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Promoting Agricultural Trade to Enhance Resilience in Africa

Edited by
Ousmane Badiane
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Godfrey Bahiigwa

Editors

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Established in 2006 under the Comprehensive Africa Agriculture Development Programme (CAADP), the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) supports efforts to promote evidence and outcome-based policy planning and implementation. In particular, ReSAKSS provides data and related analytical and knowledge products to facilitate benchmarking, review, and mutual learning processes. The International Food Policy Research Institute (IFPRI) facilitates the overall work of ReSAKSS in partnership with the African Union Commission, the NEPAD Planning and Coordinating Agency (NPCA), leading regional economic communities (RECs), and Africa-based CGIAR centers. The Africa-based CGIAR centers and the RECs include: the International Institute of Tropical Agriculture (IITA) and the Economic Community of West African States (ECOWAS) for ReSAKSS–WA; the International Livestock Research Institute (ILRI) and the Common Market for Eastern and Southern Africa (COMESA) for ReSAKSS–ECA; and the International Water Management Institute (IWMI) and the Southern African Development Community (SADC) for ReSAKSS–SA.

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Promoting Agricultural Trade to Enhance Resilience in Africa

ReSAKSS

Annual Trends and Outlook Report

2013

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Abbreviations

AGRODEP	African Growth and Development Policy Modeling Consortium
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ATOR	Annual Trends and Outlook Report
AUC	African Union Commission
CAADP	Comprehensive Africa Agriculture Development Programme
CCT	Conditional Cash Transfer
CEMAC	Economic and Monetary Community of Central Africa
CEN-SAD	Community of Sahel-Saharan States
CGE	Computable General Equilibrium
CIF	Cost-Insurance-Freight
COMESA	Common Market for Eastern and Southern Africa
DRC	Democratic Republic of the Congo
EAC	East African Community
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African States
ECX	Ethiopia Commodity Exchange
EMM	Economy-wide Multimarket Model
EPZ	Export Processing Zone
FAO	Food and Agriculture Organization of the United Nations
FCC	Fertility Capability Soil Classification
FDI	Foreign Direct Investment
FIMA	Framework for Improving Rural Infrastructure and Trade Related Capacities for Market Access
FOB	Free On Board
FRA	Food Reserve Agency [Zambia]
GDP	Gross Domestic Product
GVC	Global Value Chain
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IGAD	Intergovernmental Authority for Development
IIT	Intra-Industry Trade Index
JSR	Joint Sector Review
MIS	Market Information System
NCPB	National Cereals and Produce Board [Kenya]
NDVI	Normalized Difference Vegetation Index
NEPAD	New Partnership for Africa's Development
NPCA	NEPAD Planning and Coordinating Agency
OECD	Organization of Economic Cooperation and Development
PPP	Purchasing Power Parity
PSNP	Productive Safety Net Program [Ethiopia]
RCA	Revealed Comparative Advantage
REC	Regional Economic Community
ReSAKSS	Regional Strategic Analysis and Knowledge Support System
RF	CAADP Results Framework
SACU	Southern Africa Customs Union
SADC	Southern African Development Community
SAFEX	South African Futures Exchange
SAKSS	Strategic Analysis and Knowledge Support System
SPAM	Spatial Production Allocation Model
SSA	Africa South of the Sahara
TEI	Trade Expansion Indicator
TFP	Total Factor Productivity
TOI	Trade Overlap Indicator
UMA	Arab Maghreb Union
USAID	United States Agency for International Development
WTO	World Trade Organization

Foreword

At the June 2014 African Union Summit in Malabo, Equatorial Guinea, African Heads of State and Government committed to the goal of tripling intra-African trade in agricultural commodities and services by 2025 and to building the resilience of agricultural livelihoods and production systems to climate variability and shocks. This was in addition to their recommitment to uphold targets and principles of the Comprehensive Africa Agriculture Development Programme (CAADP). These commitments, which form part of the Malabo Declaration, highlight the high importance they have placed on trade and on building resilience as means of enhancing Africa's economic growth and transformation.

Since independence, African countries have embraced trade, and particularly regional trade integration, as essential components of their development strategies. However, Africa has yet to realize fully the benefits of trade, including from its numerous regional trade agreements. Moreover, Africa, like other developing and emerging economies, needs to harness the benefits of global trade while managing the potential negative effects of increased and volatile food prices on food security. In order to realize the goal of tripling intra-African trade and maximizing related benefits, countries will need to develop effective strategies and policies to reduce barriers to trade and to raise competitiveness and market shares in and outside Africa.

The 2013 Annual Trends and Outlook Report (ATOR) contributes to the emerging debate by analyzing Africa's recent trade performance and future outlook at the global and regional levels, including discussions of the mechanisms of dealing with food price volatility, the scope for increasing trans-border trade, and the potential impacts of weather-related shocks and biophysical factors on intra-regional exports. The ATOR finds that Africa's share of world trade of goods and services, and specifically of agricultural goods, made a turnaround and started increasing in the 2000s. Also, intra-Africa agricultural exports have grown rapidly in recent years, particularly in calorie terms, thus lessening the continent's dependence on the West in terms of trade. The Report attributes the improved trade performance to recent improvements in economic growth and infrastructure on the continent, together with higher world prices for some key raw materials.

The 2013 ATOR also finds that trade within regional economic communities—the Common Market for Eastern and Southern Africa (COMESA), the Economic Community of West African States (ECOWAS), the Southern African Development Community (SADC)—has grown in recent years, as countries have increased their trade competitiveness. Regional trade is likely expand even further, with even moderate reductions in costs of trading, yield increases, and removal of regional trade barriers. Moreover, the report finds that there is significant potential for regional trade to stabilize domestic markets, as production levels are less volatile at the regional level than at the national level. And while regional trade has the potential to improve food security, as surplus areas can supply deficit areas affected by weather shocks, such shocks can also threaten trade, especially as they become more frequent and intense. Therefore, policies and programs to help nations and communities anticipate, adapt, or recover from the effects of shocks are of the essence.

In dealing with high food prices in the medium to long term, the ATOR recommends improvements in transport infrastructure to reduce transaction costs, as well as investments in agricultural research and development, irrigation, and other inputs to raise agricultural productivity. Moreover, if well designed and carefully targeted, programs that reduce variability in consumption, such as social safety nets, can also help improve the ability of the poor and vulnerable to manage food price volatility.

Findings of the ATOR are an essential element of monitoring and evaluation in support of the CAADP Results Framework (RF). Specifically, the 2013 ATOR addresses two of the five main priority areas of the new CAADP RF. Regular monitoring is central to assessing progress in implementing the CAADP agenda, and now the Malabo trade-related commitments, to inform progress and guide any needed adjustments in working toward desired goals and targets.

