2	6.2%	15.4%	9.8%	14.6%	11.4%
By commodity type					
Wheat products	4.5%	5.8%	5.8%	6.0%	6.1%
Maize & maize products	17.2%	9.1%	12.7%	8.5%	10.8%
Sorghum, millet & other cereals	5.4%	4.6%	4.6%	5.2%	5.0%
Rice (Milled Equivalent)	6.1%	6.7%	7.4%	7.6%	7.9%
Cassava	3.4%	0.9%	1.8%	0.6%	0.9%
Roots & tubers	5.6%	4.0%	4.6%	3.9%	4.5%
Plantains	2.6%	1.5%	2.1%	1.4%	1.8%
Sugar & sweets	4.0%	3.4%	4.0%	3.2%	3.6%
Pulses	7.2%	5.5%	6.4%	5.5%	6.2%
Oilcrops & vegetable oils	3.3%	3.1%	3.5%	2.9%	3.2%

	2010	2040 Business as Usual (BaU)	2040 BaU w/ Unfavorable Environment	2040 Equitable Growth (EG)	2040 EG w/ Unfavorable Environment
Staple vegetables	6.1%	5.4%	6.4%	4.6%	5.5%
Other vegetables	2.1%	1.0%	1.4%	0.8%	0.9%
Fruit	2.6%	4.5%	3.3%	4.1%	3.6%
Non-alcoholic beverage	2.6%	4.0%	3.3%	3.5%	3.3%
Alcoholic beverages	1.4%	2.3%	1.7%	2.2%	1.9%
Beef	5.1%	9.7%	7.5%	10.2%	8.7%
Poultry	2.9%	3.0%	3.0%	3.3%	3.2%
Other meat	2.4%	2.8%	2.3%	3.5%	3.0%
Milk & animal fats	4.2%	4.3%	4.1%	4.2%	4.2%
Eggs	0.6%	0.9%	0.8%	0.9%	0.9%
Fish	3.6%	4.5%	4.3%	3.8%	3.9%
Prepared foods away from home	4.6%	9.9%	6.1%	11.7%	8.4%
Other foods	2.5%	3.5%	3.2%	2.7%	2.7%
By food/non-food					
Food	58.5%	38.5%	50.6%	43.8%	49.2%
Non-food	41.5%	61.5%	49.4%	56.2%	50.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

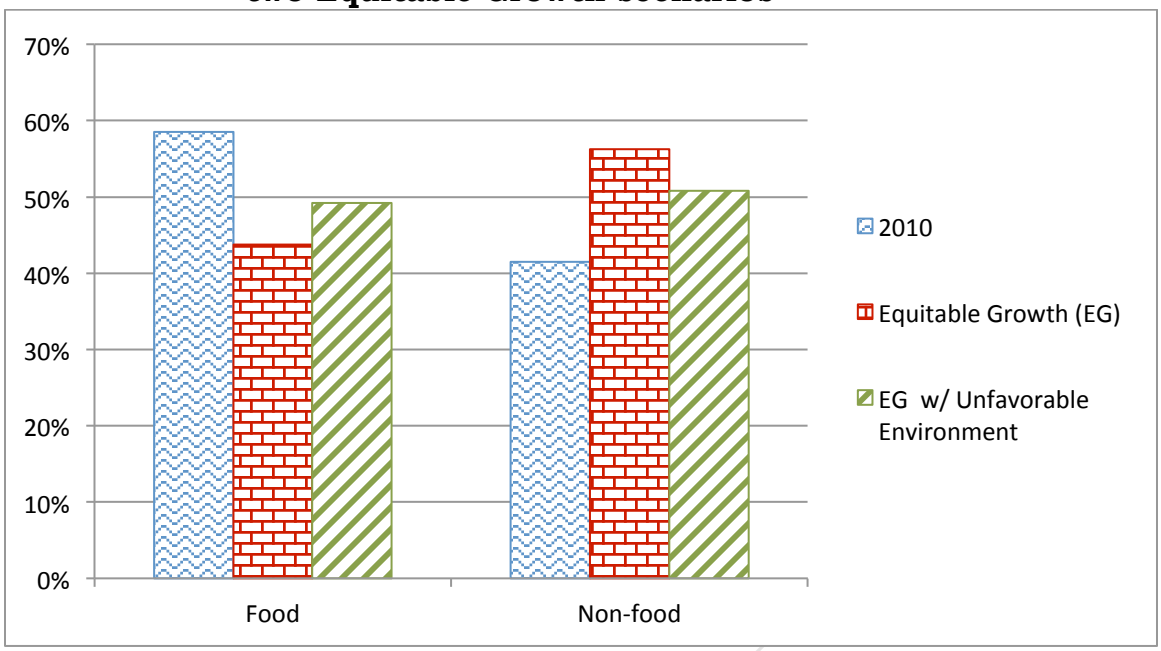
Source: Author calculations from projection model

Figure 3.12. Budget shares for food and non-food, 2010 and 2040 under two Business as Usual scenarios



Source: Author calculations from projection model

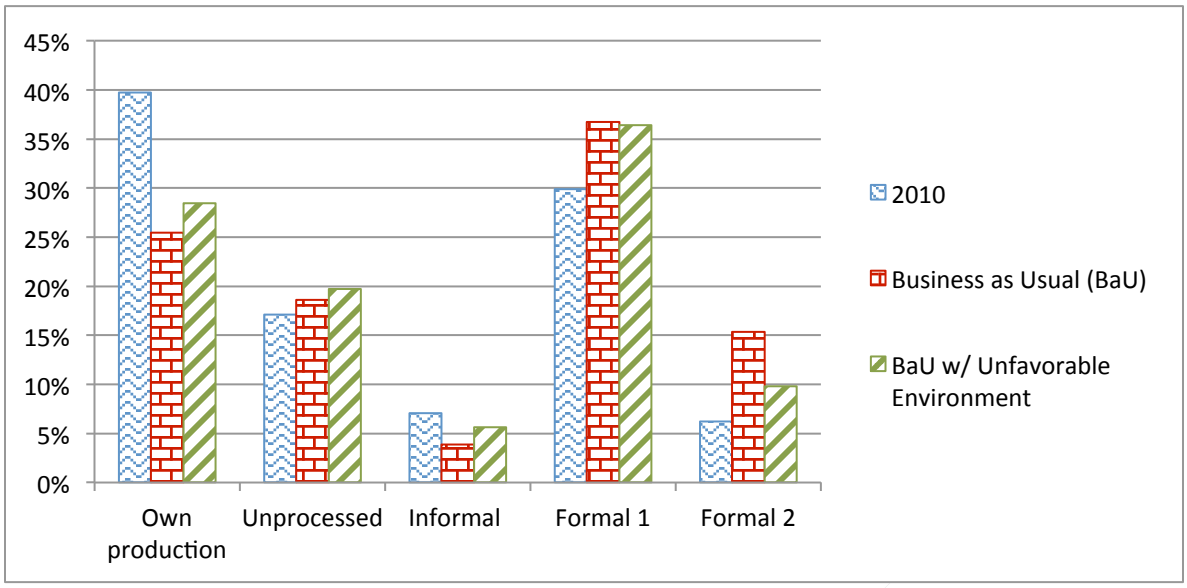
Figure 3.13. Budget shares for food and non-food, 2010 and 2040 under two Equitable Growth scenarios



Source: Author calculations from projection model

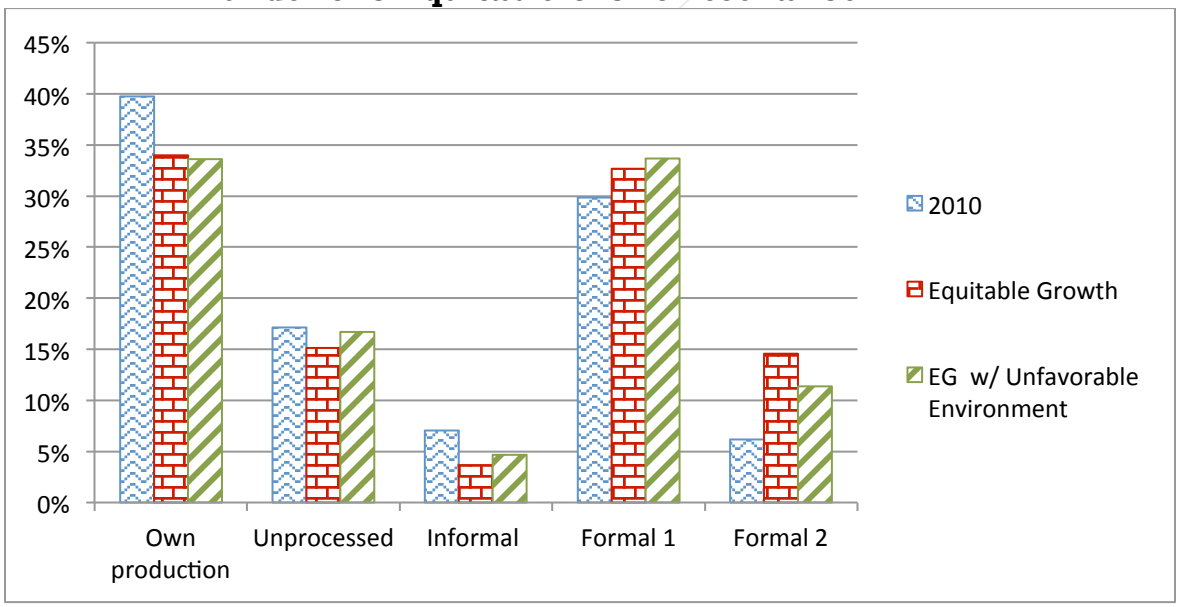
The second major pattern is that consumed own production share falls in every scenario and is made-up almost entirely by increases in the budget shares of formal processing (Figures 3.13 and 3.14). Consumed own production falls much less under EG than under BaU, due to the fact that EG results in more income growth for the poor and for those in rural areas, both of whom have higher elasticities of demand for own production than do the more wealthy and urban. Among formally processed items, Formal 1 with the lesser value added predominates but grows less in percentage terms; the more highly processed items in Formal 2 see their budget shares rise from about 6% to about 15% under BaU and EG and to 10% to 12% in each of these scenarios under unfavorable conditions that deliver less total income growth.

Figure 3.14. Food budget shares by processing level in 2010 and in 2040 under two Business as Usual scenarios



Source: Author calculations from projection model

Figure 3.15. Food budget shares by processing level in 2010 and in 2040 under two Equitable Growth scenarios



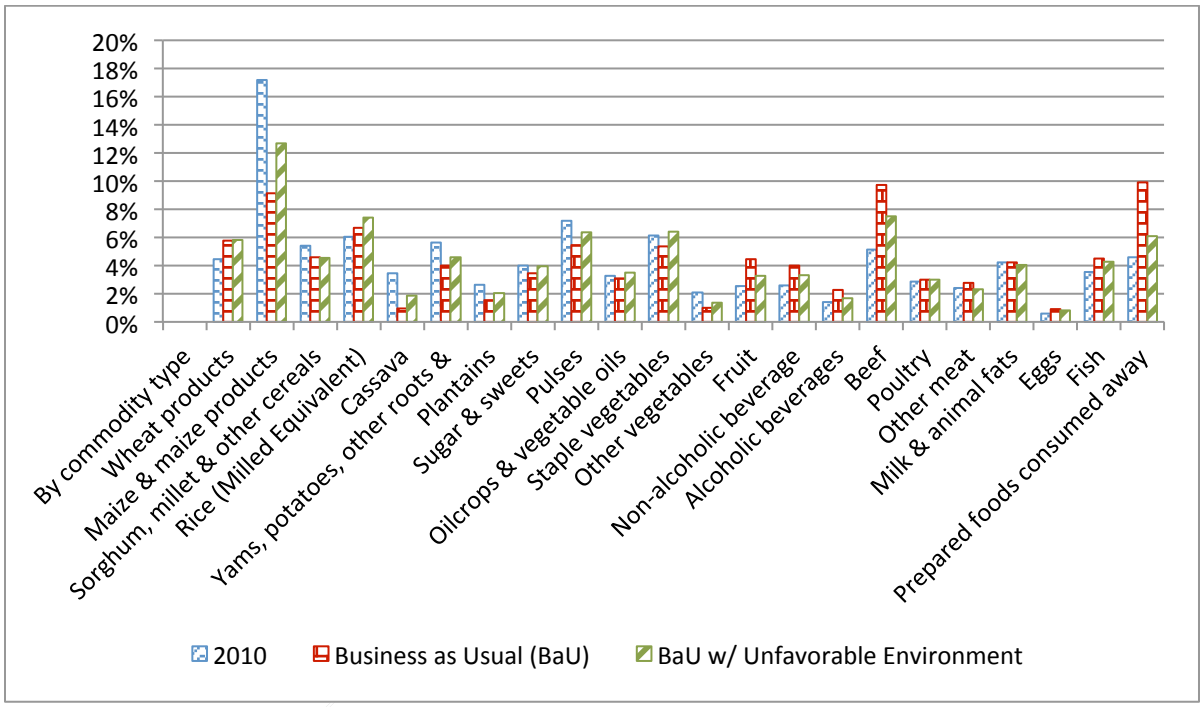
Source: Author calculations from projection model

Finally, both sets of scenarios drive large declines in food budget shares of maize, root crops (especially cassava and yams), and plantains, slight shifts within food staples towards wheat and rice, large increases in beef and prepared food consumed away from home, increases also in fruit and beverages, and relatively modest changes in all other items (Figures 3.15 and

3.16). Note that the budget share on poultry remains essentially flat from 2010 in all four scenarios. This result stems from sharp increases in quantities consumed paired with sharp declines in price; the world over, poultry production is the first meat production to industrialize as food systems transform, resulting in much higher productivity and lower prices. Consumers eat more poultry as their incomes rise, but they pay much lower prices for it.

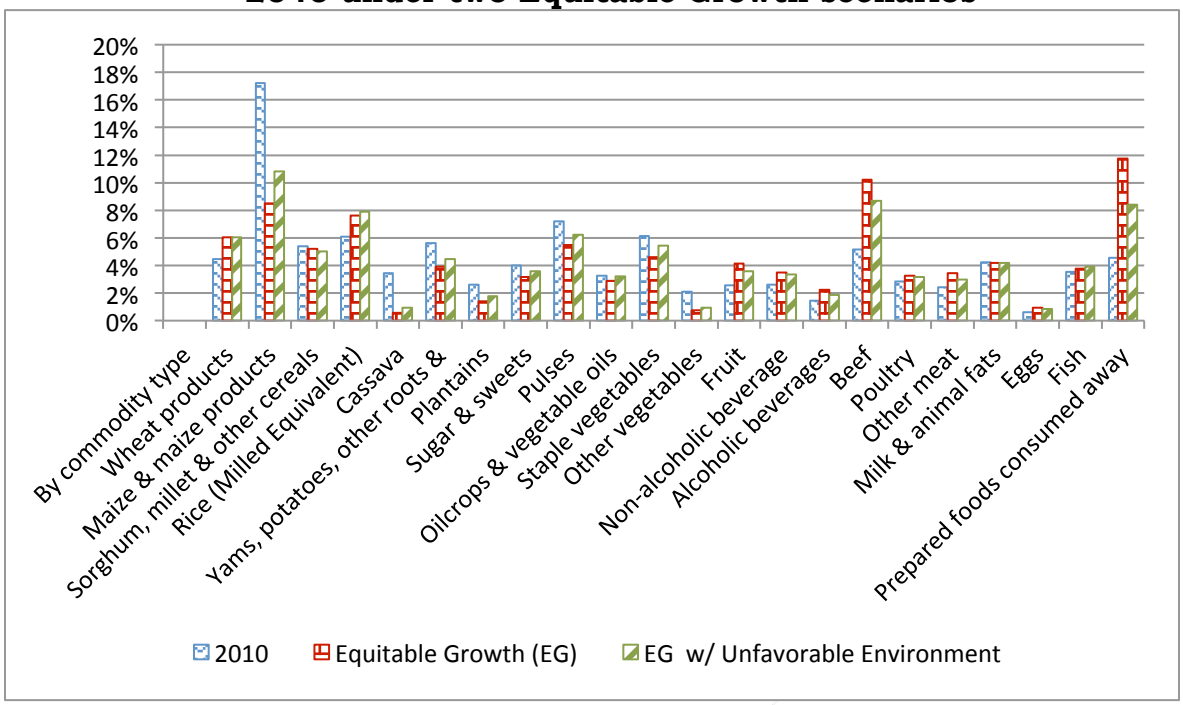
Perhaps, the most noteworthy result on food budget shares is that they are not much different in our two sets of scenarios. In each case, lower growth results in less change, but the pattern of change across processing levels and food groups is similar.

Figure 3.16. Food budget shares by detailed food group in 2010 and in 2040 under two Business as Usual scenarios



Source: Author calculations from projection model

Figure 3.17. Food budget shares by detailed food group in 2010 and in 2040 under two Equitable Growth scenarios



Source: Author calculations from projection model

Level of Expenditure: Unlike expenditure patterns, total expenditure outcomes differ dramatically across scenarios (Table 3.t5 and Figures 3.17-3.22). Due primarily to the way that the EG scenarios deliver more growth than BaU to poorer households and rural households, and because both types of households have higher elasticities of demand for food than richer and more urban households, total demand for food grows much more rapidly under the two EG scenarios. Including consumed own production, total food demand in the FSZ rises 6 times (from $137 million per day to $828 million per day) under BaU but 9 times under EG (up to $1,251 million per day). Demand for food through markets –i.e. excluding consumed own production – rises by 7.5 times and 10 times, respectively. Rises in demand are far less but still very substantial under unfavorable environments that deliver less growth: total demand rises 3.3 times under BaU and 5.8 times under EG, while market demand jumps by 4 times and 6.3 times. On average over all scenarios, demand for food through markets rises about 7 times. Though very large, these results are comparable to those of Byerlee et al (2013) who project a quadrupling of the size of urban food markets through 2030 (our projections go to 2040).

The rise in demand is seen most sharply in the most highly processed food items, demand for which rise 15 times under BaU and 21 times under EG under favorable environments for growth. Even under an unfavorable environment, the EG scenario delivers a nearly 11-fold increase in demand for Formal 1 food items, due to the distribution of growth more heavily toward low

income households and rural households compared to BaU. Informal processing grows the least under three of the four scenarios, while unprocessed foods and formal 1 foods grow similarly, each increasing between about four times and nearly 10 times depending on the scenario.

Among the food groups, the biggest winners in percentage terms are prepared foods consumed away from home, beef, and fruit. These grow under the EG (BaU) scenario with favorable conditions by 23 (13) times, 18 (11) times, and nearly 15 (10) times, respectively. Wheat and wheat products, beverages (alcoholic and non-alcoholic), fruit, and eggs are also big winners. In all cases, the increase in total demand is much more pronounced under the two EG scenarios than under the two BaU scenarios, for the reasons explained above.

The key results from this analysis are as follows:

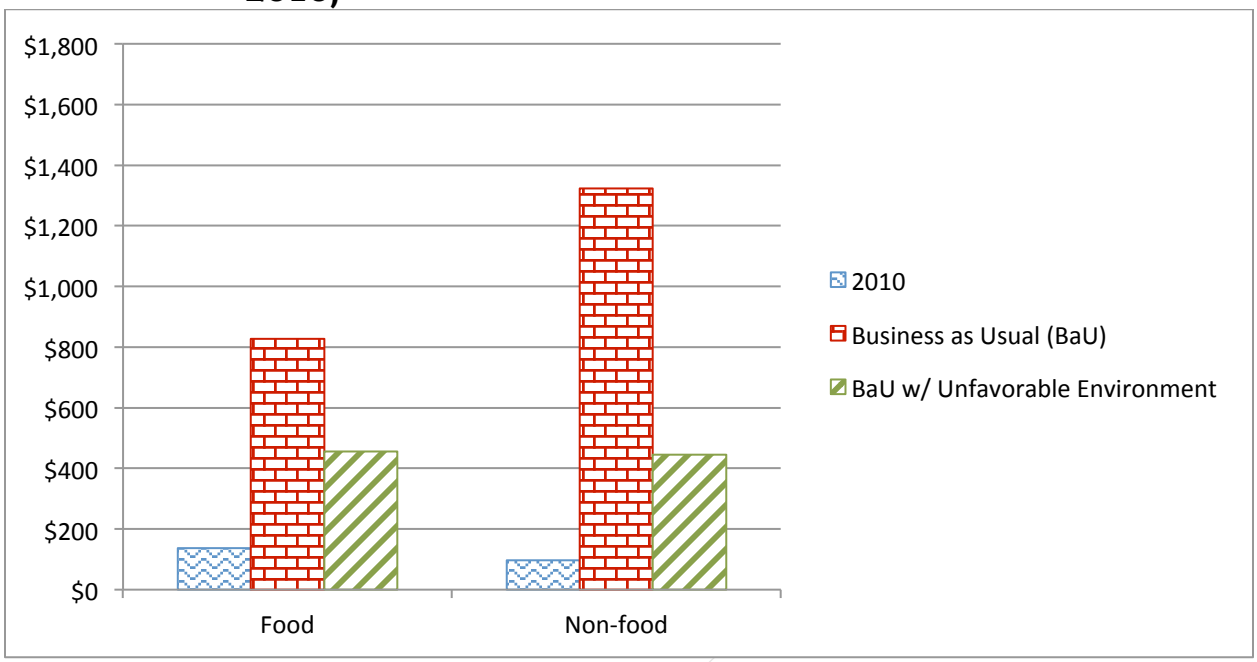
- Under all scenarios, changing patterns of demand (captured by food budget shares) are most evident for maize and overall own production (large declines), and for food away from home, beef, fruit, and high value added processed items (large increases). Wheat and wheat products, beverages (alcoholic and non-alcoholic), fruit, and eggs are also big winners;
- Differences among growth strategies (continuation of current policies producing unequal and urban-biased growth) are minor in this measure of transformation;
- Differences among strategies are very large when it comes to their impact on growth in demand; the two Equitable Growth scenarios deliver much higher multiples of growth than the two Business as Usual scenarios;
- In any case, urbanization combined with even modest economic growth will drive very large increases in overall demand for food; these increases range from 3.3 times under the least favorable scenario (BaU with unfavorable conditions) and over 9 times in the most favorable (EG with favorable conditions).

To meet this increased demand, and to produce the new foods and more value added foods that this analysis shows consumers will demand, local food systems will have to profoundly increase their level of investment and productivity at all levels, from farm through all the midstream and downstream segments.