The 2014 ReSAKSS Annual Conference will be hosted by the African Union Commission, Department of Rural Economy and Agriculture, at the African Union headquarters in Addis Ababa on October 8–10. This represents another opportunity to discuss findings and policy recommendations of the 2013 ATOR and to broaden the debate on this very important component of the post-Malabo agenda. The conference will allow state and non-state actors to discuss progress in establishing Strategic Analysis and Knowledge Support Systems (SAKSS) and in promoting more comprehensive, inclusive, and technically robust agriculture joint sector reviews (JSRs), designed (respectively) to provide data and analysis and to support regular dialogue and mutual accountability processes in the agriculture sector.

The next issue of the ATOR will examine African countries' progress toward achieving middle-income status and halving poverty and ending hunger by 2025, in line with the Malabo Declaration. In addition to informing CAADP planning processes and fora such as the annual CAADP Partnership Platform meeting, the analysis will feed into the new biennial agricultural review and mutual accountability process that African Heads of State and Government have committed to in order to ensure a successful implementation of CAADP including the provisions of the Malabo Declaration on Accelerated African Agricultural Growth and Transformation.

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Executive Summary

Whether as a source of food supplies or foreign exchange earnings, trade in food and agricultural products, in particular, can have significant ramifications on the livelihoods of poor and vulnerable communities in rural as well as urban areas. Recent food price crises in 2007/2008 and 2010/2011 made this abundantly clear, negatively impacting food security of the vulnerable and poor and undermining the trade competiveness of countries. Governments in developing and emerging economies quickly responded, especially in 2007/2008, with a myriad of policy measures that included price controls on food, cash transfers, agricultural input subsidies, use of food grain stocks, export restrictions for grains, lower import tariffs, and increased export taxes. While some of the policies provide important safety nets for the vulnerable, protectionist measures can undermine trade. Trade is particularly important as it not only affects the availability of and access to food in the short run, but it also affects the pace of growth of the economy as whole and of incomes among the poor and vulnerable, and thus the degree of resilience at national and community levels.

The expansion of trade in agricultural markets both within and outside Africa, based on stronger performance and improved competitiveness by African countries, demonstrates the positive contribution of trade to resilience. On the one hand, gains in competitiveness and market share stimulate growth and generate higher incomes. On the other hand, better market integration resulting from trade expansion spreads the pressure to adjust to market disturbances across a wider area and over a larger number of economic actors, thus reducing the level of volatility in food markets. The consequence is greater capacity across the trading space to absorb price shocks and respond to supply gaps, and thus greater resilience of domestic food markets in trading countries.

Against this background, the 2013 ATOR assesses the structure and performance of trade by African countries in global and regional agricultural markets. It also evaluates the extent of integration of African countries in these markets, and the potential for greater integration. The implications for resilience of domestic food systems are then analyzed, including the potential impact of biophysical or weather shocks on the capacity to use trade as a stabilizing instrument. The findings and related policy and strategic implications are summarized below.

Major Findings and Recommendations

Following huge declines in the 1990s, Africa's share of world trade in goods and services as well as agricultural products has been increasing since the 2000s. The increasing trend in goods and services has been driven mostly by oil, gas, and mineral exports from North African countries. However, the share of world exports of goods and services for Africa south of the Sahara (SSA) continued to decline into the 2000s and early 2010s. During the 2000s, Africa's agricultural exports increased fourfold in

value terms and twofold in caloric terms. However, agricultural imports rose almost twice as fast and outpaced exports both in value and caloric terms, resulting in a rapid widening of the agricultural trade deficit. In terms of nutritional content, imports of proteins have increased faster than imports of fats and calories, driven by growing incomes across the continent. Moreover, intra-Africa trade has expanded significantly, resulting in a decline of Africa's dependence on countries of the Organization of Economic Cooperation and Development (OECD) as trading partners. In particular, the share of Africa's agricultural exports destined for Africa has increased substantially and especially in caloric terms. Africa's growing trade shares in goods and services and agricultural products can be attributed to several factors: the recent increase in world prices of some raw materials; improved economic growth; significant improvements in local trade infrastructure (such as telecommunications) on the continent; and Africa's efforts to integrate into global and regional markets through global preferential trade agreements and regional trade agreements.

African agricultural exports have experienced a gradual diversification since the 2000s, while several countries have increased their global market share of agricultural products through higher competitiveness. At the end of the 1990s, the top 10 agricultural products exported by Africa made up 51 percent of total agricultural exports, compared to 40 percent during 2005–2010. During the latter period, the top 10 agricultural exports included cocoa, coffee, cotton, cashew nuts, oranges, tobacco, tea, and cut flowers. Countries that have managed to increase their world market shares for agricultural products through improved competitiveness (through domestic performance or geographic specialization) include Togo, Rwanda, Ghana, Ethiopia, Mozambique, Gabon, Malawi, Tunisia, Tanzania, and Niger.

Simulation results show that if current trends persist, Africa's agricultural trade will continue to expand. Under the current trajectory, Africa's agricultural imports would continue to rise faster than exports. Significant increases would be experienced in exports of cash crops, vegetables, fruits, and fibers, along with increased imports of cereals, meat and meat products, dairy products, processed food, and beverages and tobacco. Increased exports of cash crops are expected mainly for countries of the Common Market for Eastern and Southern Africa (COMESA) and the Economic Community of West African States (ECOWAS), while the Southern African Customs Union (SACU) countries would increase exports of vegetables and fruits. Under an alternative scenario that assumes an ambitious worldwide 50 percent cut in agricultural tariffs, simulation results show agricultural imports growing even faster than exports, leading to a deterioration in the trade deficit. While tariff reform would lead to a slight contraction of Africa's agricultural value-added, it would result in gains in real incomes and unskilled wages in some regional economic communities (RECs), such as COMESA and SACU, suggesting the potential benefits of trade integration through a global agricultural tariff cut. Although the scenario seems improbable given the currently stalemated WTO negotiations, it does however highlight the potential challenges and opportunities of an ambitious reform for Africa.

Regional trade in Africa is growing, but from a low base. Regional trade performance in Africa has been improving in recent years. Overall, African countries as a group and the member states of the main RECs have succeeded in increasing their competitiveness in intra-African and regional markets, expanding exports to regional markets faster than the

group of competitors. An exception is COMESA, which has lost competitiveness in agricultural exports in value terms (although it increased competitiveness in caloric terms). Intra-African and regional markets also increased in importance as export destinations for member countries. The shares of regional markets in member countries' agricultural exports in value terms increased for the Southern African Development Community (SADC) and COMESA, as well as for Africa as a whole, although the share of ECOWAS dropped. Despite recent growth, intra-regional trade levels remain relatively low. Forty-two percent of SADC countries' agricultural exports (in value terms) go to other SADC countries; shares are much lower for COMESA and ECOWAS, at 20 percent and 6 percent respectively. For Africa as a whole, the intra-African market accounts for 34 percent of agricultural exports. These low intra-regional trade shares result from the high cost of cross-border trade and outwardly-biased trading infrastructure. Simulation results suggest that regional trade will continue to expand if current trends continue, and that the growth of regional trade would be significantly accelerated by moderate reductions in overall trading costs, moderate yield increases, or the removal of trade barriers.