Table 3.5. Total expenditure on food in Rest of Africa Maize Mixed FSZ by food item groupings, 2010 and 2040 under four scenarios ('000'000 PPP USD, 2010)

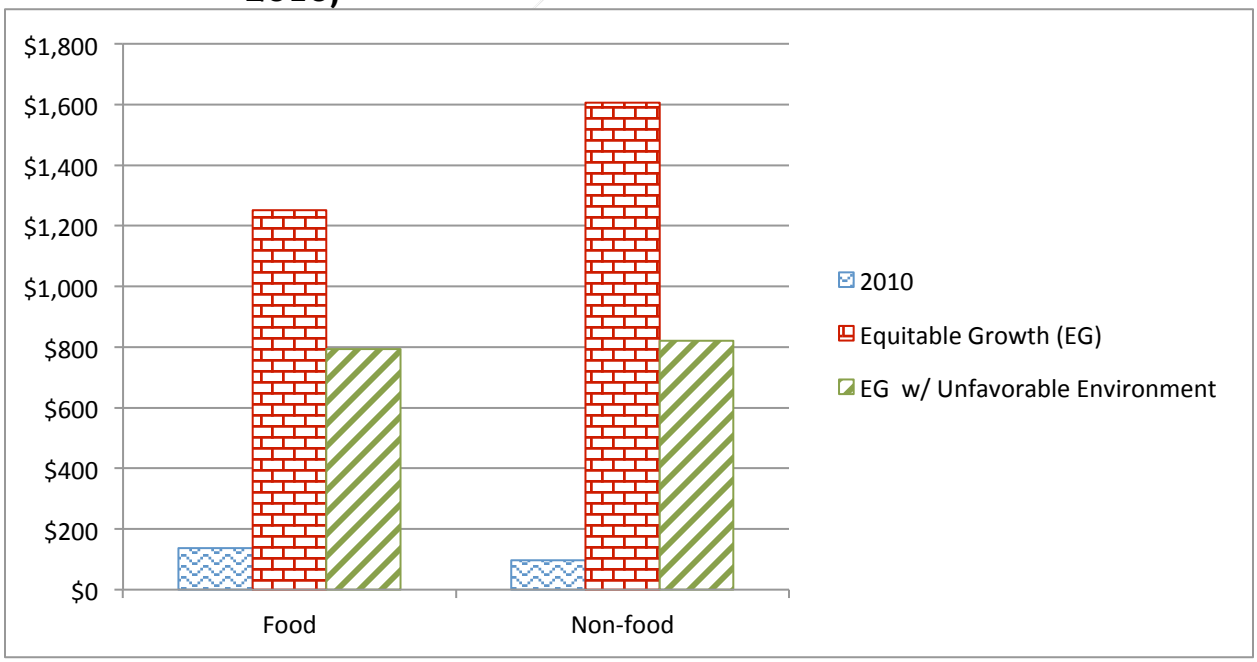
		2040			
	2010	Business as Usual (BaU)	BaU w/ Unfavorable Environ-ment	Equitable Growth (EG)	EG w/ Unfavorabl e Environ-ment
By processing level					
Own production	$54.76	$210.99	$129.66	$424.93	$266.63
Unprocessed	$23.61	$153.87	$89.71	$189.24	$132.33
Informal	$9.73	$32.12	$25.78	$45.81	$37.28
Formal 1	$41.19	$303.90	$165.84	$408.68	$267.30
Formal 2	$8.54	$127.13	$44.80	$182.54	$90.12
Non-Food			$445.55	$1,606.77	$820.27
By commodity type					
Wheat products	$6.16	$47.91	$26.47	$75.58	$48.11
Maize & maize products	$23.71	$75.59	$57.87	$106.34	$85.89
Sorghum, millet & other cereals	$7.43	$38.19	$20.72	$64.93	$39.79
Rice (Milled Equivalent)	$8.36	$55.24	$33.80	$95.60	$62.57
Cassava	$4.74	$7.79	$8.40	$7.02	$7.46
Roots & tubers	$7.77	$32.99	$20.89	$49.14	$35.29
Plantains	$3.61	$12.75	$9.34	$17.53	$14.04
Sugar & sweets	$5.52	$28.79	$18.05	$39.38	$28.35
Pulses	$9.91	$45.19	$29.03	$68.65	$49.51
Oilcrops & vegetable oils	$4.51	$25.62	$15.94	$35.94	$25.64
Staple vegetables	$8.46	$44.42	$29.31	$57.73	$43.25
Other vegetables	$2.87	$8.25	$6.30	$9.64	$7.48
Fruit	$3.54	$36.84	$14.91	$51.57	$28.37
Non-alcoholic beverage	$3.58	$33.13	$15.16	$43.82	$26.49
Alcoholic beverages	$1.97	$18.95	$7.69	$27.83	$14.84
Beef	$7.09	$80.50	$34.13	$127.65	$68.85
Poultry	$3.93	$24.69	$13.60	$40.71	$25.29
Other meat	$3.34	$22.99	$10.60	$43.22	$23.50
Milk & animal fats	$5.80	$35.17	$18.53	$52.39	$33.25
Eggs	$0.83	$7.34	$3.64	$11.55	$6.75
Fish	$4.89	$37.22	$19.41	$47.38	$31.12
Prepared foods away from home	$6.31	$82.25	$27.76	$146.89	$66.85
Other foods	$3.49	$29.33	$14.38	$33.10	$21.37
By food/non-food					
Food	$137.84	$828.01	$455.79	$1,251.20	$793.65
Non-food	$97.71	$1,322.59	$445.55	$1,606.77	$820.27
Total	$235.54	$2,150.60	$901.34	$2,857.97	$1,613.92

Figure 3.18. Total expenditure per day on food in the FSZ in 2010 and in 2040 under Business as Usual scenarios ('000'000 PPP USD, 2010)



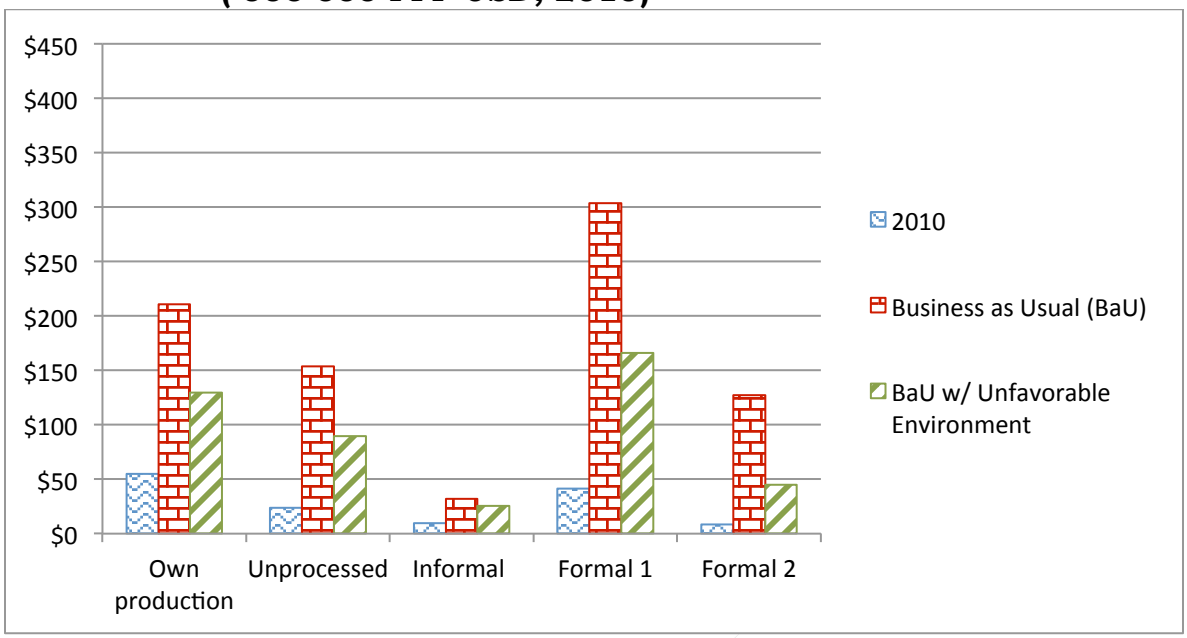
Source: Author calculations from projection model

Figure 3.19. Total expenditure per day on food in the FSZ in 2010 and in 2040 under Equitable Growth scenarios ('000'000 PPP USD, 2010)



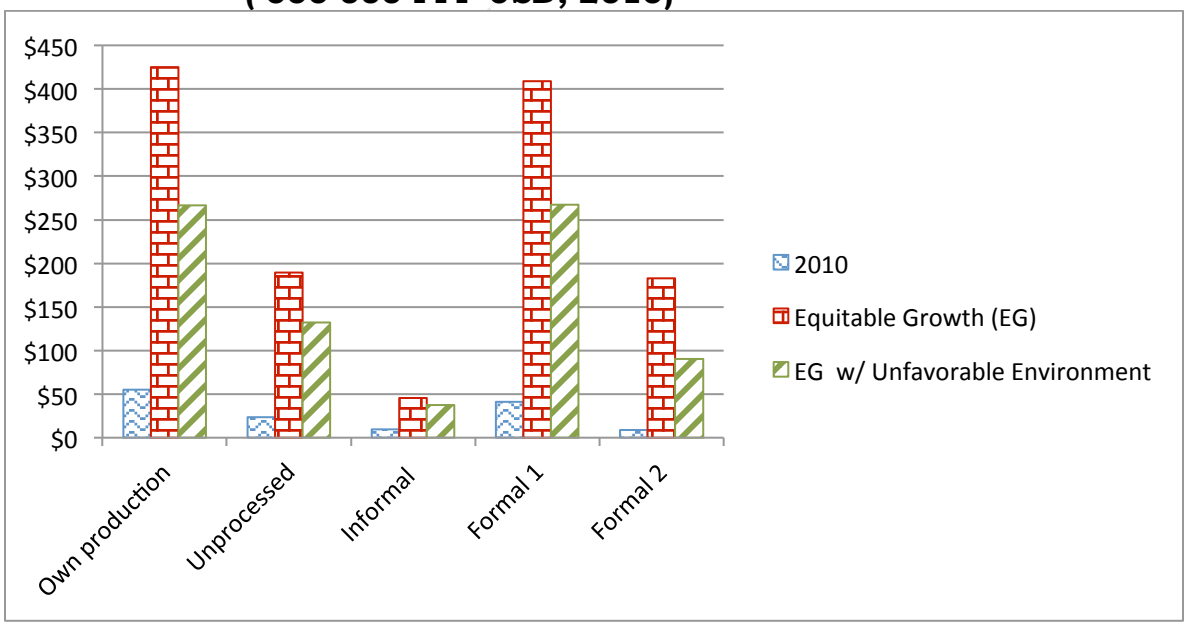
Source: Author calculations from projection model

Figure 3.20. Total expenditure per day by processing level in the FSZ in 2010 and in 2040 under Business as Usual scenarios ('000'000 PPP USD, 2010)



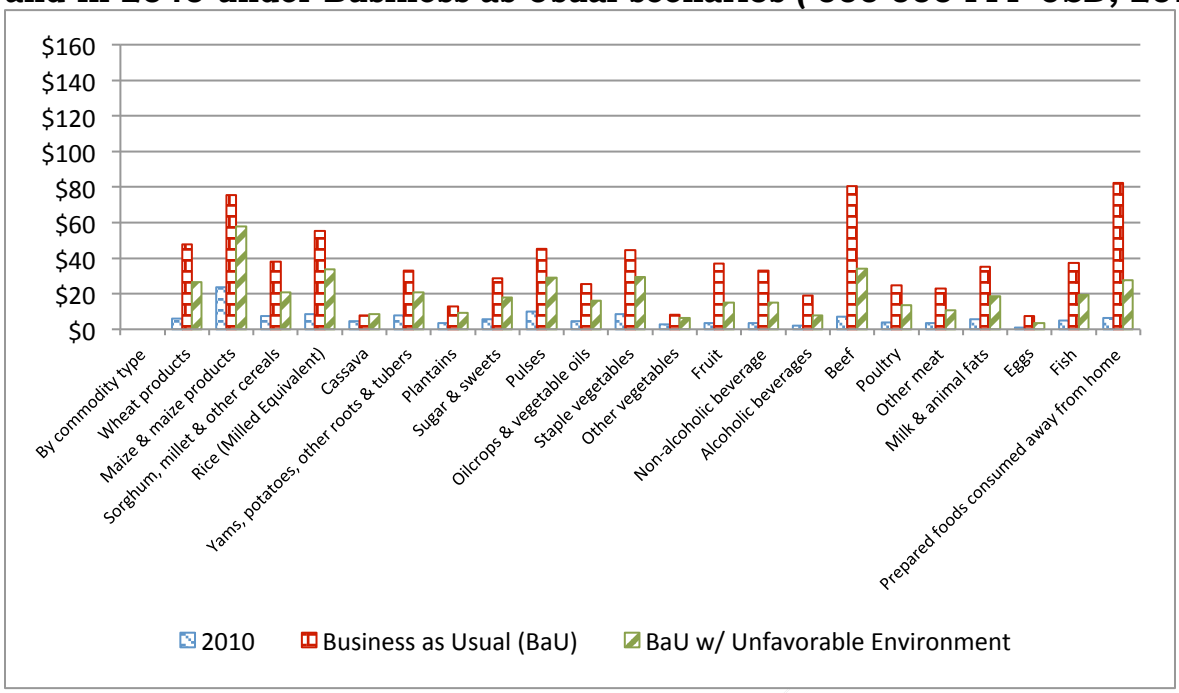
Source: Author calculations from projection model

Figure 3.21. Total expenditure per day by processing level in the FSZ in 2010 and in 2040 under Equitable Growth scenarios ('000'000 PPP USD, 2010)



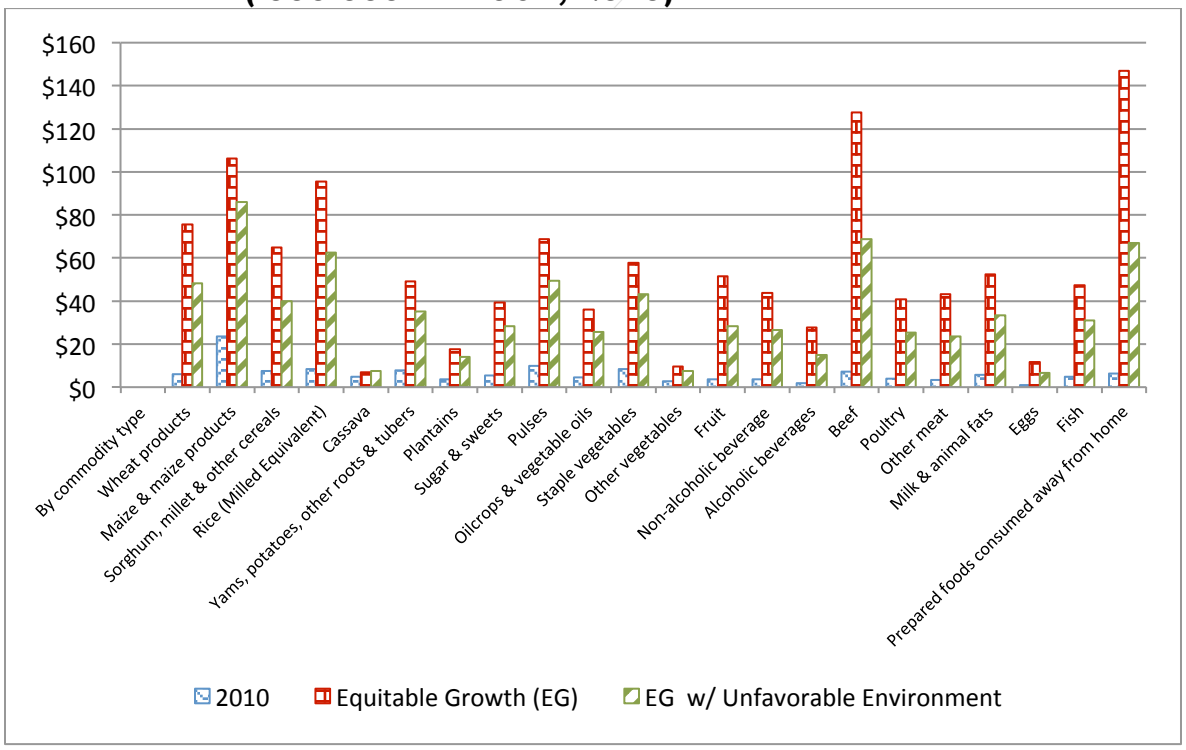
Source: Author calculations from projection model

Figure 3.22. Total expenditure per day by food group in the FSZ in 2010 and in 2040 under Business as Usual scenarios ('000'000 PPP USD, 2010)



Source: Author calculations from projection model

Figure 3.23. Total expenditure per day by food group in the FSZ in 2010 and in 2040 under two Equitable Growth scenarios ('000'000 PPP USD, 2010)



Source: Author calculations from projection model

3.5 Anticipating Qualitative Changes in Demand

Rapid urbanization and sustained income growth at the levels reflected in our projection model lead, in addition to explosive quantitative growth and major shifts towards more highly processed foods and fresh perishable foods, to transformative *qualitative* changes in consumer demand for food over time.

One such change that will be observed over time is rapid rises in demand for value, much of it closely linked to convenience. Urbanization leads to less free time for most people, especially for women, who become more likely to work outside the home, giving them less time and energy to focus on home-prepared foods. Greater packaging, semi-prepared (e.g., sliced- and diced vegetables and fruit) and prepared foods, canned and frozen goods, and fast foods become more common.

The second major qualitative change is that consumers become more concerned about food quality and safety, and their conception of what safety means evolves as their incomes and education rise. From simple visual inspection of freshness and cleanliness, consumers eventually come to expect much more sanitary shopping environments and to rely on third-party certifications and formal food safety standards to back-up their confidence in the food supply. As Unnevehr and Hirschhorn (2000) state, "food safety interventions build from basic investments and simple interventions to more complex regulatory systems as economies develop." Currently, most African countries have severely limited abilities to design, maintain, and properly adapt over time these types of complex regulatory structures. Doing so will require far more trained personnel in nutrition, food safety and toxicology, food processing, and the economics of regulation. To be of real use, these trained people will need to be employed in organizational and managerial structures that value knowledge-driven service to the public; promoting such an attitude is a major challenge in any country and is especially so at this point in nearly all African countries.

It is all but certain that these two qualitative changes will occur to a meaningful extent in Africa over the next 30 years. The difficult question is the rate at which they will occur. Properly anticipating this rate of change is important so that the needed new regulatory structures can keep pace with, and even promote and shape these changes, without getting so far ahead that they become irrelevant or even counter-productive. As one example, insisting that farmers and traders follow sophisticated process standards and meet quantitative requirements for maximum pesticide residues in fresh produce can be counter-productive when well over 90% of the produce comes from farmers with low literacy, moves through badly under-developed traditional marketing structures, and is consumed by very low income consumers who may not even understand such regulations.

Box 3.1: Will African consumers pay for food safety?

Food safety in developing and emerging countries is receiving increased attention from economists, researchers and policymakers. As urbanization proceeds, and if incomes continue to rise at robust rates, consumers in Africa will become increasingly aware of food safety issues, more demanding of food safety guarantees, and more sophisticated in their approach to food safety. From simple visual inspection of freshness and cleanliness, consumers will come to expect more sanitary shopping environments and to rely on third-party certifications and formal food safety standards to reinforce their confidence in the food supply. As Unnevehr and Hirschhorn (2000) state, "food safety interventions build from basic investments and simple interventions to more complex regulatory systems as economies develop." Yet assuring food safety in modernizing food systems involves significant costs, and current incomes in developing SSA are lower than in Asia. Are consumers in developing SSA willing now to pay for the regulatory structures and private practices that can ensure better food safety? A comprehensive review of the literature highlights three findings:

1. **Overall, consumer awareness of food safety problems in developing SSA is low:** Food safety standards, and systems to ensure them are major issues in export supply chains, especially of fresh produce to Europe. Such systems are essentially non-existent in supply chains serving domestic consumers, who are largely unaware of food safety risks (Probst et al. 2012).
2. **Risk perception by consumers is strongly affected by income:** Several studies show that consumers are willing to pay premia for food safety guarantees, but that these premia are strongly related to income (Probst et al. 2012; Alphonce & Alfnes 2012; Lagerkvist 2013). Lagerkvist et al. (2013) find that consumers shopping in modern retail outlets (who tend to have higher incomes) perceive a lower food safety risk in these channels than in traditional markets.
3. **Knowledge of African consumer willingness to pay for food safety is very limited**: The most up-to-date research on consumer preferences for food safety is skewed towards a focus on several Asian countries and provides an incomplete picture of developing country consumers' preferences, especially in SSA. Research is needed in four areas. First, consumer demand for food safety and how it varies with income level, education, and other socio-demographic variables. Second, how able are current food systems to transmit information about food safety through the supply chain, and what investments and educational programs might improve this performance? Third, a better understanding is needed of producer behavior with regards to safety and quality practices, especially their operation's willingness to bear the costs of improved safety practices. Finally, comparative assessments need to be made of alternative approaches to food safety regulation and practice. Lessons learned from developing Asian countries, in addition to SSA countries, should be included in such studies.

Conclusions: While solid empirical studies are scarce, anecdotal evidence based on the very low current incomes in developing SSA suggest that the mass of poor consumers will not be as willing as consumers in other areas of the developing world to bear the costs of food safety systems. It is also the case that African countries currently have severely limited abilities to design and implement complex regulatory structures. For both reasons, policy makers and donors need to be careful to avoid the imposition of costly and complex food safety systems that will be infeasible in the current economic environment of developing SSA. At the same time, efforts to tackle known and serious food safety problems, such as mycotoxin contamination of staple food crops, could have high payoffs in human health as long as they are based on solid knowledge of farmer and consumer knowledge, attitudes, and willingness and ability to change food safety practices.

Key variables that will drive the rate of change in these qualitative dimensions of demand are per capita income and its distribution, educational levels, and growth of urban relative to rural populations: higher income growth, more equal distribution of that growth, higher levels of education, and greater urbanization will drive more rapid and broad-based increases in demand for the range of quality characteristics we discuss above. Nutrition and food safety awareness campaigns can also influence the rate of change in consumer demand for food quality and safety. Yet, the current income levels found in ESA need to be kept firmly in mind. Growing at 4% in real terms per year, mean incomes in ESA will rise by 2040 to levels equivalent only to the four poorest countries of Latin America in 2010 (Honduras, El Salvador, Bolivia, Paraguay). In addition, UN projections call for the urban population share in ESA in 2040, despite the very rapid urbanization forecast for this period, to still be lower than it is at present in Central America. Thus, while the next 30 years will bring substantial change to the structure and quality of demand for fresh produce in the region, one needs to remain anchored in the reality of the region's very low starting point and in patterns observed over time elsewhere in the world, to avoid overestimating the degree of change and designing policies and programs with low or even negative returns.

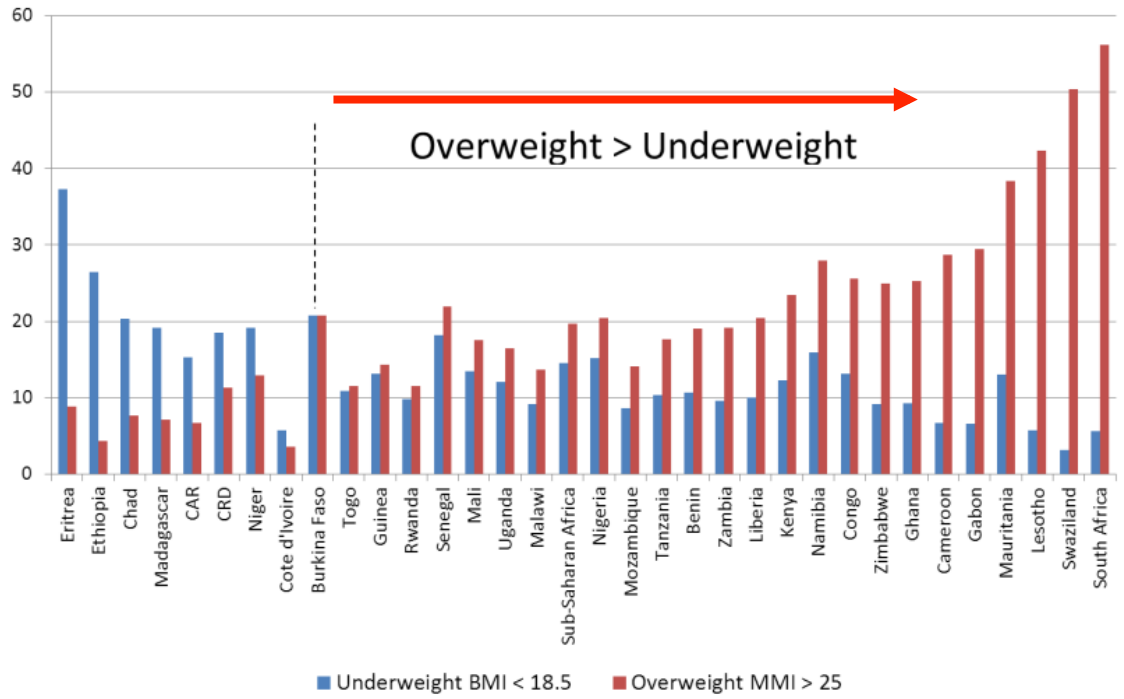
Chapter 4: Bending the Curve in Africa's Nutrition Transition

Steven Haggblade, Gyebi Duodu, John David Kabasa, Nelson Ojijo, John R.N. Taylor[8]

4.1. Introduction

Sub-Saharan Africa[9] has captured worldwide attention over many decades for its high levels of hunger and malnutrition. This unenviable reputation as a land of chronic undernutrition contrasts starkly with rising levels of obesity in rich western countries. Worldwide, since 2007, the share of overweight population has surpassed underweight population. Today, about 870 million people worldwide are undernourished, while 1.4 billion are overweight (FAO 2013). Increasingly, under- and over-nutrition coexist – even in Africa. In a majority of African countries today, among adult females the share of overweight women now exceeds the share of underweight (Figure 4.1).

Figure 4.1. Africa's Double Burden (percent of adult females under and overweight)



Source: WHO (2013)

Discussions of malnutrition have, consequently, become increasingly complex. Nutritionists frequently distinguish among three different dimensions of

[8] We thank the International Fund for Agricultural Development (IFAD), through its Modernizing African Food Systems grant (MAFS) to MSU, for the funding to make this work possible.

[9] Henceforth, this paper will refer to Sub-Saharan Africa as Africa.

malnutrition. Under-nutrition, the consumption of fewer nutrients than required to balance energy expenditure, gives rise to weight loss, stunting and chronic malnutrition. In everyday language, we refer to this as hunger. In contrast, over-nutrition, caused by consumption of more calories than required for basic metabolic activity, leads to weight gains of increasingly visible proportion. In Mexico, 70% of people are overweight, and one-third are clinically obese, as defined by Body Mass Index (BMI) greater than 30. Micro-nutrient deficiencies define a third dimension of malnutrition. These deficiencies often occur together with under and over nutrition as a result of declining diet quality and reduced intake of key vitamins, fiber and minerals. Some refer to these diet quality deficiencies as hidden hunger (Stein & Quaim 2007).

The nutrition transition describes common shifts in food consumption and lifestyle patterns that together give rise to increasing problems of overnutrition (Popkin 2002). Given uneven income distribution and growth, under and over-nutrition frequently coexist. As a result, many nutritionists refer to Africa's double burden of malnutrition.

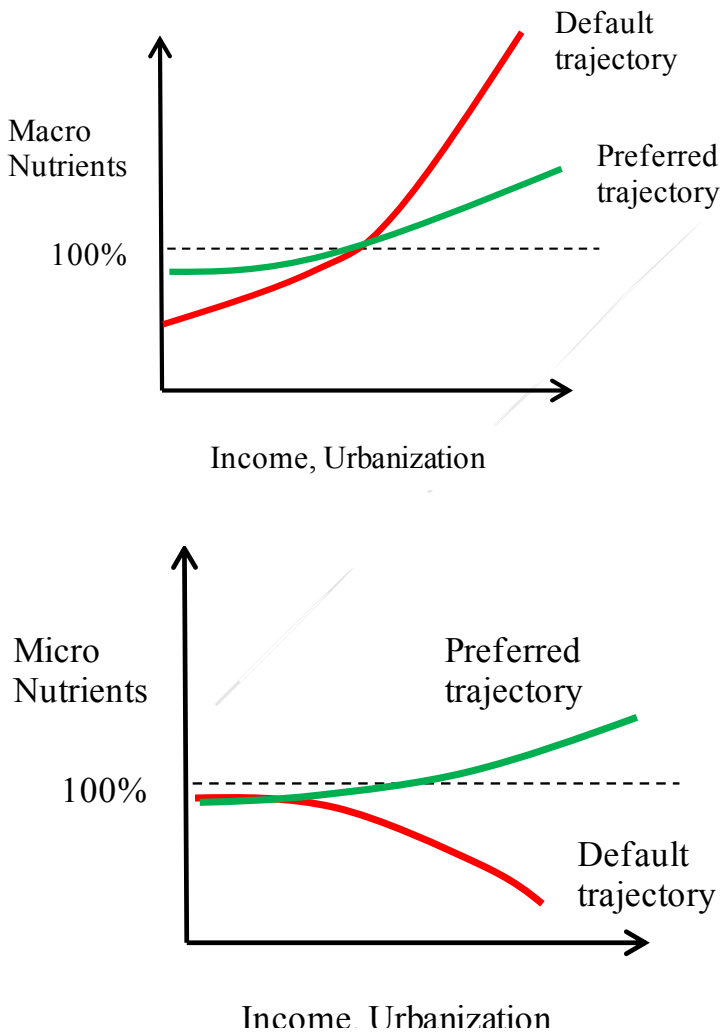
The bad news for Africa is that the nutrition transition is coming fast, as shown by results in the previous chapter. Rapid penetration of processed foods, fast foods, sodas and advertising mean that nutritional profiles will change rapidly, particularly with the continent's rapid urbanization. Moreover, tight interaction among the three dimensions of malnutrition will force public health officials to fight complex, inter-related nutritional problems across multiple fronts. The widely held "thrifty phenotype" hypothesis suggests that undernutrition in pregnant women tends to gives rise to low birth weight babies and to metabolic responses in utero that lead fetuses to hoard calories and that may, in turn, give rise to increased propensity for obesity in later life (Hales & Barker 1992; Sahn 2010). If so, then undernutrition today will set the stage for greater overnutrition in the coming generation. Similarly, calorie dense foods such as oils, fats and sugars, which give rise to obesity, simultaneously promote micro-nutrient deficiencies by crowding out nutrient-dense foods such as fresh fruits and vegetables. As a result, the multiple dimensions of malnutrition need to be addressed simultaneously. The public health and economic costs of growing overweight populations are increasing across much of the developing world. In China, by 2020 the costs of overweight diseases will exceed those of underweight in China (Popper 2003). The growing strain on public health budgets holds the potential to overwhelm public health systems in Africa.

Viewed differently, this same evidence offers glimmers of good news for Africa. As the most rural and poorest continent in the world, Africa is the last to face the nutrition transition. As a result, Africans can learn from experiences elsewhere about nutritional trajectories, causes, key mistakes to avoid as well as concrete steps that may help to prevent or at least moderate their

nutritional transition (Vorster et al. 2011, Minnar et al. 2013). Wide differences in the scope and speed of the nutrition transition across countries and locations offer prospects for comparative learning. Since the 1980s, Mexico has transitioned very rapidly from an undernourished poor country to an obese middle-income nation. In contrast, Japan, with its much richer more urbanized population, has contained adult obesity levels at under 5% compared to Mexico's one-third (FAO 2013). Africa's late start offers prospects for learning from others how to bend the nutritional trajectories in more favorable directions (Figure 4.2).

This paper examines the nutrition transition in Sub-Saharan Africa. It explores issues and evidence that identify the characteristics, causes, consequences and possible cures.

Figure 4.2. Bending the Curve in Africa's Nutrition Transition



Source: Minnar et al. (2013)

4.2. Characteristics of the Nutrition Transition

Changing diet and rising obesity define the two signature characteristics of the nutrition transition. Diets change perceptibly during typical economic transitions, as incomes and urbanization increase. As shown in Chapter 3 and repeated across the world as countries have grown and urbanized, higher incomes drive consumer diversification from staples into high-value foods (meat, dairy, fruits and vegetables, sugar and oils), while spatial concentration of urban populations drives an increasing demand for packaged, preserved and prepared foods; recall that high value added processed foods showed the greatest percentage growth of any food group in our projections. In Africa, this shift to convenience foods has already driven a dramatic shift in the composition of cereals, most notably the large increase in imported wheat used in bread, pasta, biscuits and crackers. Africa's rising income and growing middle class (Economist 2012) drives increased purchasing power and growing consumption of edible oils, refined sugars, meat products and fats (Table 4.1). Long-term studies from the Republic of South Africa, for example, indicate that dietary intake of fats has increased from 21% to 30% of total caloric intake over the past thirty years among urban South African women (Forster et al. 2011).

Table 4.1. Trends in African Food Availability (kcal/person/day)

	1961	2009	change
Cereals	1056	1283	227
wheat	236	393	157
Roots and tuber	253	320	67
Sugar	257	305	48
Pulses	1	8	7
Vegetable oils	179	277	98
Fruits	78	106	28
Vegetables	31	44	13
Meat and dairy	132	172	40
Fish	3	6	3
Total	1997	2560	563

Source: FAOSTAT

Rising obesity results from increased consumption of calories, fats and sugars coupled with reduced physical activity associated with urbanization, mechanization and the rise of automotive transportation. Levels of overweight population have increased dramatically in rich western countries and, increasingly, in the developing world. In the USA, two-thirds of the population is overweight, while in major western European countries that figures lies at over half (Table 4.2, Ogden et al. 2007). Levels of overweight population in

middle income countries from Mexico to Egypt to South Africa are now equal to or greater than USA (Popkin 2003).

Table 4.2. Prevalence of Overweight Adults (BMI > 25), by Region

	1980	2008
Africa	17	30
Developing Asia	11	22
Latin America	30	57
Europe	46	58
Developed Asia	18	30
North America	43	70
World	23	33

Source: FAO (2013)

In developing countries, rates of overweight and obesity are growing two to five times faster than in the developed world (Popkin 2003). In China, the incidence of overweight doubled among women and tripled among men between 1989 and 2000 (Bell et al. 2001). In Brazil, obesity has rapidly replaced undernutrition as a leading public health problem (Monteiro et al. 2003). In Mexico, the nutrition transition began later but has advanced more rapidly (Rivera et al. 2002). Among under-five children in Africa, overweight prevalence is projected to triple between 1990 and 2020 (de Onis, Blössner & Borghi 2010).

Adult women, with their high natural levels of subcutaneous fat, prove especially susceptible to weight gains during this transition (Fogelman 2009). This has led to high levels of overweight women in many moderate and low-income African countries (Figure 1). In South Africa, over half of all women and roughly 30% of men are now overweight (Fairbrother 2010).

Comparing the three different dimensions of malnutrition – hunger, micro-nutrient deficiencies and obesity – suggests wide differences across subregions in Africa. Southern Africa lays claim to the highest levels of adult obesity on the continent but with lower than average levels of stunting and anemia. In West, Middle and East Africa, the opposite situation occurs, with high levels of anemia and stunting but much lower levels of obesity (Table 4.3).

Table 4.3. Three Dimension of Malnutrition across Africa's Subregions

Africa Subregions	Child Stunting	Child Anemia	Adult Obesity
Northern Africa	21.0	20.4	23.0
Western Africa	36.4	43.5	6.6
Middle Africa	35.0	63.9	4.8
Eastern Africa	42.1	65.2	3.9
Southern Africa	30.8	18.7	31.3
Sub-Saharan Africa	39.6	67.8	7.5
Total Africa	35.6	64.6	11.3

Source: FAO (2013)

4.3. Consequences

The growing prevalence of over-nutrition, overweight and obesity leads to a sequence of negative health outcomes including a rapid rise in cardio-vascular diseases, diabetes, hypertension and certain forms of cancer. Diabetes has increased by 170% over the past thirty years in the developing world (Table 4.4). Hypertension, which affected 1 billion people in 2000, is projected to afflict 1.56 billion by 2025. It poses a particular problem in developing countries where hypertention is already more prevalent than in developed countries (Hossain, Kawar & El Nahas 2007).

Table 4.4. Millions of Cases of Diabetes, 2000 and Projections for 2030

	2000	2030 Projection	Percentage increase
Africa	7	19	162%
Southeast Asia	22	58	161%
Latin America	13	33	148%
Middle East	20	53	164%
India	32	79	150%
China	21	42	104%
Europe	28	37	32%
USA and Canada	20	34	72%
Developing world	84	228	171%
World	171	366	114%

Source: Hossain, Kawar & El Nahas (2007)

To the extent that calorie-dense prepared foods and soft drinks drive reduction of whole grains, fresh fruits and vegetables from diets – and the projection exercise in the last chapter suggests that this will be happening in ESA over the next 30 years - these trends likewise exacerbate micro-nutrient deficiencies which, in turn, trigger immune system malfunctions and raise vulnerability to various infectious diseases. Currently, roughly two-thirds of African children under five are anemic (FAO 2013). Dietary diversity often proves better in rural than urban areas, with urban consumers in South Africa facing particularly limited range of foods (Steyn et al. 2011).

Periodontal disease and tooth loss has also increased rapidly in the face of increasing prevalence of refined sugars and sweetened beverages, coupled with poor dental hygiene (UC Health 2012). The subsequent bacterial infections that accompany gum disease stress the immune system and lower resistance to other infections, leading to higher rates of infectious disease and increased health care costs (Ide et al. 2010, Aetna 2006).

The cumulative impact of this suite of diet-related non-communicable diseases leads to losses in worker productivity and increased health care costs to families and the public health system. In China, the public health and economic productivity costs of overweight problems now equal those posed by under-nutrition, and by 2025, the cost of over-nutrition and diet-related non-communicable diseases will surpass the costs of under-nutrition (Popkin 2003).

In Africa, similar data are not readily available. Yet fragmentary evidence suggests rapidly rising costs due to diabetes, hypertension and cardiac diseases, particularly among urban population. Although rates of undiagnosed diabetes are high in most of Africa, available evidence strongly suggests that the prevalence and burden of Type 2 diabetes are increasing rapidly (Mbanya et al. 2010). Between 2000 and 2030, African populations affected by diabetes are projected to increase by 160% (Table 4.4). Cardiovascular disease is, likewise, growing rapidly across Africa, particularly in urban areas (Vorster 2002).

4.4. Causes

A complex set of interactions among economic, cultural and technological factors drive the nutrition transition at different rates across different settings.

4.4.1. Linked Economic and Spatial Transitions

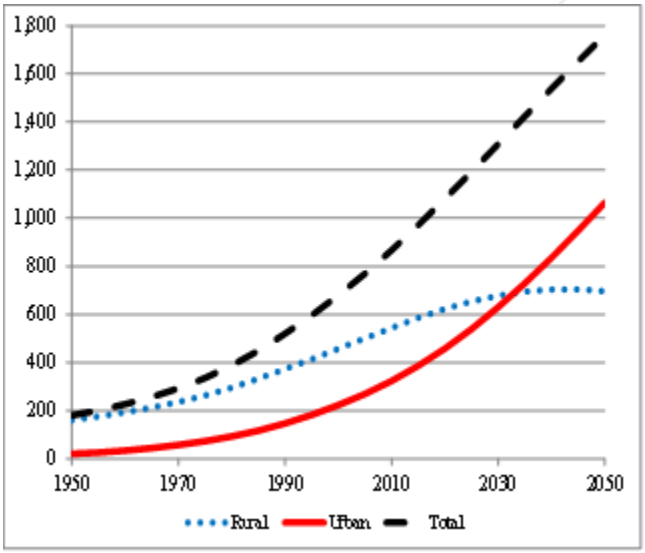
In economic terms, the technological change and capital investment that increase labor productivity drive the per capita income gains that define economic development. In turn, per capita income gains driven by productivity spark a sequence of key transitions that shape nutritional outcomes over time. First, as shown in Chapter 3, per capita income gains drive well-known transitions in food consumption, out of starchy staples (cereals, roots and

tubers) and towards meat and dairy products, fruits and vegetables, oils and fats as well as an increasing share of spending on nonfoods. Second, rising labor productivity in agriculture enables a massive release of labor from agriculture. Coupled with rising consumer demand for nonfoods and economies of scale in manufacturing and services, these forces drive spatial concentration of population in nonfarm occupations centered in urban areas. Third, urbanization congestion reduces physical activity and leads to increasingly sedentary lifestyles. Africa, though the last continent to urbanize, is currently undergoing a rapid spatial transition that will result in a majority urban population by 2030 (Figure 4.3 and Chapter 2). Finally, mechanized technologies in farm and nonfarm businesses contribute to further reduction in caloric expenditures. The combination of increased food consumption and reduced physical activity results in rapid weight gains, obesity and cardiovascular disease.

4.4.2. Cultural Norms

Cultural beliefs and perceptions of beauty clearly influence food consumption habits. In much of rural Africa, historic associations between wealth, ample food supplies and physical girth have led many societies to associate overweight stature with wealth and beauty. In recent decades, reactions to Africa's HIV/AIDS epidemic may have further entrenched this norm. Because AIDS sufferers shed weight rapidly, ample girth in recent decades has come to connote proof of HIV-free status (Fairbrother 2010).

Figure 4.3. Trends in African Urban and Rural Population Growth



Source: UN Urban Projections (http://esa.un.org/unup)

4.4.3. Processed Foods

Human survival instincts from pre-historic times exacerbate modern tendencies towards overweight. Humans are hard-wired to crave salt, sugar and fat. Sugar provides quick energy, fat stores energy for lean times, while salt levels drive osmosis and essential biological cell processes. Yet, in excess, these three nutrients impose biological overloads. Excessive salt intake contributes to hypertension. Excessive sugar consumption leads to diabetes and obesity. Excess fat intake contributes to weight gains and cardiovascular disease.

The modern food industry relies on all three ingredients to preserve and sell packaged and prepared foods (Moss 2013). Salt preserves food and enhances flavor. Sugar, likewise, serves as both a preservative and flavor enhancer. Fat supplies taste profiles that consumers are genetically programmed to prefer. The high levels of salt, sugar and fat used by most food processing industries prove highly profitable for preserving and marketing processed foods.

Food addictions result from the combination of the evolutionarily favored traits in processed foods (Gearhardt et al. 2012). Aggressive marketing, particularly to children, further entrenches consumer preferences for calorie-dense, nutrient-poor processed foods. Some food industry observers claim that the food industry deliberately manipulates taste profiles to develop physical addictions (Moss 2013). Others are less accusatory, though even food industry executives recognize that their heavy reliance on salt, sugar, fats and flavor enhancers do shape consumer consumption patterns. Given the growing prevalence of prepared and processed foods as urbanization proceeds, professionals on both sides of this debate generally agree that active engagement of the food industry will be critical to bending nutritional curves in more favorable directions.

4.5. Bending the Curve in Africa's Nutrition Transition

Africa, the last continent to urbanize, is best positioned to moderate a looming epidemic of diet-related non-communicable diseases (diabetes, hypertension, cardiovascular disease, cancers) that promise to follow in the wake of rising overweight populations. Success will depend on active learning of lessons from elsewhere coupled with early preventive actions (Fairbrother 2010, Tewfik, Bener & Twefik 2010, Gearhardt et al. 2012, Minnar 2013).

4.5.1. Prevention

Most students of the nutrition transition conclude that prevention is more feasible than treatment. Referring to the Bellagio Declaration on the health implications of the nutrition transition, Popkin concludes, "The group unanimously felt that prevention is the only feasible approach to addressing this epidemic of nutrition-related chronic diseases. The cost of their treatment and management imposes an intolerable economic burden on developing countries"(Popkin 2002, p.102). Treatment proves difficult and expensive.

Bariatric surgery (stomach stapling) can reduce weight rapidly but is very expensive. Moreover, rapid weight loss triggers biological resistance. In a calorie- rich food environment, treated patients often relapse into obesity. As a result, treatment typically proves both costly and ineffective.

4.5.2. Learning from Outliers

A handful of countries has fended-off the worst effects of the nutrition transition. South Korea, Japan, Denmark and some parts of Finland have maintained better health status despite high incomes and urbanization. In South Korea, specialists believe that taste preferences for a diet rich in vegetables and fruits but low in fats has contributed to above-normal nutritional outcomes (Lee, Popkin, & Kim 2002). In the North Karelia region of Finland, a comprehensive program of community-based education and intervention led to rapid declines in cardio-vascular disease (Puska et al. 1998).

4.5.3. Policy Options

Bending the nutritional curves onto more favorable trajectories in Africa will require action on two major fronts. The first involves diet change, increasing intake of fresh fruit, vegetables and fiber, while at the same time reducing intake of highly refined processed foods, sweeteners, fatty acids and saturated fats. The second front involves increasing physical activity (Popkin 2003).

In directing action along the first front, a great many institutions and actors impinge on food supply and dietary preferences. Similarly, along the second, town planners, employers, municipal councils, road departments, ministries of transport, schools and others all shape opportunities for physical activity in Africa's increasingly crowded urban environments. As a result of this complexity, most observers conclude that efforts to bend the nutrition curves will require an integrated approach employing a range of policies and interventions across both of these fronts (Haddad 2003, Popkin 2003, Tewfik, Bener & Twefik 2010, Gearhardt et al. 2012).