There is significant potential to stabilize domestic food markets by expanding regional trade. In theory, regional trade could stabilize domestic food markets by buffering shocks from individual country production gaps, thereby reducing price variability, but certain conditions have to be met for regional trade to play this stabilizing role. There are several indications that expanding trade within the main RECs would indeed contribute to stabilizing member country food markets and reducing price volatility. First, regional production levels are less volatile than national production levels, for almost all countries. Individual country production levels are fairly weakly correlated with each other within SADC and COMESA, indicating that negative production shocks in one country can be offset by average or above-average production in other countries within the region. Though country production levels are more highly correlated within ECOWAS, even here, regional production is more stable than national production. Second, member countries of each REC exhibit sufficiently dissimilar patterns of production, trade, and specialization to leave scope for expanding trade within the region. Trade overlap—the situation in which a country or region both imports and exports the same good at the same time—is greater at the regional than at the country level, indicating that some countries within a region are importing from extra-regional markets the same products that others are exporting to extra-regional markets. Redirecting these trade flows by decreasing barriers to regional trade would further boost the recent growth of regional trade and allow countries to take advantage of its stabilizing effects on agricultural markets.

Biophysical characteristics and weather shocks strongly affect trade performance through effects on agricultural production. Weather shocks and biophysical risks include such factors as variation in vegetation, temperature and rainfall; depleted soils; and prevalence of diseases, pests and weeds. These can strongly affect agricultural production and thus agricultural trade performance. Regional trade can improve food security, in view of the large spatial variation in food availability across and within regions. This includes spatial variation in shocks: analysis shows that, over the past three decades, in 4 out of 10 years, drought in some maize-growing areas had the potential to be mitigated by surplus rainfall in other

areas. However, the potential of regional trade to buffer shocks can also be threatened by these very shocks, particularly as they grow more severe and numerous. Results of a simulation carried out for the COMESA and ECOWAS regions show that a 50 percent reduction in annual average rainfall and a 25 percent decrease in average vegetation cover would significantly reduce net exports in both regions, with ECOWAS being slightly harder hit. The combined effect of the previous shocks plus a one degree Celsius increase in average temperatures would have further negative effects only in the COMESA region, suggesting that farmers in the ECOWAS region have already partially adapted to high temperatures. Overall, risks associated with climate change have the potential to reverse the gains made in accelerating trade.

In the medium and long run, trade policies should be aimed at reducing transportation and other transaction costs as well as increasing agricultural productivity. While short-term price stabilization may be an effective instrument for dealing with high food prices, balance is needed between the insulating effect of export restrictions and the trade-promoting effect of reducing import barriers. Moreover, governments' responses to high and volatile price levels need to be well crafted, as they are likely to have important consequences on the incomes and livelihoods of vulnerable farmers. Government responses also affect how the private sector adapts, including its propensity to invest in future trading capacity to meet the needs of growing economies. In the medium to long run, expanding markets with better transport infrastructure will reduce spatial price disparities and food price volatility by making it easier to move grains from surplus to deficit zones. Investments in market information systems can also help reduce food price volatility. Similarly, investing in agricultural productivity raises the capacity of the domestic agricultural sector to supply local markets and adjust more effectively to shocks. In particular, investments in irrigation and agricultural research and development can help raise yields. Irrigation also protects farmers from droughts, thus enhancing resilience. Market-smart input subsidies can also boost productivity, if they are well-targeted toward poor farmers, if they strengthen private distribution systems, and if they are introduced for a limited period of time and with clear exit strategies.

Trade openness among African countries, and between Africa and the rest of the world, can broaden food markets and dilute the effect of local supply shocks. Although trade openness has been blamed for increasing price volatility, it has contributed to improved price stability and food access at the global level over the last four decades. Thus, Africa will benefit significantly from increasing market integration at the domestic, regional and international levels. The regional dimension is particularly attractive, since it will reduce the risk of beggar-thy-neighbor trade policies among African countries and will lead to the emergence of larger trade blocks that can mobilize to encourage improved trade policies by other trade entities at the global level. Commodity exchanges have the potential to make food and agricultural markets more transparent and stable, though they have not yet proven their value in food grains except in South Africa.

Policies and programs that reduce consumption volatility help market participants manage food price risk and build resilience of the vulnerable and poor. Consumption-oriented programs can include contract farming (especially in selected high-value crops), futures markets, and social safety net programs. Safety net programs are particularly designed to reduce the incidence of food insecurity among poor and vulnerable households by making targeted transfers. Safety net programs already in place on the continent, such as the Productive Safety Net Program in Ethiopia, provide lessons that could be used by other countries to design similar programs to ensure short term food security of the poor and long-term investment in human capital. Although safety net programs can be costly to implement, they can have significant short- and long-term benefits in terms of food security and investment in productive capacity, if they are well designed and targeted.

The findings of the 2013 ATOR suggest that African countries have made encouraging progress in strengthening global and regional trade. However, food price volatility resulting from climate change and other factors will likely continue to affect vulnerable households for the foreseeable future. In order to further harness the potential of global and regional trade to reduce food price volatility and build resilience, both of food systems and of the poor and vulnerable, governments should invest in social safety net programs in addition to raising agricultural productivity, removing regional trade barriers, and making infrastructure improvements to reduce the overall cost of trading.

1| Introduction

As the official monitoring and evaluation (M&E) report of the Comprehensive Africa Agriculture Development Programme (CAADP), the Annual Trends and Outlook Report (ATOR) assesses trends and progress on 30 CAADP core indicators as well as the implementation agenda itself. And starting in 2011, the ATOR has featured a selected topic of strategic importance to the CAADP agenda, to help guide its planning, implementation, and dialogue processes. The 2013 ATOR contributes to the emerging debate on resilience by taking a comprehensive look at how trade can enhance food security for Africa's poor and vulnerable through greater resilience of local food markets to environmental and economic shocks. In particular, the report focuses on the role of resilience as it relates to the capacity of local food markets to absorb the effects of economic, biophysical, or other shocks, to minimize their impact on the short or long term food security of the poor and vulnerable.

Virtually all shocks, not just economic but also climate-related and social shocks, can create varying degrees of risk of disruption of local markets and access to food. The effects of shocks on the food system can be widespread, reaching well beyond the most vulnerable. The global food price spikes of 2008, with their ensuing political ramifications, are a good illustration of the reach of shocks to food supply systems. The breadth of the ripple effects of these shocks highlights the critical importance of resilient domestic markets in reducing their negative impacts on the availability of and access to food supplies in local markets. That is why countries all over the globe, developing as well as developed, use a multitude of instruments to control and mitigate the effects of shocks on domestic food markets.

Observers have noticed that recent emergencies—the 2010/2011 shock to global food prices and the last crisis in the Horn of Africa—had less serious impacts on global and regional food markets, respectively, than earlier crises. There has been less of the counterproductive interference that further disrupts markets and greater cooperation to boost trade. One major lesson is that when markets operate better, the magnitude of shocks and their effects become more manageable (Caselli et al, 2011). A key factor in the stabilization effect of trade is that it expands both the number of actors and the geography involved in the production and distribution of food. By increasing the number of adjustable elements in the system, trade expansion enhances its capacity to absorb shocks. The greater absorptive capacity arises from two factors. First, trade links supply sources that are less likely to be affected in tandem (or to similar extent) by any given shock. Second, by linking demand across a wider network of markets, trade spreads the ripple effects of shocks over a larger number of market segments, thereby reducing the pressure on individual segments to adjust. The nature of the interface between domestic and external markets as well as policies affecting that interface can

have significant impacts on the magnitude or even the direction (positive or negative) of the contribution of trade to the resilience of food supply systems.

Globalization, rapid urbanization, and faster economic growth have resulted in increasing reliance of African countries on markets, domestic and foreign, as sources of food supply, in many cases even for some of the most vulnerable segments of their populations. The choice of the feature topic of the 2013 ATOR responds to these trends and seeks to initiate a substantive debate around policy and strategy options to more effectively exploit the potential of trade—global, regional, and domestic—as a tool to enhance the resilience of local food markets in African countries. The topic covers an important dimension of Pillar II of CAADP, which deals with markets and trade-related capacities and performance, and it addresses two of the five main priority areas identified in the new CAADP Results Framework currently under preparation (AUC/NEPAD, 2008 and 2014).

The report is divided into five substantive chapters in addition to the introductory and concluding chapters. Chapter 2 provides an in-depth analysis of global trade patterns, competitiveness, and outlook among African countries. It reviews the performance of trade in goods and services as well as agricultural products by African countries and discusses determining factors. In keeping with the focus on resilience as it relates to availability of and access to food, the analysis examines exports and imports in terms of both monetary value and caloric value. The chapter closes with an assessment of the future trade performance outlook among African countries by 2030.

Chapter 3 examines the behavior of prices in food markets in and outside Africa and their implications for food systems in Africa, focusing on the extent, causes, and effects of food price volatility among African countries. It highlights the experience of several countries in dealing with price volatility and its effects and discusses various response and mitigation mechanisms. The chapter carefully examines the potential impacts of trade as either a contributing or mitigating force, discusses the determining factors, and identifies policy and intervention modalities to maximize the resilience-enhancing benefits of trade.

Chapters 4 and 5 deal with the regional dimension of food trade and market volatility. Chapter 4 examines the patterns of domestic supply instability within the three major regional economic communities (RECs): the Common Market for Eastern and Southern Africa (COMESA), the Economic Community of West African States (ECOWAS), and the Southern African Development Community (SADC). It assesses the potential to increase trans-border trade as a way of reducing domestic market volatility, and it analyzes the scope to expand trans-border trade based on existing patterns of country specialization in production and trade. Chapter 4 presents the results of simulations designed to evaluate the impact of several variables on intraregional trade in food staples, by 2025. The analysis examines the potential of alternative measures, undertaken by countries in the respective regions, to reduce the overall cost of trading, to remove barriers to trans-border trade, or to raise yields in their food sectors.

Chapter 5 tries to understand how biophysical and pest and disease risks may affect trade in food staples in the ECOWAS and COMESA regions. The analysis simulates the impact on intraregional net exports of shocks related to extreme weather, changes in vegetation cover, and rising temperature.

Chapter 6 discusses trends of key CAADP indicators as part of monitoring and evaluating agriculture sector performance and assessing progress toward meeting CAADP growth and spending targets as well as the first millennium development goal (MDG). The chapter also assesses progress on

the CAADP implementation process and the context in which the process is taking place.

Chapter 7 concludes with a summary of the main findings of the report and policy implications for the CAADP implementation agenda. Finally, the Annexes present data tables on the core CAADP M&E indicators and supplementary data tables specific to the 2013 ATOR. The data for the main Annexes are presented at the aggregate level for: Africa as a whole; Africa, south of the Sahara (SSA); geographic regions of the African Union (central, eastern, northern, southern, and western); eight RECs; and four economic groups based on agricultural production potential, alternative non-agricultural sources of growth, and income level.

2| Global Trade Patterns, Competitiveness, and Growth Outlook

Antoine Bouët, David Laborde, and Lauren Deason

Over the last 20 years, Africa has continued its integration into global and regional markets (including for agriculture) using various channels. At the global level, several large preferential trade schemes have been afforded to African countries, such as the African Growth and Opportunity Act, Everything but Arms Initiative, Economic Partnership Agreements, and the introduction or extension of Duty-Free Quota-Free Regimes. However, multilateral trade integration has reached a stalemate: no agreement has been reached since the launch of the Doha Development Agenda in 2001. For this reason, regional trade integration appears to offer more promising opportunities for Africa. Numerous African regional agreements have been adopted to foster trade and investment among member countries, through the removal of tariffs and other impediments to intra-regional trade flows. By lowering physical, political, and economic barriers and by harnessing the synergies of regional collaboration, African countries can unleash their full trade potential. However, the adoption of regional agreements with overlapping memberships can undermine the benefits of regional trade (Fortunato and Valensisi, 2011). Thus, the Heads of States and Government of the African Union have adopted and prioritized regional integration as an "overarching continental development strategy" (UNECA, 2012, p. xv).

In light of Africa's recent efforts at trade integration, this chapter examines trends and patterns in Africa's global and regional trade in goods and services and agricultural products. In particular, it assesses the performance of Africa's agricultural exports and imports as well as that of intra-Africa agricultural trade, in terms of value and calorie content. The chapter also examines the product makeup and geographic characteristics of Africa's agricultural trade as well as the leading drivers of agriculture's global market share in 27 African countries, in terms of competitiveness, geographic specialization, and sectoral specialization. Finally, a multi-country, multi-sector computable general equilibrium model (MIRAGRODEP) is used to project Africa's trade outlook at the global and regional levels between 2013 and 2030.

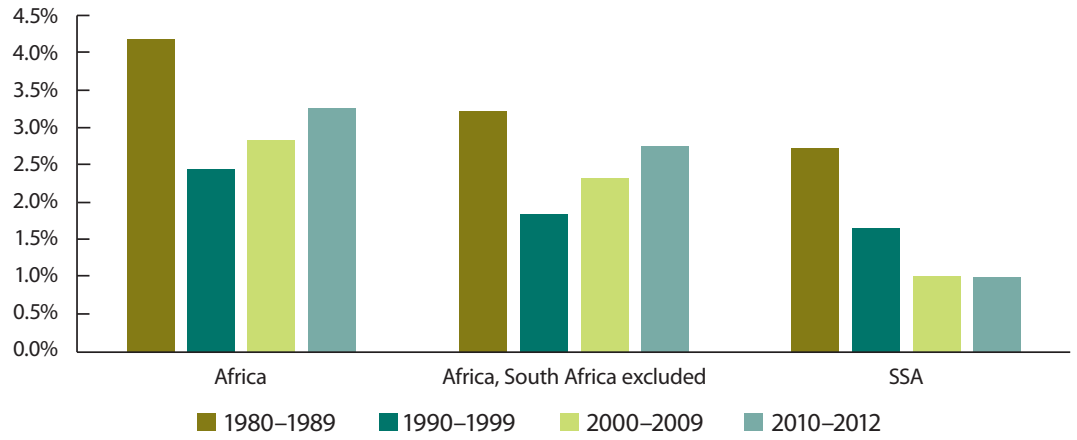
Trends and Patterns in Africa's Global Trade in Goods and Services