4.5.4. Policy Tools for Improving Dietary Quality

Beginning at the farm, teams like Harvestplus have focused on plant breeding of nutrient-rich staple foods, such as Vitamin A fortified sweet potatoes and maize. At the processing level, efforts have included food labeling and sometimes advertising restrictions. At the marketing level, many constituencies have adopted taxation of junk food, including soda taxes and sugar taxes. In 2008, Mauritius banned the sale of soft drinks in schools (Fairbrother 2010). School feeding programs, restrictions on school vending machine offerings and nutrition education have received considerable attention. Efforts to educate children often focus on public health and nutrition messages that emphasize the disease-fighting power of nutrient-dense foods such as vegetables, fresh fruits and whole grains.

4.5.5. Policy Tools for Increasing Physical Activity

Here, too, schools receive frequent attention, with increasing emphasis on physical education. Urban planning, zoning and efforts to ensure walkability and bicycle traffic all contribute to improved opportunities for physical activity among working populations.

4.5.6. Ongoing and Emerging Efforts

Alliances of consumers, public health officials, food industry executives and schools have emerged in a variety of forms to target specific dimensions of Africa' impending nutrition transition.

The public health community has long advocated maternal and child feeding and micro-nutrient supplementation as a means of ensuring healthy mother and healthy, full-weight babies. Indeed, nutrition specialists consider iron supplements and micronutrient supplements for pregnant and lactating women to be among the most cost-effective nutrition interventions available (Webb et al. 2011).

The HarvestPlus initiative has focused for several decades on opportunities for enriching staple foods (Nestel et al. 2006). WFP and many others have similarly worked on nutrient supplementation for processed foods, including maize-soya blends and weaning foods.

The Bending the Curve Consortium (BCC) has focused on four priority actions: a) high-level advocacy among public health officials and food industry executives in Africa; b) food science curriculum reform integrating food technology, nutrition and public health with strong links to the private sector through internships and applied research; c) food industry entrepreneurship for high quality and indigenous foods; and d) horticulture wholesale market reforms to reduce marketing costs, reduce current high physical losses (see Box 5.2 in next chapter), raise farm incomes, lower urban consumer prices for fresh fruit and vegetable and get ahead of the population boom by zoning, town and market planning in Africa's rapidly growing secondary cities (Minnar et al. 2013).

In South Africa, where Africa's nutrition transition has advanced most alarmingly, budding coalitions of academic, public health and food industry professions have emerged to try to bend Africa's nutritional trajectory onto more healthy, productive trajectory (Fairbrother 2010, Vorster et al. 2011).

As the world's poorest and most rural continent, Africa can learn from the mistakes of more rapidly growing first movers in Asia and Latin America about what public health problems to expect. More importantly, Africans can glean insights about concrete steps they can take now that may enable the continent to get ahead of these problems. Given the enormity of the challenge, a great many actors will need to bring energy and expertise to bear from many different

directions to deal simultaneously with Africa double burden of under and over-nutrition.

Chapter 5: The Midstream and Downstream Transformation: Current Status and Patterns of Change

David Tschirley, Jason Snyder, Christina O'Sullivan, and Eva Almenar

5.1. Introduction and Overview

The urban food marketing system at retail ("downstream") in ESA today consists of a dynamic mix of three overlapping, competing segments. The *Old Traditional* segment consists of formal shops and purpose-built, officially sanctioned market places. This was the dominant food marketing system during the colonial era and for 20 to 30 years thereafter, prior to the rise of two other segments. The *New Traditional* segment dates its origin to the economic liberalization of the late 1980s and early 1990s. This segment is entirely informal, made-up of thousands of small-scale vendors operating in spillover areas around official markets, in unofficial, quasi-illegal market places scattered throughout the city, and as uncountable individual street-vendors also spread throughout the city. These street vendors range from tiny sellers operating in low income neighborhoods selling a few fresh produce items with rudimentary infrastructure that can be moved from place to place, through owners of relatively permanent and lockable kiosks selling a range of mostly non-perishable items along busy thoroughfares.

Meanwhile, the *Modern Sector* dates its origin to the late 1990s, following the earlier economic liberalization and the fall of apartheid in South Africa. This segment is dominated by chain supermarkets primarily from South Africa and Kenya. Shoprite from South Africa was the early investor and has a dominant share of the supermarket market outside of Kenya. It has been joined over the past decade by Spar, an international firm that uses its South African presence as a base for expansion north into the rest of Africa, Pick 'n Pay which has been the dominant retailer in South Africa, and others such as Woolworth. Kenyan firms Nakumatt and Uchumi dominate the supermarket market in that country and compete with Shoprite and others in the rest of East Africa. Massmart, now owned by Walmart, is also active but primarily in South Africa and has had difficulty expanding into the rest of Africa (Reuters 2013). Local supermarkets, some individual operations and some organized in small chains, are also present but with low market shares.

In practice, it is difficult to distinguish between the officially sanctioned markets of the Old Traditional system and the markets of the New Traditional system, due to heavy spillover around the official markets, unplanned informal expansion of those markets, the unclear legal status of many of the newer markets, and the fact that the retail sellers in the two segments have more in common with each other than they do with the traditional shops or the

supermarkets. Henceforth, we will, therefore, group the two and speak of the markets and vendors of the *Traditional Sector* to mean open air markets (official and unofficial), kiosks, and street vending. This will be contrasted with the *Modern Sector*. When we mean to refer to formal shops of the traditional sector, we will specify that.

Current shares of the urban food market held by these segments are roughly as follows[10]. The formal shops of the Old Traditional segment hold about a 30% to 50% share of the total food market, with a heavy concentration in food staples, dairy, and canned foods and beverages. They sell almost no fresh produce, unprocessed staple foods (whole grains, roots and tubers, pulses), or meat. Traditional butcheries specialize in meat, with widely varying market shares in that particular product; Nairobi, in 2003, showed 68% while Zambia in 2007/08 showed 28%. Markets and vendors of the Traditional Sector - official markets of the Old Traditional system together with the open air markets, kiosks, and street vendors of the New Traditional system - sell the entire range of food products, from unprocessed through highly processed packaged items, with a 30% to 50% share over all food. However, the sector is heavily concentrated in fresh produce and unprocessed staple foods (i.e., what the traditional shops do not sell), and to a lesser extent meat. These outlets dominate the fresh produce trade, with current urban market shares of 90% or more in all countries of the region. The Modern Sector, essentially supermarket chains, holds on average about a 10% market share of overall food across the region, though it is less than this in most countries. Shares are lowest in Ethiopia, Rwanda, Burundi, Uganda, Tanzania, and Mozambique. Zambia and Kenya were the first in the region to experience supermarket penetration and see the highest shares.[11]

Each of these retail sectors relates distinctly to the wholesaling, processing, and packaging level (the "midstream"), based in large measure on the type of products they sell. The markets and vendors of the traditional sector, selling primarily fresh produce and other unprocessed grain, roots and tubers, and pulses, are the primary clients of the *traditional wholesaling sector.* This sector consists of wholesale market places about which the same distinction can be made that we applied to the retail markets: some are purpose-built structures often dating to colonial or immediate post-colonial periods that are officially sanctioned by public authorities, while others have emerged spontaneously over time as the existing market(s) became inadequate to handle growing volumes. These new wholesale markets may have little or no infrastructure specifically built for wholesaling, are typically not sanctioned by public authorizes, and, therefore, are quasi-legal. These markets, and those at retail,

[10] All share data are from Tschirley et al (2010), based on urban survey data from Kenya and Zambia. As such, they will tend to overestimate, somewhat, the market share of supermarkets over the entire region, since these two countries have seen the greatest penetration of the modern sector into food retailing.

[11] Botswana, with much higher incomes than the rest of the region, may have higher supermarket shares, though recent data are lacking.

are sometimes accepted, sometimes tolerated, and periodically targeted for legal action. Such action – typically physical destruction of market stalls, scattering of produce, and eviction of traders – was common among quasi-legal retail markets in the early 1990s, and kiosks and street vendors still suffer from such sporadic "enforcement." Unofficial wholesale markets, being the hubs (along with official wholesale markets) around which the whole system functions, have rarely been targeted in this fashion.

The markets and vendors of the traditional retail sector may also obtain product directly from nearby farmers and from modern retail outlets. The former is limited almost entirely to green leafy vegetables, the bulk of which is produced in or near urban areas and typically bypass wholesale markets due to their perishability. Purchases from modern retailers are most common for items such as bread and packaged goods.

Supermarkets rely for their fresh produce supply on a mix of "preferred suppliers", imports, and local wholesale markets. As a matter of company strategy, these chains emphasize creating their own local procurement channels for fresh produce, based on a set of preferred suppliers and, eventually, centralized warehouses to receive the product and distribute it to individual outlets in the chain. Preferred suppliers are farmers that are able to provide specified quantities of product of acceptable quality on a weekly basis. Quality parameters typically relate to size and freshness – simple visual inspection. Though the chains have made efforts to include individual and organized smallholder farmers in their procurement systems, and though they trumpet these efforts as part of their corporate social responsibility, the record has been discouraging: the vast majority of fresh produce supplied directly by farmers to supermarket chains comes from medium- to large-scale producers[12]. In practice, the chains continue to complement, sometimes substantially, their preferred supplier systems with imports of key items such as temperate fruits, onions, potatoes, and even "staple vegetables" such as tomato, and with purchases from local wholesale markets. Neven and Reardon (2004) estimated that supermarkets in Kenya relied on local wholesale markets for up to 60% of their fresh produce supplies. More updated estimates are not available and, at any rate, are difficult to obtain for two reasons: because the purchases tend to be opportunistic, made only or primarily when imports or local suppliers don't provide the needed quantities, and because the chains' publically stated commitment to building their own procurement channels that buy local production makes them hesitant to speak openly about their reliance on wholesale markets, which are often seen as potential sources of unsafe produce, or imports, which are seen as creating unfair competition with local farmers.

[12] Regoverning Markets, 2004; personal interview with Mr. Willie Minnie, Procurement Manager for Freshmark Zambia (September 2005); Reardon and Berdegue, 2002; Reardon and Timmer 2006

Less is known about supermarket chain procurement systems for processed food items. Given the near disappearance of informal processing in the urban food supply of the region, however (see chapter 3), it is clear that these purchases come almost entirely from a mix of local formal sector processors and imports.

This overview makes it plain that the traditional sector remains a dominant force in food marketing in the region, holding at present an 80% to 90% share in all food sales despite pressure from supermarkets. The characteristics of this sector are, thus, of great importance. Briefly, they are as follows. First, the sector is highly informal. Most of its food market share is held by markets, kiosks, and dispersed street vendors (i.e., traditional shops have lesser shares) and, as argued above, even the vendors in officially sanctioned markets are hard to distinguish from all other vendors. Informality means that they pay no taxes and have very little overhead expense other than market fees for those who operate in markets, and these are typically very modest and not always collected.

Second, the sector is distinctly female at retail, less so at wholesale. Tschirley et al (2012) report that in Maputo (Mozambique), over 95% of fresh produce retailers are women, while in Blantyre (Malawi), this share ranges from about 70% to 85%, depending on crop, and in Nairobi (Kenya), the share oscillates between 60% and 65%. They further report that at wholesale, in these four countries plus Zambia, females range from nearly 100% of traders (tomato and rape in Malawi) to less than 5% (tomato and onion in Zambia, and tomato in Kenya). Abdula and Tschirley (2007) show that the informal maize trade between central Mozambique and Maputo in the south is dominated by females, while the same trade into the city of Beira in the center is dominated by males. Woldu et al (2013) report the gender of owners of 11 different types of retail outlets in Addis Ababa, based on a sample of 1,226 outlets. Across all outlets, female ownership ranged from 16% for flour mills that grind grain and sell flour, to 89% among fresh produce sellers, with an average of 42%. The predominance of females in the traditional marketing sector raises important issues of gender equity as modern supply chains expand their reach with urbanization and growing income.

The third key characteristic is that the sector suffers from tremendous price variability due to very poor vertical coordination. This variability is especially pronounced in fresh produce but is not limited to that product group. Tschirley et al (2012) show that wholesale tomato prices in Zambia had a coefficient of variation 55% higher than in the US, 25% higher than in Taiwan, and 14% higher than in Costa Rica; several other measures of variability and predictability of prices were also much higher in Zambia and all of them fell consistently with a country's level of market development. See Box 5.1 for more on the factors driving price instability in fresh produce markets. The

instability of staple food prices in Africa, especially seasonal variation, has been extensively documented (see for example Byerlee, Jayne, and Myers 2006).

Fourth, the sector's competitive advantage comes fundamentally from locational convenience. This is perhaps the crucial factor, other than price, that drives the choices of low income consumers about where to purchase. The system of markets in urban ESA is typically very dense and highly varied in size. It includes a range of market sizes from very large, sprawling markets that feature the lowest prices, to many medium-sized markets and even more very small markets scattered throughout the city. To enhance locational convenience even more, traders spill out of built market places to the surrounding streets to meet consumers, and spread beyond this into busy roadsides and low income neighborhoods, where consumers can purchase their food on a daily or nearly daily basis as they return from work in public transport or on foot.

This locational convenience is of central importance for poor consumers for two reasons: as a rule they do not have vehicular transport or refrigeration, making large purchases difficult or impossible; and many of them work in the informal sector themselves, with uncertain earnings received (hopefully) on a daily basis. They, therefore, need to purchase small quantities of food as their income allows. Tschirley et al (2010) show econometrically in four cities of Zambia that a household's proximity to a supermarket chain is a more important determinant of shopping in such a chain than is proximity to other outlets to shopping in them; their results highlight the key competitive advantage that informal vendors have in being able to locate close to buyers, and, thus, one of the key challenges that supermarkets have in growing their market share among the mass of low income consumers that dominate cities in the region.

Box 5.1. Price Instability in Fresh Produce Systems of ESA

Because demand and supply vary over time, price variability is an inherent and necessary part of marketing systems. Yet, excessive price variability imposes large costs on farmers and consumers, makes traders' activities far more risky, and probably reduces the kinds of investments in these systems that are needed to promote long-term productivity growth.

Three factors influence price variability and predictability in these systems: seasonality in the flow of product to market, supply shocks, and random day-to-day fluctuations in supply. The first two are determined in the first instance by agro-climatic conditions but are moderated by farmer access to irrigation and pest control inputs, by farmer knowledge of how to use these inputs and otherwise manage their crop, and by the extent of spatial market integration. Reliable access to irrigation allows production during the cool-dry season, when pest pressure is lowest and the main limiting factor is water; access to pest control inputs, as long as farmers know how to use them effectively, allows better production during the hot-wet season; and broad spatial market integration takes advantage of varying seasonality across production zones to dampen seasonal price variation in key terminal markets. This same integration can lessen the impact of a supply shock in any one production zone.

In contrast, the severity of random day-to-day supply fluctuations depends primarily on the efficiency of vertical information flow within the system. In well-functioning systems, information flows constantly into these markets, from farm and retail levels, and flows back in the form of active coordination to slow or hasten the flow from farm, to inform retailers of supply conditions so they can plan their purchases, and to transship quantities out of the market to other areas in the country or region when local supply is too high.

Price variability is thus reduced, and predictability enhanced, by broader and more reliable access by farmers to irrigation and pest control inputs, by high levels of farmer knowledge of how to use these inputs, by broad spatial market integration, and by efficient two-way vertical information flows running through wholesale markets. All of these factors should be strongly correlated with the level of development in the country in which production takes place. In addition, modern information technology deployed within well-functioning managerial structures in wholesale markets can improve vertical information flow and reduce price variability. Wholesale markets are the appropriate location for these systems because information on supply and demand and the factors affecting them is centralized and constantly updated in these markets, but remains dispersed among traders operating there and may not be efficiently disseminated through the rest of the system.

Fifth, vendors in the sector are small-scale, suggesting high unit costs. Woldu et al, in Addis Ababa, report that the average number of people employed in the 11 retail outlet types that they surveyed (including the owner) averaged 3.0, with a range from 1.2 for fresh produce sellers to 5.4 for Kebele shops[13]. Tschirley et al (2012) report that fresh produce market retailers in Mozambique traded on average only 3 kg to 42 kg per day depending on product and market, with a gross average turnover across all products of between US$18 and US$180. Comparable figures in Nairobi, where traders tended to specialize in fewer products, were 62 kg to 112 kg and US$80 to US$240.

A sixth characteristic of the traditional sector is that, despite being small in scale, vendors in the main markets tend to be very price-competitive on unprocessed foods, especially fresh produce, but less so on processed and packaged goods (Minten and Reardon, 2008). This cost competitiveness in spite of small scale comes from several sources: non-payment of taxes since they are unregistered; the low level of market fees (which at any rate are often collected only intermittently); the lack of overhead costs for energy, administration, and infrastructure; and the willingness of many vendors to earn barely livable daily returns[14]. Vendors outside the main markets operate at even smaller scale and almost certainly charge higher prices (though good

[13] We excluded modern retail shops, consumer cooperatives, and private commercial farm shops from this list.

[14] Minten and Reardon (2008) argue that supermarkets eventually become more competitive on the price of fresh produce as they more fully develop their procurement systems.

data is lacking on this issue); their competitiveness derives almost exclusively from their extreme locational convenience.

Seventh, the sector tends to suffer high product loss at farm and wholesale levels. Losses are very low, however, at retail and consumer levels, driven by the low income of most shoppers combined with their daily or near-daily shopping habits. See Box 5.2 for a summarized review of the literature on post-harvest loss and waste in African food systems.

Finally, the sector is extremely under-served with physical infrastructure. Street vendors choose to operate outside of any market infrastructure, but even those operating in market places frequently suffer from inadequate and badly degraded infrastructure. Congestion and highly unsanitary conditions are the norm. Tschirley et al (2012) report that the infrastructure deficit is especially acute at wholesale. All wholesale trading in Blantyre and Lusaka and over 60% in Nairobi occurs in uncovered dirt fields. Maputo is better, with all of its trading occurring in a single market under somewhat improved physical conditions. Maputo also stands out in having better trash collection and drainage in its wholesale market, while in Blantyre and Lusaka, markets have

Box 5.2: Food Loss and Waste in SSA

What is food loss and waste?

Though there is currently no universally accepted definition of these terms, one common definition of food loss and waste is 'the masses of food lost or wasted in the parts of the food supply chain leading to edible products going to human consumption' (Gustavsson et al, 2011). Under this definition, any agricultural good intended for human consumption that is not consumed by humans, regardless of the reasons and regardless of the end use of the products (animal feed, compost, etc.), is defined as lost or wasted. Under this approach, food "loss" is the decrease from the farm gate up to the time the food reaches the retail level. In contrast, food "waste" occurs at the end of the food supply chain at the retail and consumer level and is driven by a greater degree of consumer choice than at lower levels in the chain. Some have computed losses in terms of quality, for example, water content or nutritional make-up (Grolleaud 2002), but these approaches are more difficult to quantify. Others have examined on kilocalorie losses, but have computed them directly from existing estimates of masses of loss and waste by food group from Gustavsson et al (Lipinski et al 2013).

Why is there renewed interest in food loss and waste?

Sparked by the food price crisis of 2007-08 and the continued high commodity prices since that time, donor agencies, governments in developed and developing countries, civil society, and private companies have devoted an enormous amount of time and resources to understanding how to meet today's food security challenges and how to feed a projected world population of 9 billion by 2050 in a sustainable manner. Among the topics receiving attention has been food loss and waste in developing and developed economies. With commonly believed figures of 40% and even 50% loss and waste in developing country food supply chains, reducing such losses was seen as a potentially highly cost-effective means of increasing the

food supply, reducing prices for poor consumers, improving profitability for farmers and other participants in the food chains, and reducing the environmental footprint of world agriculture. Viewed in this manner, few development interventions could promise positive payoffs on such a wide range of often conflicting objectives.

What do we know about food loss and waste?

The empirical data underpinning estimates of food loss and waste are old and of questionable validity: Early critical assessments of the topic showed that the numbers commonly used to quantify food losses were based on data that was at least 30 years old and whose validity was open to question. Since that time, two major empirical efforts have been undertaken without substantially improving the empirical base of data for estimates of food loss and waste. First, the FAO commissioned a major study to compute the worldwide quantity (mass) of food loss and waste (Gustavsson et al . 2011). The study developed a comprehensive, systematic, and transparent approach to quantifying global food loss and waste but relied entirely on existing empirical evidence to populate the computational framework. In, perhaps, the most ambitious recent attempt to develop new empirical estimates of food loss and waste in developing countries, Kitinoja and AlHassan (2010) and Saran, Roy, and Kitinoja (2010) conducted field assessments of 16 crops in Ghana, Rwanda, Benin, and India. The studies were unable to generate overall estimates of loss or waste for any of the crops in any of the countries due to various methodological and data collection problems.

(Box 5.2, cont'd)

Existing estimates may overestimate losses: A general tendency to over-estimate losses in both cereals and perishable crops in developing countries has been identified by several authors (Parfitt, Barthel & Macnaughton 2010; Bell et al. 1999). Reasons for these over-estimates include (1) use of extreme values rather than averages, (2) grains removed from store over the season for personal consumption or sale are not always accounted for, (3) partial damage is often treated as a complete loss, and (4) a tendency towards double-counting of losses along the food supply chain. Other authors note from observation of fruit and vegetable supply chains in developing countries that "every quality finds a ready consumer within the locality" (Parfitt et al, 2010), suggesting that much product considered lost or wasted is in fact consumed by someone or, if quality is particularly bad, by animals.

Collecting reliable field data on loss and waste is very difficult: This difficulty comes from two factors. First, the drivers of food loss and waste are highly complex. They include factors such as the state of physical infrastructure such as storage facilities, cold chains, facilities in markets for receiving and holding product, transport, availability and use of proper packaging, and others. These factors change only slowly, and so, in principle, their impact on food loss can be captured. The impact of other factors is far more difficult to capture, however. These include environmental factors such as temperature and humidity that change seasonally and day-to-day; human behavior, which changes in an unpredictable fashion; and crop characteristics that determine how the crop is affected by environmental and human behavior factors. Losses are, therefore, likely to be highly specific to time and place. The second source of difficulty in generating reliable data on food loss and waste is that quantitative data collection on food loss is expensive and time consuming; therefore, it is not often attempted and subject to substantial measurement and reporting error when it is done.