Trade has played an increasingly important role in African economies. For Africa as a whole, the share of goods and services traded in total gross domestic product (GDP) rose from 21 percent in 1990 to 30.4 percent in 2012, and reached 36.3 percent in 2008 at the peak of the commodity price hike, compared to a world average of about 25 percent (UNCTAD,

2014). And although Africa trades much less than other developing regions, its share of global trade has been increasing in recent years. Figure 2.1 illustrates the evolution of Africa's share of world exports of goods and services, which experienced a huge decline in the 1990s but began to increase in the 2000s and early 2010s for Africa as a whole. Meanwhile, the share of world exports of goods and services for SSA continued to decline into the 2000s and early 2010s, as shown in Figure 2.1. Thus, the recovery largely took place in the African countries north of the Sahara, which export oil, petroleum, gas, and other raw materials (such as phosphate, in the case of Morocco and Tunisia). The graph also points to the large contribution South Africa makes to trade, as Africa's trade share falls by about one percentage point when South Africa is excluded. Africa's growing trade shares can be attributed to the recent rise in world prices of some raw materials, as well as recent improvements on the continent in both economic growth and local trade infrastructure (such as telecommunications) and Africa's efforts to integrate into global and regional markets.

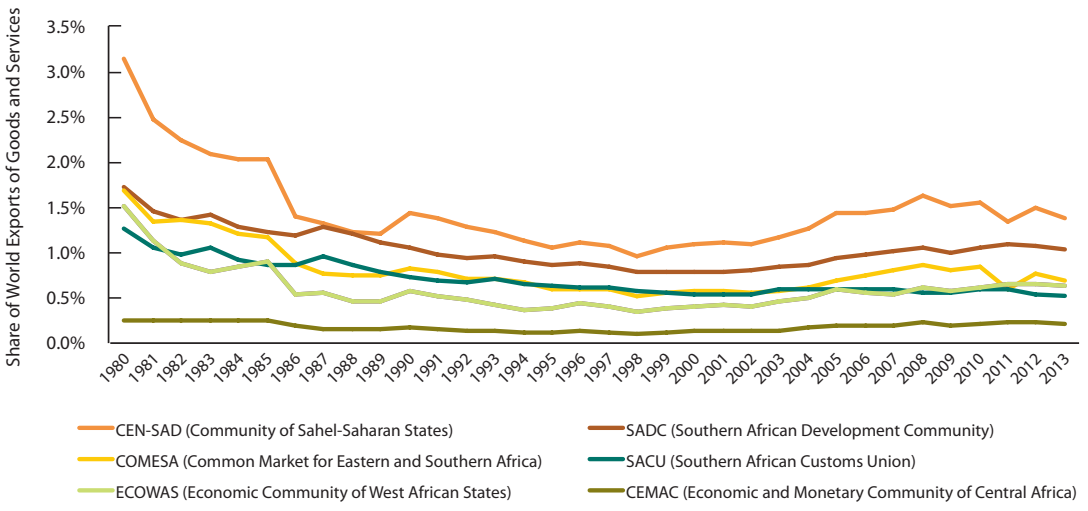
Figure 2.2 illustrates the evolution of the shares of various African RECs in world exports of goods and services, between 1980 and 2012.[1] It shows that the decline in Africa's share between 1980 and the late 1990s was likely led by declines in exports from the

FIGURE 2.1—EVOLUTION OF AFRICA'S SHARE OF WORLD EXPORTS OF GOODS AND SERVICES (1980–2012)



Source: UNCTAD and authors' calculation, 2014.

FIGURE 2.2—EVOLUTION OF REGIONAL ECONOMIC COMMUNITIES' SHARE OF WORLD EXPORTS OF GOODS AND SERVICES (1980-2012)



Source: UNCTAD and authors' calculation, 2014.

[1] RECs include: CEN-SAD, the Community of Sahel-Saharan States; CEMAC, the Economic and Monetary Community of Central Africa; COMESA, the Common Market for Eastern and Southern Africa; EAC, the East African Community; ECCAS, the Economic Community of Central African States; ECOWAS, the Economic Community of West African States; IGAD, the Intergovernmental Authority for Development; SACU, the Southern African Customs Union; SADC, the Southern African Development Community; and UMA, the Arab Maghreb Union.

Community of Sahel-Saharan States, a group that includes the big oil- and gas-exporting countries of Chad, Egypt, Libya, Nigeria, and Sudan. The decline in exports was also significant for SADC, COMESA, ECOWAS, and the Southern African Customs Union (SACU).

International trade can be one-way trade, that is, inter-industry trade—when a country exports products different from those it imports, such as cars in exchange for cereals. It can also be two-way trade, that is, intra-industry trade, when a country exports products similar to those it imports (such as cars in exchange for cars). Brulhart (2008) estimated Intra-Industry Trade Indexes (IIT) for 1962 to 2006 and found that in 2006, 27 percent of world trade was IIT, when sectors are disaggregated at the five-digit level of classification, and 44 percent at the three-digit level. Thus, the importance of IIT decreases as sectors become more disaggregated. Nonetheless, global IIT has grown steadily since 1962. African trade, however, is still largely one-way trade: Brulhart (2008) notes that "African trade remains overwhelmingly of the inter-industry type" (p. 2) and that "Africa stands out with uniquely low IIT" (p. 15). Illustrating Africa's largely one way trade, the main goods exported by Africa in 2010 included: mineral products valued at US$183.9 billion; pearls, precious stones, metals, and related articles valued at $32.5 billion; and base metals and related articles valued at $32.1 billion (International Trade Centre, 2012).[2] African imports (worth $468 billion in 2013) included mineral fuels, oils, machinery, vehicles, electronics and electrical products (Focus Africa, 2014).

In the 1990s, world trade experienced a structural transformation, with the rise of Global Value Chains (GVCs) and the replacement of trade in goods with trade in tasks. This was due to a series of factors including: the decrease of transportation and information costs; tariff cuts; international agreements (such as the World Trade Organization (WTO) Information and Technology Agreement); and regional trade agreements, including pacts on foreign direct investment (FDI). Numerous production processes are now internationalized, so that countries specialize in certain stages of the production process (tasks) instead of products. GVCs accordingly represent *"the possibility of slicing up and optimizing value chain activities among multiple companies and various geographical locations"* (WTO, 2011). However, there is a clear lack of participation by Africa in GVCs: for example, Africa ranks last in exportation of intermediate goods. In 2009, Africa only contributed 2 percent of world exports of intermediate goods, compared to Asia's share of 35 percent (World Trade Organization, 2011). Integration into GVCs often requires the creation of Export Processing Zones (EPZ) which provide special treatment—administrative, regulatory, and fiscal —in order to promote trade and investment. Africa has generally not participated in GVCs, despite the fact that countries like Egypt, Madagascar, and Mauritius have recently opened up their economies to FDI through EPZs.