Nevertheless, food losses are likely to be substantial: Gustavsson et al (2011) estimated losses and waste as follows:

Commodity	SSA	Global Range	Global Mean
Cereals	18%*	18%-30%	24%
Roots & Tubers	45%	31%-66%	47%
Oilseeds & Pulses	22%	13%-23%	18%
Fruits & Vegetables	48%	29%-50%	43%
Meat	20%	14%-20%	15%
Fish & Seafood	26%	22%-33%	25%
Milk	19%	6%-19%	12%
Eggs	6%	6%-19%	9%

Note that, as per the definition given above, these percentages include food produced for humans but consumed instead by animals; a more narrow definition would generate lower estimates. The African Post-Harvest Loss Information System (www.aphlis.net/), an innovative system established to create a transparent and standardized mechanism for calculating post-harvest grain losses in SSA, estimates somewhat lower losses for cereals, 14-15%. While quite substantial, none of these figures, with the exception of fruits and vegetables and roots & tubers, approach the commonly cited figures of 40-50%, and even these are subject to the critique of over-estimation.

(Box 5.2, cont'd)

Per capita loss and waste rises with a country's income: Gustavsson et al (2011; Figure 2) show systematically higher average total loss and waste in higher income areas: nearly 300 kg/year per capita in North America & Oceania, declining to approximately 160 kg in SSA and 130 kg in South and Southeast Asia.

The relative sizes of loss and waste shift as incomes rise: The general shift is from large losses at the farm and immediate post-farm level in low-income countries to much less loss at those stages but much more waste at retail and consumption in high income countries. Gustavsson et al (2011) estimated that more than 95% of all loss and waste in SSA occurs prior to the retail level (95% food loss/5% food waste). In comparison, 35% to 40% of all loss and waste comes from waste at consumer and retail level in North America and Europe (60-65% food loss/35-40% food waste). They estimate per capita waste by consumers in the latter at 95-115 kg/year, vs. only 6-11 kg/year in SSA. This change in the relative sizes of food loss and waste over the course of development is a direct result of (1) better technology and more efficient supply chain logistics in higher income countries that reduce losses prior to the retailer and consumer, and (2) higher consumer income and less free time in the industrialized north compared to developing countries, which leads to high levels of food waste.

What does this imply about action to stem food loss and waste in SSA's transforming food systems?

First and above all, a whole food supply chain approach is needed. Technical solutions are often available but aren't utilized for poorly understood reasons or due to constraints elsewhere in the system. Second, improved farm level production technology, especially pest control, can make a major contribution to reduced food losses, especially for fruits and vegetables. Third, the track record of improved on-farm storage is poor in smallholder farming systems, featuring big promotion efforts but low adoption. Fourth, simple improvements in packaging at farm- and immediate post-farm level can also have major payoffs but require public-private cooperation to move the whole system to the new packaging, not just a few farmers. An example is the success of the Ghanaian Tomato Traders' Association in moving the trade from hand-made, non-standardized wooden crates to standard plastic crates. Fifth, increased formalization in the processing, wholesaling, and packaging sector, including improved transport and cold chains, will lead to lower losses after the farm, but reliable public provision of energy and water are needed if these private sector solutions are to be effective. Finally, as incomes rise in SSA, the problem of food loss at farm- and processing/wholesaling levels will in part resolve itself through private action in pursuit of efficiencies, and facilitated by more effective public infrastructure. But the problem will increasingly move to waste at retail and consumer level as seen today in industrialized countries. As a result, public campaigns directed at consumers and, potentially, intelligent regulation at retail will become more important in stemming total food loss and waste.

no drainage of any kind and suffer large amounts of accumulated, rotting organic trash. Though infrastructure at retail is generally better than at wholesale, still 80% of traders in Maputo and Lusaka and nearly 50% in Blantyre operate in areas that lack either an improved floor or roofs that provide sufficient clearance for comfortable walking. 95% of traders in Nairobi operate under such conditions. Across the four countries, the share of retail

traders operating in areas with neither a roof *nor* an improved floor ranges from about 25% in Nairobi to about 70% in Lusaka. Drainage is also poor, with nearly 70% of traders in Maputo and 80% in Nairobi operating in areas either with no installed drainage infrastructure or where the installed system does not work. Trash pick-up is sporadic; 96% of the retail trade area in Nairobi shows moderate to heavy accumulation of trash over a period of days, with Lusaka showing similar patterns.

Lusaka provides a stark but not unusual example at wholesale. All wholesaling takes place in a small open area alongside Soweto market, the city's largest retail market located in the busy business district of the capital. Featuring a single entry and exit road, the area has no roof, features bare dirt that is either dusty or deeply muddy most days of the year, depending on the season, and is extraordinarily congested and lacking in hygiene. Traffic in and out of the single road comes to a halt at the busiest times. Mounds of trash – some paper and wood but primarily refuse from the fresh produce that constitutes the majority of the volume traded in the market – accumulate, mix with water, and create a fetid smell on warm days. The grains, pulses, and fresh produce traded in this area – nearly all fresh produce consumed in the city except for green leafy vegetables are traded here – is cause for serious public health concern.

These characteristics make it easy to understand why, despite the continued dominance of the traditional marketing system, supermarket chains have received enormous attention from analysts of developing country food systems, including those in ESA, and from development organizations wishing to improve the lives of urban consumers while linking small farmers to improved supply chains with potentially better profit opportunities[15]. These chains are capitalist enterprises with large amounts of cash and low-cost financing to put behind their vision of building modern, efficient supply chains to provide consumers with the food they want at affordable prices in a clean and safe shopping environment. This vision is central to what is typically meant by the transformation of food systems: rationalized systems operating at increasing scale that drives down unit costs while paying close attention to reliability, quality, and safety. If these firms succeed in taking over large shares of the market while achieving their procurement system vision, they will have profound effects on the food system of ESA and its participants – small and large farmers, rural traders, wholesale and retail urban traders, small- and large processors, and consumers. The extent to which this vision has been

[15] For early studies on Latin America, see Reardon and Berdegue (2002) for a summary, and Alvarado and Charmel (2002), Schwentesius and Gomez (2002), Faigeuenbaum et al (2002), Farina (2002), and Ghezán et al (2002) for country studies. See also Reardon et al (2004). For Asia, see Reardon et al (2003a), Reardon et al (2003b), Hu et al (2004), and Coe and Hess (2005). For Africa, see Weatherspoon and Reardon (2003), Neven and Reardon (2004), and Neven et al (2005). More recent work includes Minten (2008), Woldu et al (2012). Other references will be made elsewhere in the paper.

realized to date, and the rate at which it might be realized over time, are, thus, central questions in any consideration of these systems.

The rest of this chapter focuses on this and related questions of food system modernization. It is organized as follows. Section 5.2 returns to the projection exercise of chapter 3 and uses it, along with other information, to illustrate the current structure of the domestic food marketing system in ESA and its anticipated structure in 2040. Section 5.3 discusses the current status and future prospects for the modern retail sector in ESA, reviewing the evolution of thinking on this issue, illustrating the patterns of diffusion of supermarkets to date, looking forward to anticipate how fast they might grow through 2040 and finally laying out the systemic impacts that supermarkets can have on the system once their market share rises sufficiently high.

5.2. The structure of domestic food marketing in the region: current and anticipated to 2040

Figures 5.1 and 5.2 show the current and anticipated future (2040) structure of food marketing in the region. The cross-hatched portions in Figure 5.1 come from the detailed analysis of LSMS consumer expenditure data in the five countries analyzed in Chapter 3 and the classification of those expenditures by level of processing. These same elements in Figure 5.2 come from projection model results for 2040, reflecting the means of the four scenarios for those processing levels. Other elements of the channel maps reflect best judgment based on review of the literature.

Three key patterns can be seen. First, FAOSTAT data suggests that ESA currently relies on imports from outside the region for roughly 18% of the value of consumed food. Net imports in ESA, and more broadly in SSA, have been rising steadily since the mid-1990s; a major question is what share of the dramatic increases in demand shown in Chapter 3 will be captured by imports versus local production and processing, and what needs to be done to avoid a large import share. See Box 5.3 for background on this issue.

Figure 5.24. Structure of food marketing system in East and Southern Africa, 2010

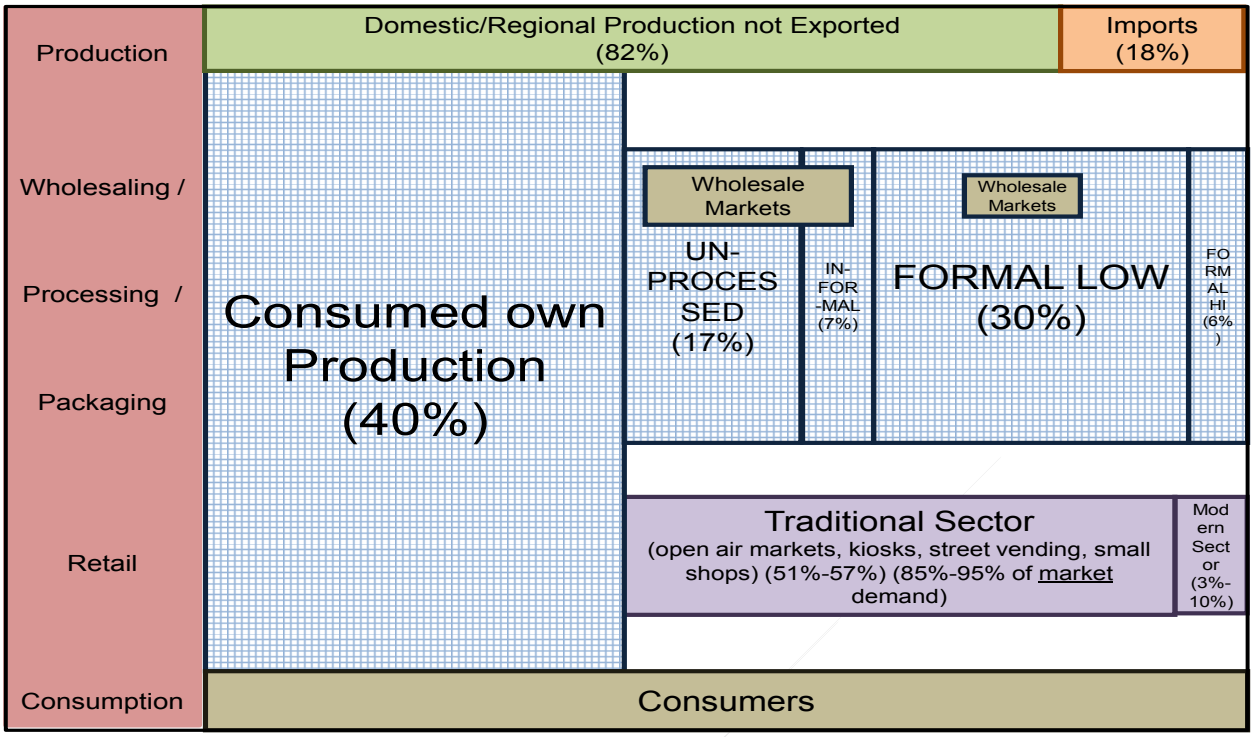
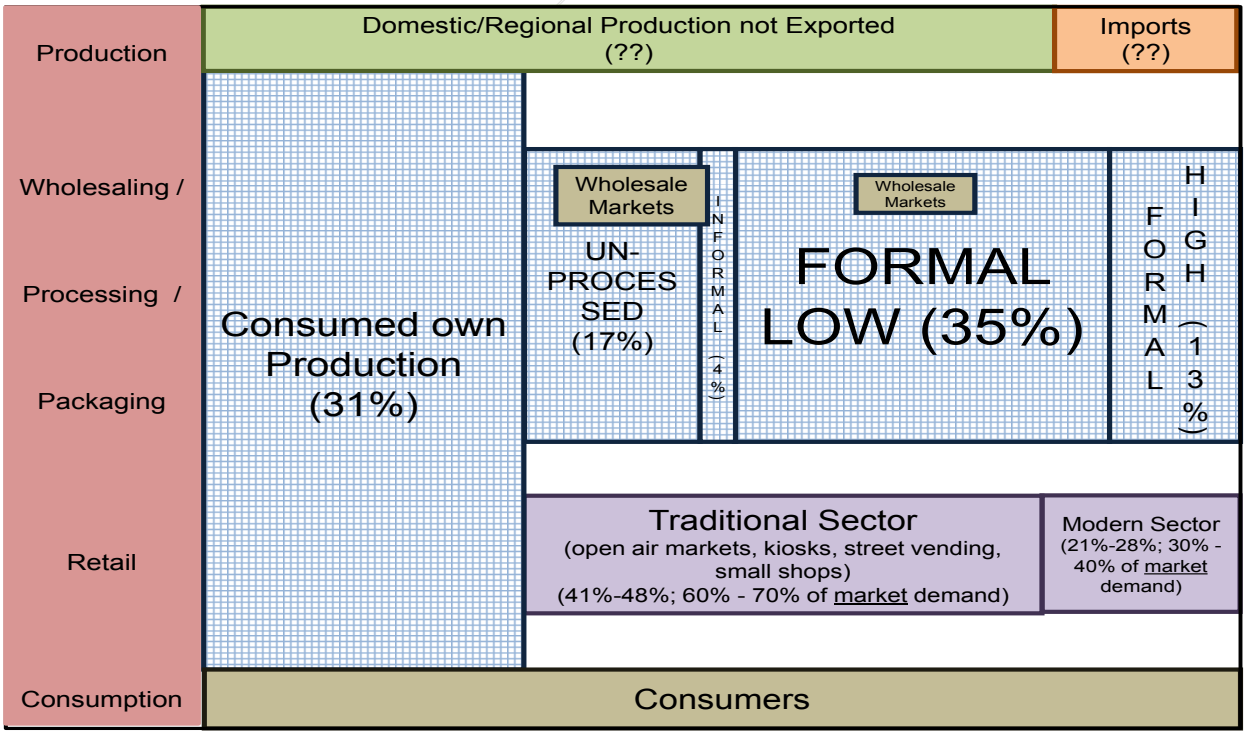


Figure 5.25. Anticipated structure of food marketing system in East and Southern Africa, 2040

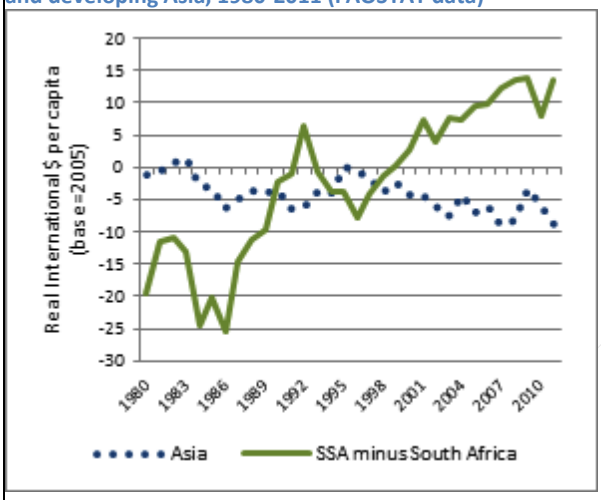


Box 5.3. Food Imports in SSA

Chapter 3 of this report projected vast increases in the quantity and value-added of food over the next 30 years. When paired with the fact that agricultural productivity on the continent has lagged other areas of the world for many years, a pressing question emerges: will a large portion of this increase in demand be satisfied by imports, rather than by local production and processing? Rakotoarisoa et al (2011) investigated the reasons for the surge in food imports on the African continent (including North Africa and South Africa), with data through 2007. Here we focus on developing SSA (SSA north of South Africa) and update to 2011. We use FAOSTAT data on imports and exports to examine trends, and World Bank Development Indicators data to examine the drivers of food imports and how developing SSA compares to Asia in its import levels and trends. Several points emerge from the analysis:

SSA north of South Africa has seen a steady increase in the real value of net per capita food imports, while these figures in developing Asia have trended steadily down: Figure B1 shows developing SSA has been a net importer of food since 1998, with a sustained rise in imports since 1996. Meanwhile, developing Asia has been a net exporter since the early 1980s and its export position has gradually improved over this time.

Figure B1. Value of net imports per capita in SSA (minus RSA) and developing Asia, 1980-2011 (FAOSTAT data)



Imports in developing SSA remain a small share of food consumed in the region: The real value of net imports into the continent rose from negative 6% (meaning the region was a net exporter) of adjusted gross production[1] in 1984 and 1986 (the lowest value since 1980) to a range of +1% to +3% from 2002 to 2011. While imports from outside the continent have clearly increased, they remain a small share of food consumption in developing SSA.

There are great differences across regions in import position[2]: Southern African imports have averaged about 25% of adjusted production since the late 1990s, while Middle Africa's have fluctuated between 8% and 10%. Meanwhile, East Africa has remained a net exporter during all but two years since 1980, and West Africa has remained around the developing SSA average.

Regression analysis shows that Asia has turned its performance around since 1980, while SSA has continued to import more than predicted: We asked "does SSA import more food than would be predicted from its observable structural characteristics?" In particular, we focused on countries' endowment of arable land, the purchasing power of its population, and the share of that population that lives in cities – variables that should influence the level of imports but not be (strongly or quickly) influenced by those imports.

[1] FAOSTAT reports production value using farmgate prices. We increased these values by a factor of 3 to reflect typical marketing margins on the continent and make the production figure more comparable to the trade data, which is valued at CIF prices. Adjusting by a factor of 2 increases the estimated share of imports to 1.5% to 4%..

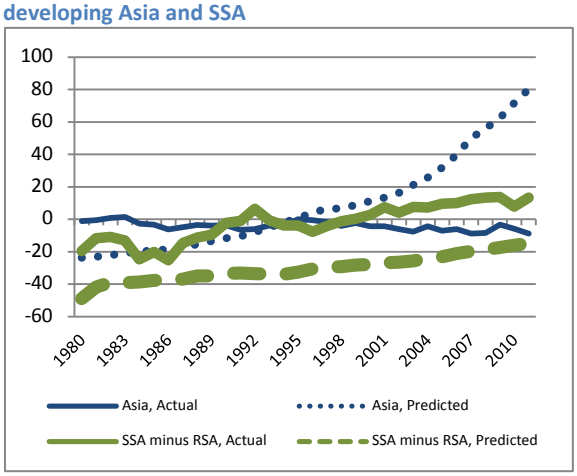
[2] Regions are as follows: **East Africa:** Burundi, Comoros, Dijibouti,Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Somalia, Uganda, Tanzania, Zambia. **Middle Africa:** Angola, Cameroon, Central African Republic, Chad, Congo, DRC, Equitorial Guinea, Gabon. **Southern Africa:** Botswana, Lesotho, Namibia, Swaziland **Western Africa:** Benin, Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo.

(Box 5.3, cont'd)

To address this question we assembled, from FAOSTAT, annual data on per capita value of net food imports since 1980 from all countries in Latin America, developing Asia (Asia minus Japan, Singapore, and South Korea), and Sub-Saharan Africa. We excluded island nations. We then assembled data from World Bank Development Indicators on the structural characteristics mentioned above. Specific variables were:

- Real per capita Gross National Income, in purchasing power parity terms (base = 2010);
- The country's urban share in total population;
- The share of the largest city in total urban population, a measure of the centralization of urbanization;
- Hectares of arable land per person;
- Whether the country is landlocked or not

Figure B1. Predicted vs. actual net per capita imports, developing Asia and SSA



We then regressed net per capita real food imports on these variables above to generate predicted values for each country, aggregated these into regional figures, and compared to actual imports. We explicitly left out of the regression variables that capture policy and programmatic decisions that influence the productivity of the countries' food systems and thus their ability to produce, process, and distribute the quantity and quality of food demanded by its populace. As a result, any difference between predicted and actual imports should reflect differences in performance (compared to other countries in the region) on these variables; imports above (below) predicted levels would reflect inferior (superior) performance.

A graph of predicted against actual per capita imports in each region is in Figure B2. Latin America consistently imported less than its predicted levels, reflecting its land abundance and broad use of capital intensive technology that allows it to be a net exporter while 75% of its people lived in urban areas (Table B1). We exclude it from Figure B1 to highlight the difference in performance between developing Asia and developing SSA.

Results show that developing SSA has consistently imported more food than its structural characteristics would suggest. This is consistent with the continent's low agricultural productivity. Results in Asia are driven by China. The region saw a sharp increase over the period in its predicted imports, driven almost entirely by its spectacular rise in incomes. Yet strong performance in its food system allowed it to reduce imports, not increase them.

Implications for the future: SSA's agricultural performance has lagged behind other areas of the world for several decades. As its income and level of urbanization rise, its imports could be set to grow much more rapidly than agricultural production, driving large trade deficits, unless policies and public- and private investments are able to drive increased productivity throughout its food system. A positive note is that total investment in public agricultural R&D increased 20% between 2001 and 2008, after a long decline. Yet this growth was confined to a small number of countries (Lynam, Beintema, and Annor-Frempong 2012). Crucially, given the rise in demand for value added products documented in Chapter 3, continued and large investments in agricultural R&D must be based on a "broader policy and strategic framework that encompasses agro-industrial and agribusiness services along with farming." (IFPRI 2011).

Second, public wholesale markets currently dominate the marketing of unprocessed products and of raw material for informal processing. They play a substantially lesser role in the procurement of raw material for formal processing. It is all but certain that their share of the market for unprocessed items and of raw material for processing will fall as supermarkets expand. But, as will be shown later in the chapter, traditional retail markets are likely to continue to hold substantial market shares among consumers in 2040, and wholesale markets will continue to be their main source of supply. It is also the case that the absolute volume and value of product flowing through wholesale markets will increase dramatically even as its share of total volume falls, meaning that investment in upgrading and expanding these facilities is of high importance.

Finally, best estimates are that the modern retail sector (primarily chain supermarkets) currently holds between 5% and 15% of the overall food market in the region, not considering consumed own production; when the 40% figure for this is considered, supermarket shares of all food consumption come to a range of 3% to 10%. The rest of the food reaching consumers through markets – 85% to 95% - flows through open air markets, kiosks, street vending, and traditional shops such as bakeries, butcheries, and small grocers. Based on reasoning from current supermarket shares in South Africa (see below), we suggest that modern retail's share in total food trade in the region will rise to between 30% and 40% in 2040 – a substantial share that will give it major leverage to drive systemic change in procurement and even production systems but which will still leave an important role for traditional markets serving the mass of low income consumers.

5.3. The modern sector: Status and prospects for supermarkets in ESA's food system

This section first charts the evolution of thinking regarding the rise of modern retail broadly in the developing world before documenting current thinking and empirical patterns in ESA. It then discusses patterns of diffusion of supermarkets in the region using empirical data from Zambia as an illustration. It uses this discussion to look forward by discussing the drivers of modern retail expansion, documenting very recent investments in the continent, and discussing how the urbanization and changing consumer demand patterns shown in the previous chapter might influence the rise of modern retail. We emphasize the low current level of penetration of supermarkets in most areas of the continent, the near certainty of their growth in coming decades, the unpredictable nature of their expansion, and the possibility of turning points after which growth can become very rapid.

5.3.1. The evolution of thinking regarding the rise of modern retail in developing countries

Supermarkets existed in Latin America from at least the 1960s (see Schwentesius and Gomez (2002) for data on Mexico; Harrison et al. (1974) and

Riley et al (1970) for very early data on Brazil, Colombia, Bolivia, and Puerto Rico). These outlets and their potential broader effect on the food system were an important area of study there, and in Asia (Goldman 1974), during the 1960s and 1970s. Growth of the sector was relatively slow, however, until the economic boom and opening to foreign direct investment (FDI) of the 1990s, which first drove growth in Latin America, followed by East/Southeast Asia and Central Europe, and finally by selected countries of Africa (Reardon et al, 2004). This growth, together with new procurement practices that the modern retailers work to apply, led to a rash of studies widely known as the "supermarket revolution" literature that attempted to document and anticipate the impacts of these firms on existing actors in the food system, and to draw policy implications for governments and donors.[16]

Though distinctions were made between countries, regions, and types of food products, four recurring themes in the supermarket revolution literature can be identified since 2000. The first theme has been the "rapid rise" of supermarkets in three "waves" starting in the early 1990s (South America, South Africa, East Asia, and Central Europe), mid- to late 1990s (Southeast Asia, Central America, and Mexico), and late 1990s and early 2000s (China, Vietnam, India, Russia; Reardon and Timmer 2012). Annual growth rates in total food sales from 2001 to 2009 have been pegged at 11% in "first wave" countries, 18% in the second wave, and 41% in third wave; growth during this period was slowest in the first wave and fastest in the third wave due to the common dynamic of growth eventually slowing as a sector gets larger and takes over more market share. This rapid growth resulted in sharply rising shares of the total food market in the hands of modern retailers, said to have exceeded 50% by the late 1990s in the first wave of countries, and to have reached as high as 20% by the late 2000s in third wave countries.

Themes two through four in the literature relate to the impact on upstream participants of the procurement systems that modern retailers work to install in their drive to reduce procurement costs and increase quality and reliability in supplies. These themes are (1) the difficulty of small processors to compete with large processors for the new "supermarket market", as modern retailers work to procure from a smaller number of large suppliers that can themselves attain scale, reduce unit costs, and provide agreed quantities year-round, (2) the by-passing of traditional wholesale markets by supermarkets in favor of selected processors, dedicated wholesalers, and a limited number of larger farmers, thus driving the progressive decline of traditional wholesale, and (3) the urgent need to deal with the exclusion of smallholder farmers from the supermarket channel for fresh produce, as retailers focused on developing a

[16] For early studies on Latin America, see Reardon and Berdegue (2002) for a summary, and Alvarado and Charmel (2002), Schwentesius and Gomez (2002), Faigeuenbaum et al (2002), Farina (2002), and Ghezán et al (2002) for country studies. See also Reardon et al (2004). For Asia, see Reardon et al (2003a), Reardon et al (2003b), Hu et al (2004), and Coe and Hess (2005). For Africa, see Weatherspoon and Reardon (2003), Neven and Reardon (2004), and Neven et al (2005).

limited set of "preferred suppliers" who could provide fixed quantities of produce year-round that meets the firms' quality standards. Modern retail was, thus, seen as the leading edge of food system transformation, driving consolidation first at retail (the "downstream" segment of the system), then progressively with midstream segments (processing, wholesaling, packaging) and eventually production.

Through much of the first decade of this century, conditions for supermarket expansion in Africa were seen to lag but not to differ fundamentally from those in other regions of the developing world; Africa was portrayed as a later wave in the surge of supermarket expansion, with "take-off" having occurred in East and Southern Africa by the early 2000s and showing signs of beginning in West Africa (Reardon et al, 2004). Some of the earliest literature suggested a time frame of as little as five years before supermarket procurement standards became the dominant standards that farmers would face in marketing their production (Weatherspoon and Reardon, 2003).

More cautious views regarding the likely rate of supermarket expansion were expressed early in Asia, and more frequently, as the decade progressed, in Asia, Africa, and even Latin America. Goldman et al (1999) identified the "persistent continued strength of 'wet markets' in Hong Kong"[17] despite that city's developed economy; they attributed this strength to these traditional markets' adaptation to consumer shopping habits. Goldman (2000) was one of the first to identify consumers' "selective adoption" of supermarkets, whereby "consumers who regularly shop in supermarkets continue to purchase fresh food in traditional outlets". These findings echo those of others showing continued retail diversity even where supermarkets have expanded most, with the common pattern being the purchase of packaged manufactured foods and household items in supermarkets and fresh perishable items in traditional markets. In Vietnam, Cadilhon et al (2006) anticipate strong growth of supermarkets (from a base of only 2%) but suggest that "policy makers should not promote the 'modernization' of food systems at the expense of traditional channels, which meet important consumer needs". Maruyama et al (2007) also foresee strong growth in Vietnam but cite serious challenges for supermarkets in lowering their prices and enhancing their locational convenience, both of which are key factors for the great mass of consumers in Africa and Asia.

Patterns in Latin America are relevant as a potential indicator of future patterns elsewhere. Writing in the early 2000s, Booz-Allen Hamilton (2003) noted that "emerging consumers infrequently shop – if at all – at large supermarkets" in Brazil, despite the heavy market penetration of such outlets in that country. They refer to "the myth (that) it's just a matter of money & time until emerging consumers flock to large supermarkets" (p. 12), and conclude in general for Latin America that "small retailers have a sustainable

[17] "Wet markets" refer to traditional open air markets.

business model". These contentions echo Goldman (1974), who documented consumer behavior patterns that were making it difficult for modern retailers at the time to expand market share. Farina and Nunez (2005) also highlight continued (and even increasing) retail diversity in Brazil, noting that "the number of independent supermarkets (as opposed to large chains) and traditional retailers has grown, and their share in food sales has increased (in recent years)".

Reviewing literature on supermarkets in Africa, Humphrey (2006) concluded that "the extent of transformation of retailing … as a consequence of (supermarket expansion) is overestimated". In Kenya, where supermarkets had penetrated more than in any SSA country outside South Africa and perhaps Zambia, Tschirley et al (2009) estimated that supermarket chains in Nairobi held about 4% of the fresh produce market and 11.5% of the overall food market in late 2003. They further showed that nearly all fresh produce purchases in these supermarkets, and well over half of purchases of all food, were made by consumers in the top 20% of the income distribution. The same authors estimated that supermarket chains in urban Zambia during 2007/08 had market shares of 7.2% for all food and 3.1% for fresh produce, with similar concentration of sales among the highest income consumers as in Nairobi.

In a cross-country econometric analysis, Traill (2006) estimated that Kenyan supermarkets will hold, at most, a 16% share of total food sales by 2013; this would correspond to a 4%-5% share of fresh produce. In apparent confirmation of this projection, Tschirley et al (2011) showed that fresh produce shares of supermarkets in Nairobi in 2009 were essentially unchanged from 2003, at 3%-4%. In Madagascar, Minten (2008) shows the very small market shares of supermarkets, notes that none of the global retailers have expansion plans, and suggests that "agriculture for local consumption in poor countries will be largely bypassed by the global food retail revolution." Woldu et al (2012), studying Addis Ababa, show supermarket shares in food expenditure ranging from 0% to 3% for different cereals, 1% to 8% for several fruits and vegetables, and 1% to 2% for several processed foods. These very low market shares are despite a decade of nearly 10% annual income growth, which is rapidly transforming urban Ethiopia.

By 2007, Reardon and Timmer (2007) had noted the very small market shares of supermarkets in nearly all of SSA. They suggested "considerable uncertainty about the rate at which the supermarket sector will grow" even in Kenya and Zambia; in most of the rest of SSA, they deemed it "unlikely that … we will see supermarket growth for several decades." Echoing this, Reardon and Gulati (2008) do not include SSA outside South Africa in their table of "waves" of global supermarket expansion. Reardon and Timmer (2012) indicate that in SSA outside South Africa, "modern retail is just starting."

Summarizing, after a burst of enthusiasm through much of the decade of the 2000s, there now exists a broad consensus that supermarket expansion in SSA has been much slower than originally anticipated and that the rate of future growth is uncertain. This more cautious expectation is due in large measure to much lower incomes compared to other developing areas; per capita purchasing power parity income across all of sub-Saharan Africa was only 40% of the 15 poorest Latin American countries in 2010, and 31% of Latin America as a whole[18]. To reach mean income levels seen *today* in Latin America, real per capita incomes in SSA would have to grow 6.5% per year for 20 years, a level of transformative growth seen only in China over the past century. These patterns strongly suggest that, even as supermarkets grow and gain market share, and even though growth could become quite rapid at some point, traditional retail channels will remain crucial players in horticultural marketing systems in Africa for the foreseeable future. The patterns also suggest that meaningfully addressing the problems in these traditional systems will be central to achieving objectives ranging from improved smallholder incomes through horticulture, to food safety and urban planning goals.

5.3.2. Patterns of Supermarket Diffusion in SSA: An Illustration from Zambia

With a high level of urbanization and lying close to South Africa, Zambia was an early target of supermarket expansion primarily by Shoprite-South Africa. Patterns of supermarket penetration there well illustrate those repeated around the world and likely to be seen in the rest of ESA once the phenomenon spreads with more vigor to more countries. We use data from a household survey in four cities of Zambia to inform these issues. In August 2007 and February 2008, Michigan State University collaborated with Zambia's Central Statistical Office (CSO) in a two round survey of 1,856 households in Lusaka, Kitwe, Kasama, and Mansa. Lusaka and Kitwe are the country's two largest cities, each lying within the urbanized central arc of the country; Kasama and Mansa are smaller towns lying outside this area in the north of the country. The sample was designed to be representative of each city individually and of the four cities as a whole. In 2010, these four cities accounted for 50% of Zambia's urban population of settlements greater than 10,000.

Supermarket expansion in Zambia is characterized by four patterns. First, local supermarkets existed prior to the arrival of foreign investors but were small, undercapitalized, and had little ability to install procurement systems that would leverage systemic change in the food system. In Zambia, the main local supermarket firm has been Melissa, with three stores in Lusaka in the late 2000s, but numerous much smaller independent self-serve stores have existed for some time.

[18] World Bank data, file NY.GNP.PCAP.PP.CD_Indicator_MetaData_en_EXCEL.xls, downloadable at http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD.

Second, initial investment by foreign capital in modern food retail was followed by an extended period of limited activity, which has picked-up again over the past five years. Shoprite Checkers invested in Zambia in 1995-97 with 17 stores, five of them in Lusaka. This number remained unchanged until at least the late 2000s, and the company now has 18 supermarkets and one cash-and-carry wholesale outlet in the country. Spar, a Dutch retailer, entered the country in the mid-2000s and now has 11 stores, 7 of them in Lusaka.

Third, through the late 2000s, supermarket chains' market share was highest in dairy, fresh fruit, and staples (Table 5.1). Their market share in staples was based primarily on maize meal, the dominant staple in the country, which the supermarkets sold at highly competitive prices. Its fresh fruit share was based largely on the introduction of new temperate fruits imported from South Africa, such as apples. Market share on fresh vegetables was only 1%, and on fruit and vegetables together, it was 3.1%. Twelve years after supermarket chains had first entered the market, they had an overall food market share of 7.3%. Traditional and often informal outlets – the open air markets and so-called *ka sector* composed of innumerable small sellers on streets and alleyways of the cities – had an overall market share of over 50%, with shares of 93% on fresh produce, 88% on pulses, 51% on meat, and 50% on staples. In no product category did supermarket chains approach the market share of open air markets and the *ka sector*.

The fourth pattern is that supermarkets remain heavily reliant on upper income consumers for their sales (Table 5.2). Two-thirds of all food sales in supermarket chains were to the top 20% of the income distribution, with the bottom 60% accounting for only 12% of sales. Even the top 20% of earners spend more than three times as much in traditional shops, open air markets, and informal *ka sector* outlets as they do in supermarket chains.

Table 5.1. Market share of various retail channels by food group, four cities of Zambia, 2007/08

	Market Outlet						
Food Group	Super-market Chains	Indep. Super-markets	Mini-marts Grocers	Open Market	Ka Sector	Butchery	Other minor outlets
	---------- % of total expenditure within the food group ----------						
Staples	8.8%	2.2%	43.8%	17.7%	22.0%	0.2%	5.3%
Dairy	19.6%	4.1%	38.7%	7.8%	23.4%	3.2%	3.2%
Meat	7.1%	1.6%	5.2%	37.8%	12.8%	28.0%	7.6%
Fresh Veg.	1.0%	0.8%	0.4%	67.6%	27.9%	0.0%	2.3%
Fresh Fruit	11.1%	1.9%	0.9%	55.7%	28.1%	0.0%	2.2%
Fresh F&V	3.1%	1.1%	0.5%	65.5%	27.6%	0.0%	2.3%
Pulses	3.2%	1.2%	5.3%	74.6%	13.7%	0.0%	2.0%
Other	6.7%	1.6%	29.9%	17.6%	26.3%	0.0%	17.9%

Overall	7.3%	1.8%	21.8%	31.2%	21.7%	7.3%	9.0%

Source: Central Statistical Office/FSRP/MSU Urban Household Consumption Survey, 2007/08

Supermarkets have continued to expand and innovate in Zambia since this survey. Since 2010, Pick 'n Pay, the dominant chain in South Africa, has opened six stores. The last one, in March 2013, was its first small store format and is said to emphasize groceries, perishables, and fresh foods – the latter two being categories that supermarkets take much longer to penetrate. The question for policy makers and development partners, which we turn to in the next section, is how rapidly they are likely to grow their market share, and which policies and programs need to be put in in the meantime to improve the often dysfunctional traditional marketing system.

Table 5.2. Overall food market share of various retail channels by quintile of per capita total expenditure, four cities of Zambia, 2007/08

Per capita expenditure quintile	Mean per capita total expenditure (USD)	Market Outlet						
		Super-market Chains	Indep. Super-markets & Mini-marts	Grocers	Open Market	Ka Sector	Butchery	Other minor outlets
		---------- % of total expenditure over 80 food items ----------						
1 (lowest)	256	0.8%	0.1%	21.7%	36.6%	29.9%	3.2%	7.7%
2	437	1.3%	0.3%	23.4%	35.7%	26.5%	6.2%	6.6%
3	638	2.7%	0.6%	23.5%	36.2%	21.7%	7.2%	8.1%
4	974	6.4%	1.9%	22.8%	30.0%	21.0%	8.2%	9.6%
5 (highest)	2,582	17.1%	4.1%	19.0%	23.7%	15.6%	9.3%	11.1%
Overall	977	7.2%	1.8%	21.9%	31.2%	21.6%	7.4%	9.0%

Source: Central Statistical Office/FSRP/MSU Urban Household Consumption Survey, 2007/08

5.3.3.Anticipating future growth of modern retail in Africa

Future growth in supermarkets in Africa will be driven by evolution of demand by consumers for supermarket services and supply of these services by firms (Reardon, Timmer, and Berdegue 2004). Key drivers on the supply side are policies regarding foreign direct investment (FDI) and policy and investment factors that determine the general cost of doing business in the country. Policies that hinder or promote private investment whether foreign or domestic will hinder or promote food system transformation, including the rise of supermarkets. Opening to FDI in Latin America was a key policy change that allowed international food retailing companies to target the urban populations of the continent and spurred the rapid growth of modern retail in that region. Economic liberalization in SSA in the mid-1990s was a necessary trigger for what supermarket expansion there has been to date on the continent. The

reduction of bureaucratic impediments to doing business can be important to attract more local and foreign investment. Public infrastructural investment in water, sanitation, transport, and electricity also are needed if supermarkets are to be able to reduce their costs and provide superior quality of service at prices that most consumers can afford.

Several demand side factors need to come together to see rapid supermarket expansion. One is urbanization, which has been occurring at generally high rates in the region for several decades. Yet, as documented earlier in this paper, this urbanization occurred into the late 1990s with very little growth in income. When urbanization and income growth occur together – as has been happening since the late 1990s – they drive major changes in consumer behavior that can favor supermarket development. Among these changes is an increase in the perceived opportunity cost of time, especially for women. Convenience, thus, becomes of greater value to urban residents. This can work in the favor of supermarkets for households that have the ability to buy larger quantities of food at less frequent intervals, which is associated with ownership of vehicles (or at least access to good public transport) and refrigeration. For poorer households without access to vehicles and refrigeration, however, shopping in diffuse informal outlets of the traditional marketing system can be far more convenient (see discussion above about locational convenience). Public investment in the electricity grid, road infrastructure, and public transport, thus, also affects the demand for supermarket services. The distribution of growth – in particular growth strategies that raise incomes for the poorest – can also lead to more rapid growth of a broad market for supermarket services. Finally, urban consumers with growing incomes tend to become more educated over time, which is associated with growing awareness of the need for sanitation and a preference to shop in the clean environment that most supermarkets provide.

Two demand side analyses of shopping in supermarkets are Tschirley et al (2010) and Neven et al (2005). Tschirley et al analyze the data from four cities of Zambia described above, plus similar data from Nairobi, Kenya. Neven et al focus more broadly on urban Kenya. Tschirley et al show, in both countries, that income, owning a car, owning a refrigerator, and having a more educated household head all positively influence the likelihood of shopping in a supermarket chain. Overall, their results agree with those of Neven et al (2005) in Kenya, highlighting the importance of income, education, and the ability to shop less frequently in driving the use of supermarkets.[19] This analysis also strengthens findings from earlier research by showing (in Zambia) that, for a given food category and controlling for other factors such as the household's income, processed items are more likely than unprocessed to be purchased in a supermarket.

[19] Neven finds car ownership insignificant.

Two additional results for Zambia from Tschirley et al (2010) are noteworthy. First, supermarket chains may have more difficulty gaining market share in large urban centers than in smaller towns. Second, and as discussed in the first section of this chapter, distance to various retail outlets in Zambia has an important influence on choice of outlet. This puts supermarkets at a disadvantage compared to the traditional sector in competing for the low income consumer, one which they are trying to address by investing in greater numbers of smaller-format stores.

These results, together with the changes in consumer demand patterns projected in the previous chapter, clearly suggest that an economically growing and urbanizing SSA that remains open to private investment, is likely to see continued growth of supermarkets. Recent investments on the continent by Walmart and Carrefour show clearly that large international corporations have Africa in their strategic plans. Carrefour in 2013 entered a joint venture with the trading and distribution company CFAO to open eight retail outlets in countries of West and Central Africa, where supermarkets so far are barely perceptible. In a much bigger move, Walmart, in 2011, purchased South African retailer Massmart and its 377 outlets in 12 African countries (including South Africa).

The key question is the rate at which supermarkets will take over market share. Dihel (2011) reports that supermarket sales in East Africa are forecast to grow at 10% to 11% per year over the next five years, after growing between 7% per year (in Kenya) and 15% per year (in Rwanda) over the previous five years. If current total food market shares of supermarkets in the region are, as we suggest, around 10%, and if they are able to sustain growth rates of 10% per year over the next 30 years, then they will reach a 30% market share at that time[20]. Currently in South Africa, supermarkets hold a 50% share in the national food market[21]. It, thus, seems reasonable to expect that by the end of our projection period, and assuming continued openness of countries to private sector activity together with economic growth, supermarket shares in ESA will lie somewhere between these two levels. At these levels of market share, these firms can have far-reaching effects on Africa's food system, and in fact these effects would begin to be felt prior to that time.

5.3.4. Future impacts of supermarkets on African food systems

Once supermarkets do reach higher levels of market share, they can begin to have five system-wide and inter-related effects (this is likely to happen sooner in places like Kenya and Zambia than it will in countries of West and Central Africa or in Ethiopia, for example). First, through their operational efficiencies,

[20] We assume 5% growth in per capita income, a 2.5% rate of growth of urban population, and 0.7 elasticity of demand for food, yielding a 6% annual growth rate in in total demand for food. Supermarkets need to grow more rapidly than this to increase their market share.

[21] Author's calculations from 2010 South Africa Income and Expenditure Survey (IES) data.

they can potentially drive lower price levels throughout the food system, to the benefit of consumers. This is especially likely for the processed and semi-processed goods such as maize meals, wheat flour, bread, oils, meat, fish, and dairy, that typically make-up 85% of these stores' sales.

The second, third, and fourth potential systemic effects derive from this efficiency and price effect. The second effect is that supermarkets can drive consolidation and increased scale of operation in the processing and wholesaling sectors in their push to "squeeze costs out of the system". Third, supermarkets can reduce the number of smaller independent shops and drive them towards niche markets as they (the small shops) attempt to earn higher profits on declining volumes. In this way, supermarkets can actually drive diversification in the food system as existing small retailers search out new markets to serve in an attempt to remain in business. Booz-Allen Hamilton (2003) and Farina and Nunez (2005) both highlight this dynamic and argue that food systems at retail in Latin America – where supermarket penetration is far higher than in SSA - are maintaining a diverse set of outlets in spite of the expansion of supermarkets.

Fourth, robust evidence indicates that smallholders are largely excluded from the supermarket procurement system, despite much talk of Corporate Social Responsibility and real attempts to include them. Concern about this exclusion is most acute in fresh produce, where supermarkets attempt to procure produce only from their "preferred suppliers", and where robust evidence indicates that all but a tiny minority, whether independent or in farmer groups, are unable to remain on these preferred supplier lists on a sustained basis. Currently, these programs carry a tiny fraction of the food trade in African countries and so cannot be considered a major policy issue. For example, in Kenya in 2009, this share was only about three-tenths of one percent of all food purchased in urban areas[22]. As supermarkets grow their share and succeed in reducing their use of wholesale markets, however, this is likely to become a more important issue.

The final systemic effect that supermarkets can eventually have in African food systems is reduction of food safety problems through the creation of more hygienic shopping environments and better ability to mainstream food safety practices. As this happens, traditional markets will need to modify their own practices to avoid even more rapid loss of market share. In this way, competition among these two channels can drive improved practices throughout the system.

[22] Based on a 4% market share by supermarket chains in fresh produce, a 20% share of fresh produce in urban consumer food expenditure, and a 40% share of preferred supplier programs in supermarket chain fresh produce procurement (the rest being purchased in traditional wholesale markets; Neven and Reardon, 2004, for Kenya): 0.04*0.2*0.4 = .0032 = 0.32%

Chapter 6. Literature review on formal private Investments in African Agriculture

Domenico Dentoni and Dimitrios Mitsopoulos

6.1. Introduction

The transformation of food systems dominated by small-scale, informal production, marketing, and processing into more modernized systems operating at greater scale involves massive amounts of private investment at many levels. To date, two types of large-scale investment in the continent's food systems have received great attention in the popular and professional press: investment at retail in modern supermarkets and hypermarkets (the "supermarket revolution") and investment by foreign corporations and even governments in land. Largely unexamined has been the investment that must be taking place between these two levels, in input and equipment supply, transport, logistics, processing, and wholesaling. Investments at this level are the backbone of modern food systems, and their performance has major implications for the entire system.