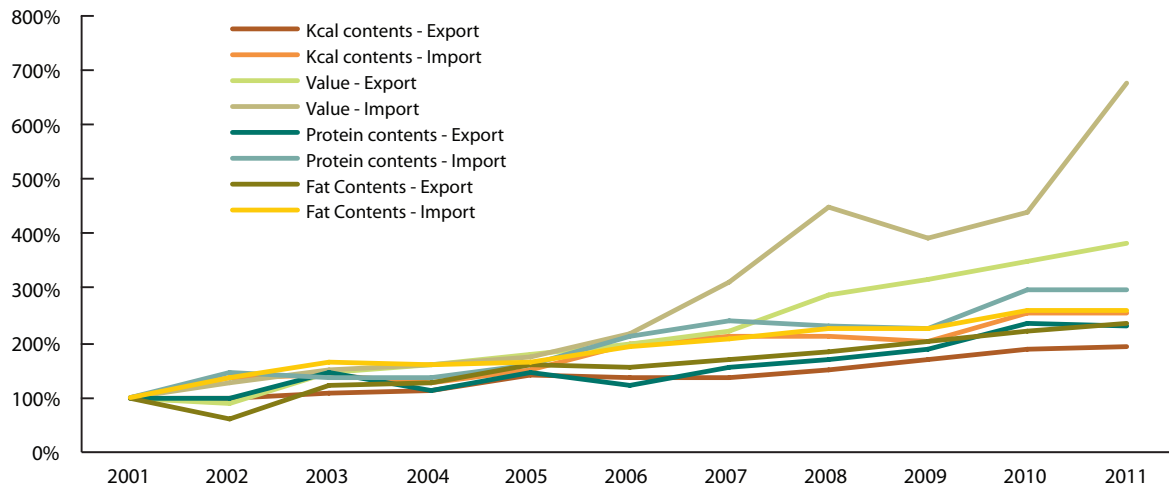
Trends and Patterns in Africa's Agricultural Trade

Agricultural trade offers opportunities for accelerating economic growth and raising incomes of smallholder farmers in poor countries (FAO, 1995). Africa's share of world agricultural trade has increased steadily in recent years, with its share in agricultural exports rising from 1.2 percent in 1996–2000 to 3.3 percent in 2009-2013 (UNCTAD, 2014). Figure 2.3 shows the evolution of African agricultural exports and imports between 2001 and 2011, in terms of value and nutritional content (calories/fats/

[2] All dollar figures are US dollars.

proteins). In value terms, agricultural imports have increased more rapidly than exports. This can be attributed to higher economic growth and demographic changes in Africa during this period, notwithstanding other factors (Rakotoarisoa, Lafrate, and Paschali, 2011). Figure 2.3 also illustrates a diversification in Africa's food demand, as imports have increased more rapidly in terms of protein content, especially in more recent years. Because of higher economic growth and incomes, Africa is importing and consuming more protein-based products, including meat and meat products such as eggs and milk.

FIGURE 2.3—EVOLUTION OF AFRICA'S AGRICULTURAL EXPORTS AND IMPORTS (2001–2011)



Source: Comtrade and authors' calculation, 2014.

As agricultural exports have lagged behind imports, Africa's agricultural trade deficit with the rest of the world has grown. Table 2.1 shows Africa's agricultural exports and imports, in monetary value and calorie content, presented at average levels and as a percentage of global trade. Africa's agricultural exports have been dynamic: over ten years the value of exports increased by a factor of four, and the quantity of calories exported doubled. Nevertheless, the agricultural trade deficit has deepened, from $0.8 billion in 2001 to $36.6 billion in 2011; in calorie content, the deficit has tripled from 8.5 10^{12} kilocalories (kcal) to 24.5 10^{12} kcal. The rapid rise in imports may reflect higher economic growth and increased demographic pressure in Africa compared to the rest of the world. However, it may also reflect Africa's negative performance in terms of competitiveness (Rakotoarisoa, Lafrate and Paschali, 2011). Moreover, Africa maintains a clear disparity between countries that are highly specialized in oil, gas, petroleum, and/or minerals and that import large quantities of agricultural products (such as Algeria, Equatorial Guinea, Libya, Nigeria, and Sudan) and those countries that predominantly export agricultural products (including Ethiopia, Rwanda, Togo, and Zimbabwe).

The geographic structure of Africa's international trade has shifted, as recent increases in agricultural exports and imports have resulted in greater trade not only with the rest of the world but also within Africa. Tables 2.2 and 2.3 point to deepening regional integration in Africa, as well as lessening dependence on the Organization for Economic Cooperation and Development (OECD) countries. During 2002–2007, about 31.4 percent of Africa's agricultural exports (in calorie terms) were traded within Africa, increasing from 13.8 percent during 1990–1995. Similarly, agricultural

imports within Africa (in value terms) increased from 6.8 percent in 1990–1995 to 12.4 percent in 2002–2007.[3] This shift went along with a sharp drop of imports from North America, which benefited Latin American farmers.

Moreover, intra-Africa agricultural trade is now substantially higher when measured in calories rather than in dollar value. Table 2.4 shows that in calorie terms, between 1989 and 2007, 34.1 percent of African exports were destined to Africa, while 36.2 percent went to Europe and 23.1 percent went to Asia. This is in sharp contrast to (in value terms) only 13.2 percent of African exports destined to Africa while 63.8 percent went to Europe, over the same period (Table 2.5). This shows that in nominal value, intra-African trade has been relatively low, and African agricultural exports have been concentrated on European destinations.

In general, African countries export to each other low-value and (relatively) high-calorie agricultural products, such as peanuts, cashew nuts, sugar, rice, vegetable oil, and corn. At the same time, African countries export

TABLE 2.1—AFRICA'S AGRICULTURAL EXPORTS AND IMPORTS, IN VALUE AND CALORIE CONTENT (2001–2011)

	KILOCALORIES (10^{12})		BILLIONS (CURRENT US$)		PERCENTAGE OF GLOBAL TRADE, CALORIE CONTENT (%)		PERCENTAGE OF GLOBAL TRADE, VALUE (%)	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
2011	7.9	32.5	40.8	77.4	2.2	10.3	3.3	6.3
2010	7.6	32.3	37.6	50.1	2.2	10.1	3.7	5.0
2009	6.9	25.6	33.7	45.0	2.1	8.4	3.7	5.1
2008	6.2	26.9	30.7	51.2	1.8	8.8	2.9	4.8
2007	5.6	26.9	23.5	35.9	1.8	9.2	2.7	4.1
2006	5.5	24.9	21.3	24.8	1.9	9.3	3.1	3.6
2005	5.8	19.0	19.0	19.8	2.1	6.7	3.1	3.1
2004	4.5	16.3	17.4	18.4	1.7	6.8	2.9	3.0
2003	4.5	18.1	15.6	17.3	1.7	7.6	3.0	3.3
2002	4.0	17.0	9.5	14.3	1.6	7.4	2.2	3.1
2001	4.1	12.6	10.7	11.5	1.7	6.0	2.6	2.8

Source: Comtrade and authors' calculation, 2014.