The chapter aims to begin filling that gap by reviewing the literature on formal investment flows into the African food system over the past decade (2003-2013). In so doing, it pays special attention to investment by the largest African-based players and by large investors from elsewhere in the developing world ("South-South" foreign direct investment). We first present a synthesis of the literature on private agribusiness companies in Africa in the past decade and an updated map of the 200 largest companies in 2010-2012 from secondary data. This is followed by a review of the literature on recent private investment flows in Africa from African and other developing country companies, disaggregated by region, country and stage of the agribusiness chain (from farming to retailing). We conclude with a brief review of the status of Public-Private Partnerships (PPPs) and Multi-Stakeholder Platforms as development vehicles in African food systems.

6.2. Surveys of Agribusiness Companies in Africa

In the latest eight years, three surveys mapped the largest companies in SSA including those in the agribusiness sector (UNIDO, 2007; BusinessMap Foundation, 2006; OECD, 2008).

The first survey was conducted by the United Nations Industrial Development Organization (UNIDO) on foreign direct investments (FDI) in 15 African countries in 2005. FDI was defined as investments made outside the home country of the investing firm, with the firm maintaining control over the use of its invested resources (Dunning, 1993). An important characteristic of FDI is

that it reflects a desire for long-term engagement in a country's economy. Out of 1,216 companies surveyed, 340 dealt with food or agricultural production / processing; 178 (53%) were owned directly by foreign investors while 140 (41%) were subsidiaries of foreign multinational companies (MNCs) (UNIDO, 2007).

UNIDO aggregated the 340 sampled agribusiness companies into nine subsectors: beverages, fisheries, food producers and processors, forestry and paper, horticulture, input supply (agricultural machinery, seeds, and chemicals), rubber and leather, textiles, and tobacco. The food processors and producers category had the largest number of companies (112). It is dominated by European companies, and approximately 60% produce for export. Asian companies in Africa are mainly in the textile sector. The beverages, input supply and tobacco operations are primarily subsidiaries of foreign MNCs (UNIDO, 2007).

Some patterns can be recognized at the country level. In Ethiopia, almost a third of the 31 surveyed agribusiness enterprises are in horticulture; in Madagascar, a high proportion of enterprises are in the textile and apparel industry. Mozambique has seen investment primarily from forestry operations (UNIDO, 2007). Almost all countries except Malawi, Senegal and Mali had at least one agribusiness-related activity among the top five (by number of investing enterprises) foreign investor activities. Nearly two-thirds (65%) of all agribusinesses was owned by foreign investors, while a smaller percentage (28%) was joint ventures, half of them established jointly with a local partner. Most investments were small, less than USD 2 million (UNIDO, 2007).

A second survey of African companies, BusinessMap Foundation, collected secondary and primary data on company and investment projects in African countries from 1994 to 2006. The data have limitations: the survey included anticipated investment but with little ability to confirm that the investments actually took place; some investments are spread out over a couple of years and the amount invested per year is not certain; the FDI flows were understated sometimes due to missing values in the dataset for investment; and agricultural input suppliers are not included in the survey. Six sectors are targeted: beverages; food producers and processors; food and drug retailers; forestry and paper; household goods; textiles; and tobacco (BusinessMap Foundation, 2006), with 356 investments identified.

Similarly to UNIDO, the category of food producers and processors showed the highest number of investment projects (though these were smaller in average size), accounting for almost 45% (160 companies) of the recorded agribusiness projects across 20 African countries. Beverages accounted for 23% of the investment projects (81 companies). The dominant investors in the production and processing stage are CDC Capital Partners from UK (18 investments), Illovo Sugar Ltd. from South Africa (9), Parmalat Food (6) from Australia and Tongaat-Hulett Group Ltd. from South Africa (6). United Kingdom, USA and South Africa were the major investors. Significant investments in the

beverages industrial sector are done mainly by SABMiller PLC and The Coca-Cola Company. Shoprite Holdings Limited – the South African company that started the supermarket push into SSA north of South Africa - is responsible for the majority of investments under the food and drug retail subsector (Business Map Foundation, 2006). Investments by food producers and processors, beverages and by household and textiles dominate flows (BusinessMap Foundation, 2006).

The third survey, conducted by the Organization for Economic Co-operation and Development (OECD, 2008), listed the largest foreign and African agribusiness companies in SSA based on secondary data from Fortune Global 500 and Jeune Afrique Les 500 rankings. The study included companies at all different points of the chain, including agricultural producers, input and machinery / equipment suppliers, manufacturers, processors and retailers. The database includes 115 companies of which 21 are MNCs (OECD, 2008). The SSA companies are the largest single group, accounting for more than 18 percent of the total revenue of all surveyed companies. Southern Africa has the largest number of both local and foreign companies, followed by West Africa. In West Africa, African companies have a larger presence in the agro-food sector than do MNCs. Some of the companies are region-specific while others target all regions. Among the top 20 companies, 16 have their headquarters in South Africa; Nigeria is a distant second. Dynamic growth in the beverage subsector was identified with the large presence of both foreign and African companies sometimes operating in partnership (franchising and license agreements), an indication of an increase in demand for beverages (OECD, 2008).

6.3. Updated List of Largest African-based Companies

This section is based on a list of the 200 largest African agri-food companies in SSA including basic business information[23]. This list was developed in an attempt to paint a representative picture of regional private investment in the agribusiness sector. We focus on African companies and African subsidiaries of foreign multinationals, and not on direct investments from companies in other continents, due to the gap of knowledge so far about such companies.

The list was developed as follows. First we obtained The Africa Report of the top 500 companies operating in Africa, in all economic sectors (http://www.theafricareport.com/Top-500-Companies/top-500-companies.html), and selected companies operating in the food & beverage and agricultural input sectors (The Africa Report, 2012). The Africa Report rankings, from a database of 7,093 companies, are based on firms' 2010 performance unless otherwise specified. To this was added the top companies from the same sectors from African Business Research Limited (http://www.africasia.com/uploads/top_comapanies_07_ab_

[23] The 27 page list is available upon request from the authors.

march_main_ranking.pdf). These two steps yielded 56 companies. We then searched online, using the Africa Business Pages (http://directory.africa-business.com) to complete the 200.

The selected companies operate along the entire chain including agricultural production, manufacturing / processing, retail, distribution and input supplies (chemicals, farm equipment and machinery). The information includes website, turnover which is the income from sales of goods and services (only the largest 60 of them ranked according to their turnover), area of operations, product categories and sub-sectors and the type of business / primary business. The company information is based on online sources; thus, if a large company does not have any web presence (which we would consider as highly unlikely), then it was not included in this list.

The companies listed from the online search were selected based on the following inclusion criteria:

- The firms can be classified as one of the following: input suppliers (chemical or seed companies), agricultural producers (mainly farmers), food manufacturer / processor wholesaler, retailer, or distributor (transportation activities).
- The firm has invested in SSA;
- Companies in the list can also be subsidiaries of an MNC (for example, Nestle' Nigeria), not only companies with headquarters in Africa.

6.3.1. Results and Use of the Table

Table 6.1 presents information on the 50 largest companies in the African agro-food sector from the larger list. These are ranked based on their turnover in 2010. With few exceptions, all the companies are vertically integrated across several levels in the supply chain. Therefore, the companies cannot be classified as operating in only one stage of the chain. The companies were aggregated into six main activities: retailing, distribution, processing / manufacturing, input supply, food production and packaging. Firms not dealing with food (e.g. those operating with tobacco, forestry and paper, textiles, oil and gas extraction) were excluded. Cotton, however, was included as cotton seed cake can be used as feed for livestock. The food production includes fishing companies and beverage/beer producers. Input supply refers to the supply of raw materials and food ingredients for the agro-industry, feed for animals, chemicals, fertilizers, machinery and equipment and other subsectors related to agriculture activities.

South African companies dominate the ranking with 20 enterprises of which the top 10 are in fact the top 10 in all of SSA. Nigeria accounts for 10 companies, with 8 coming from Ivory Coast, two from Kenya (4%) and one from each of the other listed countries. Food processing and manufacturing is the top sector, with 38 companies. South Africa accounts for 45% of all firms in

food production, 34% in food processing and manufacturing, 50% in input supply, 36% in retailing, 41% in distribution and 100% in packaging by having the only one packaging company in top 50 ranking.

As has already been mentioned, most of the largest companies operate at several levels in the chains. Table 6.2 classifies the top five companies in each of the sectors. This updated list identifies the largest private players influencing change in SSA's food system. Thus, it provides a descriptive basis to analyse how their investments impact the ag-food system, specifically the social and environmental externalities. The knowledge gap concerns what these companies are investing in currently, considering that only the largest African companies are public and participate in the stock exchange, so they have reports for investors online (for example, Tiger Brands as manufacturer and Massmart & Shoprite as retailers). Thus, to understand the recent patterns of investment of the largest African companies, there is an urgent need of collecting and analyzing primary data.

Table 6.1. Top 50 agro-food companies in SSA by country of origin and sector of operations

Country of Origin	# of companies	Sector of Operation					
		Food production	Processing / mfg	Input supply	Retail	Distribu-tion	Packaging
S. Africa	20	7	12	6	9	7	1
Nigeria	10	3	9	1	4	2	
Ivory Coast	8	2	6	1	3	2	
Kenya	2		2		2		
Zimbabwe	1	1	1	1	1	1	
Mauritius	1	1	1	1	1	1	
Botswana	1	1	1		1	1	
Burkina	1			1			
Swaziland	1	1					
Namibia	1		1		1		
Congo	1		1		1	1	
Zambia	1	1	1				
Ghana	1		1			1	
Cameroon	1		1			1	
TOTAL	50	17	37	11	23	17	1

Note: companies can operate in more than one sector, so columns sum to more than 50

Table 6.2. Top 5 SSA companies in main agro-food activities

Food and beverage processors/manufacturers	Country of origin		Food producers	Country of origin
SAB MILLER PLC	South Africa		PIONEER FOODS GROUP	South Africa

TIGER BRANDS	South Africa	FLOUR MILLS NIGERIA	Nigeria
PIONEER FOODS GROUP	South Africa	ASTRAL FOODS LIMITED	South Africa
TONGAAR-HULETT	South Africa	ILLOVO SUGAR LIMITED	South Africa
NIGERIAN BREWERIES PLC	Nigeria	RAINBOW CHICKEN LIMITED	South Africa
Food retailers and distributors	Country of origin		
SHOPRITE HOLDINGS	South Africa		
PICK'N PAY STORES HOLDINGS	South Africa		
MASSMART HOLDINGS	South Africa		
WOOLWORTHS	South Africa		
SPAR GROUP	South Africa		

6.3.2. Recent Patterns of Private Investments

From Western countries: FDI to Africa is growing rapidly reaching USD 35.5 billion in 2006 and USD 87.6 billion by 2008 (Anseeuw 2013). Of the 2006 amount, USD 9.1 billion was invested in the agribusiness sector, the highest level ever. The FDI originates mainly from the EU, United States and South Africa, though Asian countries are emerging as powerful investors in the region (UNCTAD, 2007b). The literature about the investments in agro-food supply chain by western countries (USA, EU) in Africa is limited and focuses mainly on some examples of large MNCs. Main sources of FDI flows in Africa in the period 1996-2000 were from US companies with USD 9,249 million, France with USD 4,362 million, UK with USD 3,269 million, Germany with USD 2,475 million and Portugal with USD 1,560 million (UNCTAD, 2002). Netherlands follows with USD 816 million in 1996-2000.

There are many large MNCs from Western countries such as Nestle or Unilever that operate in SSA by having affiliates, subsidiaries or under franchising and licensing agreements (such as Nestle Ghana and Unilever Nigeria). Most investment by these MNCs is in the beverage sector (Felgenhauer and Labella, 2008). For example, Coca-Cola Company is present in most SSA countries through franchises with local firms, which provide bottling and distribution services (OECD, 2008); the Belgian-Brazilian Anheuser-Busch InBev, which is the world's largest brewer, operates in most of the SSA countries.

European companies dominate food production and processing (UNIDO, 2007). Nestle from Switzerland, Unilever from UK and Netherlands and the Archers Daniels Midland (ADM) from USA are the top three foreign food processors in

SSA (OECD, 2008). In particular, ADM is present in Cameroon, Ivory Coast and Ghana operating in cocoa and shea nut processing.

Kenya is the major destination of foreign investment in East Africa. Large tobacco companies such as British American Tobacco from UK and USA (present in 40 African markets) and Altria group (ex-Phillip Morris Companies) from USA are also engaged in agricultural production (tobacco). Agricultural input supply companies such as BASF, Bayer and the Linde Group from Germany, and DuPont and Dow from USA, are the largest foreign firms operating in this particular position in the chain (OECD, 2008; Felgenhauer and Labella, 2008). In food production, firms such as Dole Food Company and Chiquita Brands from USA are planning to invest in the banana sub-sector in Angola. Investment companies from UK such as the Emergent Asset Management and the Cru Investment Management are also interested to invest in farmland in SSA (one target country is Malawi) (FAO, 2010).

Chinese FDI in SSA Agriculture: The Chinese government actively promotes investment by its companies in Africa. Through its "going global" strategy, the government assists Chinese firms to become global enterprises by providing high technology, by building global brands from China's most successful companies and by increasing investments overseas by Chinese enterprises (Brautigam and Xiaoyang, 2009). Other promotion tools include foreign aid funds to subsidize loans for joint ventures, infrastructure projects, and sponsored seminars on agribusiness opportunities in Africa for Chinese companies and provincial officials with an emphasis on the assistance the state could provide. This state support is in the form of business information, connections, diplomatic support, export credits, zero tariff entry, insurance, low-cost loans and risk assessments.

Kaplisky and Morris (2009) indicate that "official estimates of China's FDI flows to SSA are contradictory, confusing and almost certainly understate their true significance". That said, important insights can be gleaned from the literature. First, Chinese agricultural investments in Africa remain limited in relation to the country's business ventures in other sectors, accounting in 2009 for only for 3.1% of the country's total stock of investments on the continent (Lei, 2011). For example, only 23 out of 184 (12%) investment projects by Chinese companies were focused on agriculture in Zambia (Kragelund, 2009), 6 out of 118 (5%) in Uganda (Obwona et al., 2007) and 14 out of 140 (10%) in Tanzania (Moshi and Mtui, 2008). The major driving factor in Chinese investment was their high demand for energy and natural resources (Jenkins and Edwards, 2006), and overall investment is ,thus, dominated by extractive activities (UNCTAD, 2004; The Economist, 2004; Jenkins and Edwards, 2006).

Second, two types of Chinese corporations are identified in Africa (Asanzi, 2012). New state-owned and generally small- to medium-size companies tend to be active in the production of food crops such as rice, maize and meat to supply local markets. They also sometimes invest in cotton, though this is

almost entirely exported to China. Examples of these new state-owned enterprises are: the Hubei Lianfeng Overseas Agricultural Corporation that focuses on Mozambique and Africa region in general; the Hubei Dadi Corporation for Economic and Technical Cooperation that promotes rice production in African countries such as Nigeria, Ghana and Congo; and China-Africa Cotton Development that operates in Malawi, Zambia, Tanzania and Mozambique (Freedman et al., 2008; Asanzi, 2012). The second type of Chinese company is the large, private or state-owned multinational corporations (Hairong and Sautman, 2010; Freedman et al., 2008). These corporations tend to focus on the production of cash crops such as cotton, palm oil and soybeans destined, in part, for local markets but also for the Chinese market (Asanzi, 2012). Examples of large state-owned multinational companies are: China Grains and Oils Group Corporation (CGOG), which is attempting to operate in Mozambique; China Overseas Engineering Group Company (COVEC), which is attempting to establish large farmlands in the Congo (Asanzi, 2012); and ZTE Agribusiness Congo, a private subsidiary of the Chinese ZTE Agribusiness Company, which also attempted to acquire farmland in Congo (Asanzi, 2012).

A third distinguishing feature of Chinese investment in Africa's agriculture is that it combines business imperatives and development assistance in the form of aid (Brautigam, 2010; Asanzi, 2012). China during the last decade built a strong network of trade, aid and investment links with about 50 African countries. Aid and business are combined in one package in a series of summits, agreements and announcements by high level officials and politicians. China, through its Africa Policy White paper (January 2006) and during ministerial-level meetings of the Forum on China–Africa Cooperation, highlights the focus on cooperation with African governments among others in several areas: land development, agricultural plantation and animal husbandry, transfer of agricultural machinery and technology and the processing/storage and transport of agricultural produce (Brautigam and Tang, 2012). Project development, finance and marketing assistance are facilitated by China Export Import Bank for agricultural projects overseas (Comtex News Network, 2006). China also sends experts to assist agricultural projects and to establish agricultural training schools and demonstration centres (Brautigam and Xiaoyang, 2009).

To provide more illustrative detail on Chinese agricultural investment on the continent, we examine two country examples: Ethiopia and Tanzania. Ethiopia is rich in natural resources and, under the late President Meles Zenawi, established an investor-friendly policy environment (Weisledder, 2009). The total number of proposed Chinese agricultural investment projects since 2008 is 32: 18 in vegetable farming, 4 in edible oil production and processing, 3 are licensed in sugar cane production and processing, 3 are licensed in pig farming and processing, 2 are approved in poultry, 1 in mushroom farming and 1 in a rubber plantation (Ethiopian Investment Agency, 2012).

However, many of the approved investments have not come to fruition. Many Chinese investors visited the country to investigate opportunities in the agro-sector but few invested. A key reason for this appears to be that the investors seek a "quick return on investment," and agriculture requires a longer time frame (Brautigam and Tang 2012). Currently, no more than three leather factories are operational and one small Chinese farm; the numerous others are in the planning stage showing that Chinese investment in the Ethiopian agcricultural sector is quite limited (Brautigam and Tang, 2012). Confirming this, Alemu (2013) states that among 118 realized agriculture investments from FDI, 20% are from U.S.A., 18% from Ethiopians living abroad, 15% are European, 8%are Israeli, 8% are joint ventures, 7% are from Saudi Arabia, while 14% come from various countries, including China.

Chinese agricultural investment in Tanzania has followed a similar course to Ethiopia: many investors exploring possibilities but few are making investments, scared-off by the riskiness of agriculture in the country. What investments remain tend to be large-scale but also with limited success. The Chinese and Tanzanian governments co-financed the Ruvu State Farm, a 2,834 ha farm producing rice, cotton, vegetables, cereals, fruits as well as beef and dairy products. Production today has decreased, and about half the farm has been turned over to small-scale farmers (Land Rights Research and Resources Institute, 2009).

The largest agricultural investment *cum* aid project by China in Tanzania had been the Mbarali Rice Farm in Mbaye, managed with Chinese technical assistance for decades. This was a self-contained farm (electric power, irrigation etc.) with cows, pigs, chickens, rice mill, related facilities to livestock, staff housing, and more than 450 workers, and it was having an annual capacity of 8,000 to 10,000 tons supplying 25% of Tanzanian market demand. The farm closed in 2001, and the land now primarily supports cooperative groups of 884 smallholders.

The largest Chinese investment in agriculture to date remains the China Agricultural Development Company's sisal farm, started in 1999 with the investment of a state-owned enterprise, the China State Farm Agribusiness Corporation, in two abandoned sisal farms, Rudewa Estate and Kisangata Estate, a total area of 6,900ha. The company recently transferred its ownership to a new company set up by the China Agricultural Development Company and the China Africa Development Fund. The sisal farm is the second largest in Tanzania with an investment until today of about USD 6.45 million (Brautigam and Tang, 2012).

According to a statement by the Chinese economic counsellor in 2008, agriculture is very risky in Tanzania, and it is very difficult to generate "win-win situations" (Brautigam and Tang, 2012). Thus, many projects have failed such as the Upenja State Farm, the Mahonda State Sugar Cane Farm and Processing Factory. Examples of successful projects include the Boley

International which started in 2007 producing olive oil, telephone poles from Eucalyptus trees and castor oil, the Honey King's Organic Honey Outgrower Scheme (from 2011), the Suzhou Guoxin Pesticide Factory (from 2005) and some horticulture, maize and mixed farms. Potential projects are rural energy projects and biofuel farming (Brautigam and Tang, 2012).

These examples suggest that, despite China's large and growing presence in Africa's energy, infrastructure, and construction sectors, and despite some interest in the agricultural sector, only modest agricultural investment has taken place. Barriers have included the risky agroecology of SSA combined with poor infrastructure, often high energy costs, and the proposed large sizes of investments, which require large amounts of land. Despite widespread concern about enormous tracks of land being granted to Chinese investors, the reality is that few of these investments have come to fruition (Asanzi, 2012).

Indian agricultural FDI in SSA: Like China, India seeks investments globally in countries rich in natural resources to import resources and to supply Indian industry (Duanmu and Guney, 2009; Jenkins and Edwards, 2006). Indian investments abroad are increasing rapidly in number due to the relaxation of the Indian's government's restrictions on capital outflow after the economic reforms of the 1990s. Today, national policies and guidelines promote, regulate and encourage Indian FDI (Petersen, 2008). As a result, India's outward FDI grew from only USD 1 million in 1983 to USD 24 million in 1992 and USD 2.2 billion in 2004 (UNCTAD, 2006).

Developing region acquisitions by Indian firms are concentrated in Asia (48% of the total value, USD 12.3 billion, and 58% of the total number of firms, 166 in total) and Africa (28% of total value and 22% of total number of firms). However, the food and beverages subsector is a minor portion of this investment: from 2000 to 2007, Indian investments in SSA's food, beverages and tobacco sector accounted for only USD 23 million of the total USD 3 billion of Indian FDI on the continent (Pradhan 2008). In comparison with Chinese investments, Indian investments are typically considered to be more inclusive of local communities due to the presence of upstream and downstream investments such as fertilizer plants or product processing (CCICED, 2011). Moreover, Indian companies seek long-term profitability in FDI through more horizontal FDI in contrast with China which tends to look for rapid expansion overseas through more vertical FDI. Horizontal FDI is likely to be more integrated with the local economy.

Brazilian agricultural FDI in SSA: Brazil is a relatively new player as it moved into development in Africa in the mid-2000s as a part of its commitment to promoting South-South cooperation. It began with the visit of president Lula to 26 African countries, the establishment of the Brazil-Africa Forum, the start of technical cooperation programs and the expansion of embassies with African countries (Cabral and Shankland 2013; Patriota and Pierri, 2013). Brazil shares cultural similarities with Africa such as the existence of African

diaspora in Brazil, Brazilian communities that moved to West Africa in previous centuries, the similar physical environment, and in some cases language (Chichava et al., 2013; Amanor, 2013). However, until today communications between Brazil and SSA remain poor with only limited joint action being undertaken (studies, research etc.) and the much-claimed affinities between Brazil and Africa are largely rhetorical (Cabral and Shankland, 2013).

Brazilian investments aim to create a niche for Brazilian technology transfer, services and knowledge to Africa though the building of vertical linkages between agriculture and agri-processing and building agribusiness capacities within Africa (Amanor, 2013). Like China, Brazilian private investment in SSA has grown along with development aid to the continent. Ghana, Zimbabwe, Senegal, Kenya and Mozambique have signed agreements for the extension of the More Food Programme, an adaption of a Brazilian program that seeks to enhance rural food security, increase productivity, address technology capacity issues, and create an expanded market for Brazilian technology by providing loans to the local farmers for the acquisition of Brazilian agricultural technology along with technical assistance (Amanor, 2013; Patriota and Pierri 2013; Chichava et al., 2013). In contrast with China, Brazilian companies in Africa are few, tend to be large, and are all private. These multinational companies are operating around natural resources, construction, energy and agribusiness (Shneider, 2009).

Overall, Brazilian investment is very low compared to the Chinese but more focused on agriculture. As a result, Brazil, for example, is seen as contributing significantly to Ghana's development. Such an example is the provision of a loan of USD 300 million to the Ghanaian company Northern Sugar to build a sugar cane complex for ethanol production. The plant will be built by a Brazilian company, the Constram S/A. Other investments include the establishment of a cashew processing plant, a pasta and biscuit processing plant and investments in rice production (Amanor, 2013). Brazil has established an Africa office of the Brazilian Agricultural Research Corporation (EMBRAPA) in Ghana (Amanor, 2013).

Ethiopia is seeking to partner with Brazil in the bio-energy sector, particularly the production of biofuel from sugar. Currently in Ethiopia, Brazil operates the Tarnar Farm PLC (started in 2008) which produces fruits, maize and grains and the BDFC Ethiopia Industry PLC (started in 2007) which produces and processes coffee and sugar (Ethiopian Investment Agency, 2012). Other Brazilian investments in the region include investments in sugar and ethanol in Nigeria and Angola (Aykut and Goldstein, 2006; Games, 2010).

Mozambique has strong diplomatic bonds with Brazil due, in part, to a common language and some historical ties. It is the top beneficiary of Brazilian technical cooperation in Africa with 21 active projects and nine proposed (including in the agricultural sector) by the end of 2011. Some of the most noticeable ongoing agricultural projects in Mozambique beyond the More food

Africa programme is ProSavana, an agricultural research and extension programme, with local development component, and the Plataforma, a technical cooperation program (funded trilaterally with USAID) for strengthening agriculture and livestock research institutions and systems (Chicava et al., 2013). It is understood that private Brazilian investment is likely to follow.

In Zimbabwe, Brazilian expertise was used to build a large ethanol plant. Similarly, Green Fuels set up a USD 600 million ethanol processing factory with Brazilian expertise and technology as a joint venture with the Agricultural and Rural Development Authority of Zimbabwe (Mukwereza, 2013).

From African countries: Intraregional FDI is particularly underdeveloped in Africa with the exception of South Africa, which ranked third during 2002-2003 in FDI on the continent, following the UK and USA (Page and Te Velde, 2004; Cleeve and Ibeh, 2012). In 2002, South African FDI was about USD 19.3 billion worldwide, but only USD 1.353 billion (7%) was invested in Africa (Page and Te Velde, 2004).

Southern Africa absorbs 80% to 90% of South African FDI in SSA, with Mozambique and Namibia being the top host countries (Page and Te Velde, 2004; Games, 2004; Games, 2010). Nigeria is the top destination in West Africa; Ghana Ivory Coast and Mali follow (Games, 2004). After South Africa, other major foreign investors from the African continent are Ethiopia, Nigeria and Botswana.

Regarding agriculture and agribusiness, South African FDI has been dominated by the retail sector, with companies such as Shorprite, Pick 'N Pay and Metro Cash & Carry investing in Namibia, Zimbabwe, Nigeria, Zambia, Tanzania, Uganda and seven other African countries (African Development Report, 2003). Massmart Holdings, another investor in retail and consumer goods, has investments in Botswana, Nigeria, Ghana, South Africa, Lesotho, Swaziland, Mauritius, Tanzania, Malawi, Uganda, Mozambique, Zambia and Namibia. At the production level, Southern African Illovo Sugar has major investments in Malawi, Tanzania, Swaziland, Mauritius, Zambia and Mozambique. SabMiller is a major investor in beverages in many African countries (31 in total) such as Mozambique, Tanzania, Uganda and Zambia (Page and Te Velde, 2004; Cleeve and Ibeh, 2012). Most South African companies operate through franchising which is an effective way to empower local business people and to connect them with the formal economy (Games, 2004).

Examining the destination of African food system FDI in Africa, Uganda receives 10% of its total FDI from South Africa, 5% from Mauritius and 5% from Kenya. Most of these agro-food investments are in brewing and beverage by Kenya (Uganda Breweries and Elvira Mineral Water) and South Africa (Page

and Te Velde, 2004). South Africa, in 2002, was among the top 10 investors in Uganda, with USD 17 million invested (Games, 2004). The main investor in Malawi is South Africa with investments in agriculture such as tobacco and sugar (Page and Te Velde, 2004). Tanzania received about 44% (USD 155.4 million) of its total FDI in 2001 from SSA; 24% was from South Africa, 5% from Ghana and 5% from both Mauritius and Kenya. Agro-food investments include brewing (mainly by SAB for Kibo Breweries), grain milling (Uganda Grain milling) and sugar. South Africa was also the main investor in Mozambique, accounting for 35% of inflows from 1990 to 2001 (Goldstein, 2003). Agro-food investments include brewing and sugar by South Africa and sugar by Mauritius. South Africa is major investor also in Botswana accounting for almost 60% of FDI in that country. Agricultural investment includes chicken production among others (Page and Te Velde, 2004).

6.4. Public-Private Partnerships and Multi-Stakeholder Platforms as vehicles to promote private investment

Public-private partnerships (PPPs) in Africa have risen in the last two decades as common development policy and strategic tools shared between government, companies and other private institutions in agriculture (Reinicke and Deng, 2000; Hartwich et al., 2005, FAO, 2013a). Objectives of PPPs in African agriculture include (1) Increasing the level of private investments in inefficient agricultural supply chains (Poulton and Macarthey, 2012); (2) Stimulating innovation and entrepreneurship in the supply chain to transform agricultural products into high value food, feed, fuel or fiber (World Bank, 2007); (3) problem-solving to establish legitimacy of international governance structures through democratic participation and accountability (Bortzel and Risse, 2002); and (4) developing and maintaining infrastructures (in transport, energy, public education and R&D) as public goods to increase the efficiency and competitiveness of African agricultural value chains (World Bank, 2009).

Private companies are held responsible for raising financing for the necessary investments to relieve the public budget and achieve cost-effective services (Poulton and Macartney, 2012). In exchange, the private actors expect to gain from the PPPs through increased market access, supply chain efficiency and competitiveness and legitimacy vis-a-vis local Governments, local communities and international stakeholders. Objectives and outcomes of PPPs depend on the country context and the public investor, which is either an African government or a foreign government.

Four trends of PPPs of China in Africa have been identified: (1) Decreasing public, increasing private enterprises in the African market following policy reforms in China; (2) Increasing high-technology investments supporting the establishment of Chinese global brands in Africa; (3) Increased provision of subsidized loans for joint ventures and infrastructure projects, capacity building and market information systems, legal assistance for Chinese companies; and (4) Increased development aid for land productivity and

transfer of equipment and technology for agricultural and food processing, storage and transportation, as established during the Forum on China–Africa Cooperation 2006 meetings (Comtex News Network, 2006; Brautigam and Xiaoyang, 2009; Brautigam and Tang, 2012).

After the World Summit on Sustainable Development in Johannesburg in 2002, multi-stakeholder platforms (MSPs) became common public-private permanent institutions for coordination and negotiation of public and private R&D, capacity building, and infrastructure investments for sustainable development in Africa. MSPs are broadly defined as "voluntary, self-enforced and non-negotiated agreements between different constellations of governments, international organizations, NGOs and industry partners" (Bäckstrand 2006, p. 296). Between 2002-2010, all the world's largest 50 food and beverage manufacturing firms (in terms of 2008 turnover) with presence in Africa founded, led or became members of at least one MSP (Dentoni and Peterson 2011; updated by Dentoni and Mitsopoulos 2013). The amount of private and public investment spent to develop and undertake activities in MSPs varies significantly and has not been estimated yet.

MSPs' goals and activities vary significantly. Of 17 MSPs reviewed by Dentoni and Mitsopoulos (2013):

- Nine focus on agricultural production with the goal of increasing smallholders' market access through assistance in supplying the MSPs' members with needed raw material. These MSPs also tend to focus on food security and environmental sustainability. Examples of these include Global Report Initiative, UN Global Compact, Novella Africa Initiative, African Cashew Alliance, Cotton Made in Africa, IDH, SAI Platform, Sustainable Food Lab and Seas of Change.
- Five MSPs focus on the supply chain between agricultural production and food retail with the goal of stimulating technological and systems innovation and entrepreneurship. These include: Forum for Agricultural Research in Africa (FARA); Agri-ProFocus (APF) National Agri-Hubs; Alliance for a Green Revolution in Africa (AGRA); Southern Africa Food Lab; African (Accelerated) Agribusiness and Agro-industries Development Initiative (3ADI).
- Three focus on marginalized consumers with the goal of increasing access to nutritious food, also through the improvement of staple varieties. These include: GAIN Alliance, Amsterdam Initiative against Malnutrition and Flour Fortification Initiative.

MSP activities include (some of the 17 listed in Dentoni Mitsopoulos 2013 undertakes more than one activity reported below):

- Six MSPs facilitate agri-hubs, clusters or 'innovation platforms' at production, processing, manufacturing and/or retail level: Forum for Agricultural Research in Africa (FARA); UN Global Compact; Agri-ProFocus (APF); African Cashew Alliance; Southern Africa Food Lab;

African (Accelerated) Agribusiness and Agro-industries Development Initiative (3ADI).

- Four co-invest in the development and diffusion of technological R&D: Novella Africa Initiative; Flour Fortification Initiative; Alliance for a Green Revolution in Africa (AGRA); and Amsterdam Initiative against Malnutrition (AIM).
- Three MSPs negotiate, set, apply and train supply chain actors on standards and rule of conducts on social and environmental sustainability practices: Cotton made in Africa (CmiA); Sustainable Trade Initiative (IDH); and Sustainable Agriculture Initiative (SAI) Platform.
- Two of them negotiate, set, apply and train supply chain actors on reporting/information disclosure standards: UN Global Compact and Global Reporting Initiative.
- Four develop information, knowledge-sharing and deep-learning systems on sustainable development practices of local and global stakeholders: GAIN Business Alliance; Southern Africa Food Lab; Sustainable Food Laboratory; and Seas of Change.

Of these 17 MSPs, 13 are led by European or US corporations or government agencies and four are led by African public institutions or universities. None are led by FDI investors from other emerging economies, including China, India or Latin America, nor do any companies from these countries participate in any of the 17 MSPs.

Other than this descriptive information, we have not found any rigorous analysis of the impact of PPPs or MSPs on development outcomes in African food systems. Given the high profile of some of these efforts and the use of donor funds to support them (e.g., CMiA), more rigorous assessment is clearly called for.

6.5. Conclusions

This chapter reviewed the literature on African companies, on investment flows from African and international companies and on PPPs in Africa. Moreover, it developed an updated list of the largest African companies in the agricultural and food sector in 2011 and analyzed an updated list of MSPs founded by African, US or European public or private actors between 2002 and 2013 (Dentoni and Mitsopoulos 2013).

Results lead to the conclusion that literature on the description and analysis of the largest domestic and regional players and of patterns of current investments in the African supply chains is outdated and lacks detail. At a very basic level, more studies are needed that identify what firms are investing in what levels and value chains of the food system, what business practices they are bringing, and how their activities are affecting farmers, smaller local businesses, and consumers. This lack of information is especially sharp below retail, at the level of processing, wholesaling, packaging, and transport.

Chapter 7: Conclusions and Implications for Further Research

David Tschirley

We first summarize four sets of key findings from this paper. Based on this, we then identify in concise fashion the key research topics that should have high payoff in coming years.

7.1. Summary of Findings

The most important findings from this paper and their implications are as follows. Our first set of findings relates to urbanization. Though specific rates may be in dispute and though patterns vary across regions and countries, nearly all analysts agree that SSA – and ESA in particular – are urbanizing very rapidly. We also found that the spatial concentration of urban populations is declining as those populations grow, with smaller cities and towns capturing a greater share of the total urban population. This pattern bodes well for increased growth linkages between smaller cities and towns and the production areas that surround them and thus for the ability of rural residents to use migration to urban areas as a springboard to a better life. The potential programmatic implications of this finding are that government and donors need to be sure that investment in energy, sanitation, transport and food marketing infrastructure, and other urban investment is channeled broadly to include these secondary cities and towns, and that rural road network investment also takes the development of these secondary cities and towns into account.

A second set of findings and implications revolve around the diet transformation and the downstream and midstream transformations it drives. In the absence of macroeconomic or climatic shocks not foreseen at the present time, continued economic openness by governments in the region will result in economic growth that, paired with rapid urbanization, will drive a rapid transformation of diets. The *pattern* of diet transformation – the change in the particular mix of foods that will be consumed – is relatively insensitive to the four growth scenarios that we analyzed. Under all scenarios, budget shares for maize, other coarse grains, and roots and tubers fall while those for food away from home, proteins, wheat, rice, fruit and a broad range of processed goods will rise. The increased demand for processed foods is particularly dramatic and has major implications in particular for the midstream of the food system. Unlike changes in demand patterns, the transformation in the *level* of demand is quite sensitive to the particular growth scenario, with more equitable growth strategies fueling substantially greater growth. But under even the most pessimistic scenario (Business as Usual with unfavorable economic environment), total demand for food will rise in real terms by more than three times; the increase will be over nine times in the most optimistic scenario.

We found that current processing and marketing systems are inadequate to handle even current volumes in efficient and hygienic fashion; and the modern sector, though present and growing, is likely still to have less than 50% of the market by 2040. Much more needs to be known about the dynamic of change in the traditional sector. We have a reasonable snapshot of its current status and strong reason to believe that it will remain a major player for several decades. What is not understood nearly well enough is the status of any quiet revolution in this sector. This knowledge gap is especially pressing with respect to the midstream processing / wholesaling / packaging / logistics sector. Little is known about the structure – market shares among multinationals, large regional players, and smaller local players – or the behavior and performance of this sector. See the next section for specific research questions that need to be pursued.

We showed that the data on food loss and waste is largely outdated and of questionable validity, but that the balance of evidence suggests that food losses can be substantial for some crops at farm- and immediate post-farm level. Waste is very low at retail and consumer levels but is likely to grow over time as consumer incomes rise. Approaches to reducing loss at farm and immediate post-farm level need to take a whole supply chain approach, as narrow technical solutions targeting one level may not be adopted due to constraints at other levels. Major efforts to stem rises in food waste at retail and consumer level may be premature at this time but should be kept in mind as economic growth proceeds.

Relatedly, and despite the wide literature on adoption and diffusion of innovations and on the relevance of public-private partnerships in designing and implementing effective supply chain programs, a knowledge gap remains regarding the stages of the supply chain where large companies seek co-investment with government/donor investments and regarding their impacts.

PPPs are of potential importance for improving the performance of wholesale markets. More needs to be known about successful ownership, management, and logistics structures for public wholesale facilities, how they emerged, what role is played by public and private stakeholders, and what impacts they've had upstream and downstream. Specific instances of successful public-private collaboration need to be documented.

Where functional managerial structures do exist in wholesale markets, high payoffs could come from action research and impact assessment to test the deployment of modern ICTs within these markets in well-conceived programs to improve the two-way flow information on supply and demand and factors affecting each. In addition to near real-time information on prices, such a system could include information such as pest outbreaks, transport bottlenecks, current supply and demand conditions in the market, and others. Improved vertical flow of information is the fundamental basis for dealing with the extreme price instability typically seen in traditional markets.

Gendered participation in the traditional sector suggests that women will be disproportionately affected by the transformation of the downstream food system because they constitute the majority of retail traders in the region's traditional trading system. Yet there will clearly be winners in this system, as it will continue to hold a substantial portion of all trade for several decades, will grow greatly in absolute size, and should itself show increases in scale and technology over time. High priority should be given to programs that build women's functional literacy and entrepreneurial skills to be active participants in the quiet revolution that is beginning to unfold.

We found that very little is known about African consumer willingness to pay for food safety. Reasoning from the low levels of income in ESA compared to China and other countries of Asia where food safety has become an issue of intense interest recently, we suggest that food safety will not likely be a major concern for most consumers for some years. Yet, working now to generate basic knowledge about consumer attitudes may assist public and private officials to properly anticipate this growing demand.

A third general finding relates to the diet transformation and the nutrition transition. We've shown that women are already particularly affected by the nutrition transition, being heavily over-represented among the growing number of overweight and obese people in SSA. Designing educational and other programs for them to help avoid the worst impacts of the nutrition transition needs to have a high priority. Focusing on women also makes sense from a multi-generational perspective, as they will have the largest influence in the family on the consumption habits and nutritional knowledge and attitudes of their children.

Fourth, we showed that net per capita food imports into the region (in real value terms) have been rising steadily since 1996. They could be set to rise quite sharply with growing incomes in coming years unless encouraging recent trends in agricultural R&D investment and agricultural productivity continue and quicken and achieve real impact on agricultural productivity. Crucially, and in light of the large increases in consumer demand for processed and fresh perishable foods that will be seen over the next 30 years (compared to very slow growth in demand for unprocessed commodities), the focus in promoting productivity growth needs to be on the whole supply chain, not just the farm. East Asia faced the same prospect of rapidly rising imports as its incomes exploded over the past 15 years and avoided it through broad increases in food system productivity.

7.2. Key Research Questions

We tie these questions to the four sets of key findings identified above. In all areas, we focus on the types of research questions whose answers will contribute directly to improved investment for development outcomes.

7.2.1. Urbanization

The key research need on this topic regards (a) the pattern of urban investment, currently and in the recent past, in smaller cities and towns as compared to large cities, and (b) a critical assessment of the likely returns to each. This research needs to be done in a forward-looking urban planning context, anticipating the likely growth of smaller cities and towns and realizing that smart investment can help them capture a greater share of the growing urban population, with benefits for rural and urban areas.

7.2.2. The Diet Transformation and Changes in the Downstream and Midstream

Maximizing the return on investment at this level requires a solid understanding of the dynamics of change in the so-called traditional system (is a quiet revolution taking place, and what does it look like?), in the "modern" system of supermarkets and modern processing and wholesaling, and the inter-relationships among them. The need is primarily for regularly updated information on processes of change, to allow more informed projection of future change and less for definitive research on precise issues at a point in time. Among the questions to ask are:

- What are the levels and location (what countries, where in those countries and, in particular, how close to urban areas, what commodities, what stage in the system) of investment by modern multinational, regional, and local firms? How are these firms re-organizing their procurement and market strategies, including forms of vertical and horizontal coordination, as a result of urbanization and retail transformation? How are smaller local firms responding to the pressure of investment by larger firms, and what are examples of success? How are processing and packaging technologies co-evolving in these sectors? What effects are these changes having on the cost, variety, and quality of food available to urban consumers? What is the relative orientation of this sector to the domestic and export markets, and where are the prime growth opportunities in both? The type of information available on the top 200 firms investing in Africa is simply a launching pad for generating much more detailed understanding of what investments are being made and what behavioral characteristics are accompanying that investment.
- What is the status of the quiet revolution? How is the so-called traditional sector changing both in response to pressure from modern firms and endogenously in response to new and greater demands from consumers? Understanding the dynamics and spatial distribution of change in this system – rates and types of change and how they vary across and within countries, especially with respect to proximity to urban centers of varying size - is crucial to designing appropriate policies

and programs to assist the smaller players in their competition with large capital and to build a progressive and diverse food system.

- What are the key characteristics of wholesale facility ownership and management that result in high use and value added for consumers, producers, and traders, and what are the conditions and approaches that allow these structures to come into being? How much market share are entrepreneurial wholesalers independent of wholesale markets garnering, and in what commodities? Which of these models have the potential for expansion and adaptation to climate change and population increases in urban areas, and what are the barriers to expansion?
- What combination of training, incentives, access to services, and public awareness campaigns will best assist some share of the women currently operating in the traditional marketing sector to transition over time into more remunerative niches that allow them to maintain an entrepreneurial position in the food system as this system transforms?
- How will the magnitude of wage labor and salaried opportunities evolve for current female and male participants in the food system who might not be able to compete entrepreneurially? Beyond basic education, what policies and programs might increase the attractiveness of wage labor for formal sector investors and lessen the move towards labor-replacing technology?
- What are current consumer attitudes to food safety in ESA, and how do these vary with location of residence, education, gender, and income? Such knowledge would be important for food processing companies serving urban consumers (who will be the first to begin paying attention to food safety) and public regulatory bodies charged with protecting citizen health.

7.2.3. The Nutrition Transition

Section 4.5 of Chapter 4 focuses extensively on what needs to be known to "bend the curves" of the nutrition transition, avoiding its worst impacts. Questions include:

- What can be learned from countries such as South Korea, Japan, and Denmark that have maintained better health status despite having a high-income, urbanized populace?
- What approaches work to induce better diet decisions among consumers? Since women are now the most affected, what combination of public education campaigns and other programs might best reach them? Can changing the attitudes and practices of mothers lead to better nutrition decisions by their children? How might nutrition education be integrated into elementary and later school curriculums to encourage good nutrition decision-making? What role can social advertising play?

- Similar questions apply to inducing more physical exercise. Urban planning might have major impacts on these behaviors if they are taken actively into account in planning decisions.
- What approaches to the education of agribusiness leaders will have the largest impact on the nutritional quality of the food they produce?

7.2.4. Imports

What policy and programmatic approaches are needed to ensure that Africa – rather than imports - satisfies most of its increased demand for food and value-added? More precisely, what approaches might be most effective in ensuring sufficient and proper investment in food systems to ensure the whole-system productivity needed to achieve this goal? This question is closely related to the questions in section 7.2.2. above and also requires attention at the level of transformations 4 (factor markets) and 5 (agricultural production). These will be the focus of a follow-on white paper that builds on the knowledge contained in this current paper and completes the current story of African's emerging food system transformation.

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