[3] The 1989–2007 average is higher than that for both 1990–1995 and 2002–2007 because the average share of calorie exports to Africa (from Africa) is substantially higher during 1996–2001, when it averaged 45.4 percent; this indicates that the statistic is significantly volatile.

high-value, low-calorie (or non-calorie) agricultural products to Europe and Asia, such as coffee, cotton, tobacco, flowers, tea, and fruits and vegetables. However, there are some countries that are exceptions: Senegal exports significant quantities of high calorie products such as fish and peanuts to Europe.

The product concentration of African exports has been highlighted in the economic literature. Kose and Riezman (2001) estimated that African economies "export on average 54 different goods. This number is around 213 for the G7" (p. 61). This lack of product diversification of African exports has been recently confirmed by Songwe and Winkler, 2012.[4]

However, within the agricultural sector, African exports have undergone a gradual diversification, starting in 2000. At the end of the 1990s, the top 10 HS6 agricultural products exported by African countries represented 51 percent of total agricultural exports in value terms; the top three agricultural exports at that time were coffee, sugar, and tea, followed by cotton, wine and grapes, oranges, and cut flowers.[5] In calorie content, Africa's main agricultural exports included sugar products (plus alcohol), wheat, corn, palm oil, and cashew nuts. In contrast, during 2005–2010, the top 10 HS6 agricultural products exported by African countries represented on average just 40 percent of the total agricultural export value, and the top exports were cocoa, coffee, cotton, cashew nuts, oranges, tobacco, tea, and cut flowers. Over the same period, in terms of calories, the main exports were corn, potatoes, rice, mixed vegetable oil (groundnut, palm), and sesame seeds, while exports of sugar products declined.

TABLE 2.2—DESTINATION OF AFRICA'S AGRICULTURAL EXPORTS (%)

African Exports	Africa	Asia	Europe	Latin America and Caribbean	North America	Oceania
Value (US $)						
1990–1995	8.0	16.8	67.3	0.6	7.0	0.3
2002–2007	15.2	14.9	62.5	0.5	6.1	0.8
Kilocalories						
1990–1995	13.8	26.2	50.0	3.0	6.6	0.5
2002–2007	31.4	29.2	34.0	0.9	4.2	0.2

Source: BACI and authors' calculation, 2014.

TABLE 2.3—ORIGIN OF AFRICA'S AGRICULTURAL IMPORTS (%)

African Exports	Africa	Asia	Europe	Latin America and Caribbean	North America	Oceania
Value (US $)						
1990–1995	6.8	17.3	37.9	10.0	24.8	3.3
2002–2007	12.4	19.8	35.2	16.0	13.7	2.9
Kilocalories						
1990–1995	3.1	14.2	23.8	10.4	44.8	3.6
2002–2007	7.1	20.4	27.1	19.5	21.6	4.4

Source: BACI and authors' calculation, 2014.

[4] The estimate is an average over the years 1970, 1980, and 1990.

[5] HS6 is a 6 digit code in the Harmonized System (HS) of tariff nomenclature, an internationally standardized system of names and numbers to classify traded products.

On the import side, the composition of agricultural products has been stable over time, with no differences in nominal value and caloric content. Ten products account for 70 percent of imported calorie content and 46 percent of the value of agricultural imports. The ten products include: wheat (durum and soft), sugar (refined), rice (broken, semi-milled), corn, milk powder, and sunflower oil (increasingly replaced by soybean oil). More recently, soybean meal for livestock consumption is one of the top import products, but only in value terms as it is rich in proteins and not calories.

TABLE 2.4—BILATERAL AGRICULTURAL TRADE MATRIX: SHARE OF EXPORT CALORIES TO VARIOUS DESTINATIONS (1989–2007 AVERAGE; %)

IMPORTING REGION ▶ / ▼ EXPORTING REGION	Africa	Asia	Europe	Latin America and Caribbean	North America	Oceania	*Total*
Africa	34.1	23.1	36.2	1.4	5.0	0.2	100
Asia	9.3	65.1	18.5	1.1	4.0	1.9	100
Europe	9.2	13.8	73.6	1.5	1.7	0.2	100
Latin America and Caribbean	9.3	28.5	36.5	18.5	7.0	0.2	100
North America	9.9	42.9	14.7	22.4	9.8	0.4	100
Oceania	9.4	63.1	8.3	5.0	4.7	9.6	100
Grand Total	***10.1***	***36.7***	***36.5***	***10.3***	***5.5***	***1.0***	***100***

Source: BACI and authors' calculation, 2014.

TABLE 2.5—BILATERAL AGRICULTURAL TRADE MATRIX: SHARE OF EXPORT VALUE TO VARIOUS DESTINATIONS (1989–2007 AVERAGE; %)

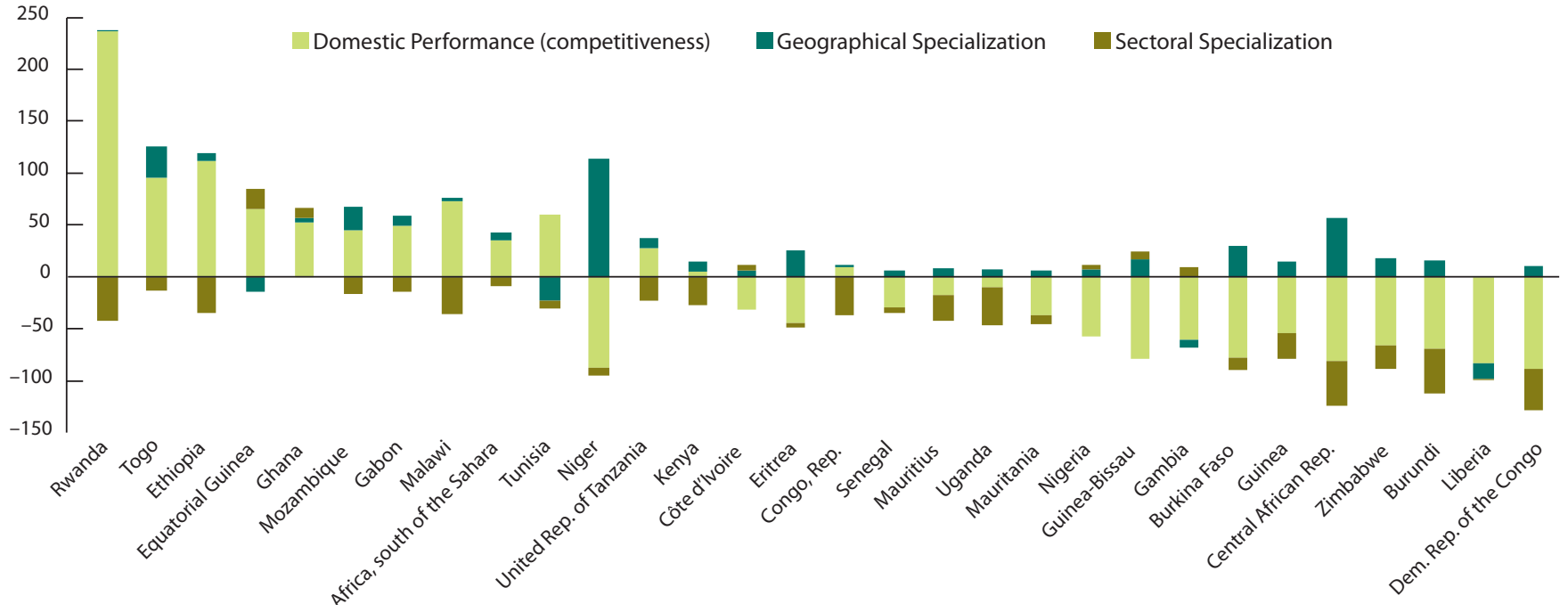
IMPORTING REGION ▶ / ▼ EXPORTING REGION	Africa	Asia	Europe	Latin America and Caribbean	North America	Oceania	*Total*
Africa	13.2	15.6	63.8	0.6	6.2	0.6	100
Asia	5.1	55.8	23.8	1.2	12.4	1.8	100
Europe	3.3	8.2	80.6	1.4	5.8	0.6	100
Latin America and Caribbean	4.4	17.3	37.0	15.7	25.1	0.5	100
North America	4.8	36.0	15.5	16.9	25.7	1.1	100
Oceania	3.4	50.8	17.2	2.9	17.4	8.3	100
Grand Total	***4.3***	***23.1***	***52.9***	***5.7***	***12.9***	***1.2***	***100***

Source: BACI and authors' calculation, 2014.

Agricultural Trade Competitiveness of African Countries

This section decomposes African countries' global market share over the period 1995–2007, in order to evaluate each country's performance and the underlying factors. The increase in a country's exports from period *t* to period *t+1* may reflect various factors: i) initially (in *t*), the country was exporting to countries which will significantly increase demand for imports between *t* and *t+1* (indicating geographical specialization effect); or ii) the demand for the products initially exported by the country (in t) will

FIGURE 2.4—EVOLUTION OF AFRICAN COUNTRIES' GLOBAL MARKET SHARE OF AGRICULTURAL PRODUCTS (1995–2007)



Source: BACI and authors' calculation, 2014.
Note: Vertical axis shows percent change in world market shares.

significantly increase between *t* and *t+1* (sectoral specialization effect); or iii) a residual factor that we attribute to domestic performance (or competitiveness). Thus, the domestic performance factor is defined as the portion of market share growth that is not attributable to increases in either sectoral or geographic demand and that is assumed to be the result of increased competitiveness (Cheptea, Fontagné and Zignago, 2014).

The measures of trade decomposition are estimated using the shift-share methodology described by Cheptea, Fontagné and Zignago (2014). Figure 2.4 shows the decomposition of African countries' global market share of agricultural products during 1995–2007. The vertical axis measures the percent change in world market share, and each bar shows the decomposition by the three drivers: geographical specialization, sectoral specialization, and competitiveness.

Figure 2.4 shows that Togo more than doubled (+112.1 percent) its world market share in agricultural exports between 1995 and 2007. Two opposing factors underlie this performance. Togo's initial sector specialization reduced its world market share by 13.5 percent: Togo's exports are highly concentrated in products that did not experience a substantial

increase in demand in that period, including poppy seeds, cotton, cotton seeds, and oilcakes from cotton seeds. However, geographic specialization increased its world market share by 29.7 percent: Togo's exports are concentrated on destinations that experienced a substantial increase in demand between 1995 and 2007. The residual is attributed to an increase in competitiveness (domestic performance) that increased Togo's world market share in agricultural products by an impressive 95.9 percent.

Ten of the 27 countries studied experienced an increase in their agricultural world market share between 1995 and 2007: Togo, Rwanda, Ghana, Ethiopia, Mozambique, Gabon, Malawi, Tunisia, Tanzania, and Niger. This was primarily due to a positive domestic performance effect and a positive geographic specialization effect, which outweighed a negative sectoral specialization effect. Tunisia, however, did not benefit from geographic specialization; and Ghana did not experience a negative sectoral effect. The positive geographic specialization effect in Niger—shown by a more than doubling of its world market share—is noteworthy. Niger exports cowpeas and horticultural products such as onions and hot peppers, commodities with destinations that experienced substantial demand increases during 1995–2007. Also noteworthy is the quadrupling of Rwanda's world market share over the same period, driven largely by an improved domestic performance, that is, competitiveness.

The remaining 17 countries experienced a deterioration in agricultural world market share (1995–2007): Kenya, Cote d'Ivoire, Senegal, Congo, Mauritius, Mauritania, Uganda, Cameroon, Nigeria, Gambia, Guinea, Zimbabwe, Guinea-Bissau, Chad, Burundi, Central African Republic, Liberia. This mainly reflects negative domestic performance, except for Kenya, Congo, Mauritius, and Uganda. For these four countries, the explanation lies in a negative sectoral specialization effect.

Outlook for Africa's Trade Growth: 2013 to 2030

The previous sections show that agricultural imports have increased faster than exports, while the level of intra-Africa agricultural trade has also increased, especially in calorie content terms. Given these trends and patterns, this section projects trade trends under both a baseline, "business as usual" scenario and an alternative scenario. Specifically, the study uses a multi-country, multi-sector recursive dynamic computable general equilibrium (CGE) model, MIRAGRODEP, to project the outlook for trade between 2013 and 2030.[6] Under this baseline (or business as usual) scenario, there is no reform in national agricultural trade policies, and current trends continue for population growth (using "middle scenario" UN demographic projections), labor endowments, and total factor productivity (TFP), which has been relatively strong in recent years. In the model, TFP for Africa is projected to grow at an annual rate ranging from 1.2 percent in CEMAC to 2.5 percent in SACU. This rate can be compared to the values used for the European Union and India, of 0.5 percent and 2.5 percent respectively. An alternative scenario is then considered that assumes a worldwide increase in trade openness, through an ambitious 50-percent reduction in agricultural tariff barriers. While this scenario seems improbable, given the difficulties

[6] MIRAGRODEP is a new version of the MIRAGE model of the world economy, for which GAMS codes have been simplified and presented in a more compact and user-friendly way. MIRAGRODEP is devoted to trade policy analysis and operates in a sequential dynamic recursive setup. MIRAGRODEP was designed for the African Growth and Development Policy (AGRODEP) modeling Consortium. For more information about MIRAGRODEP see www.agrodep.org/model/miragrodep-model. For more information on MIRAGE, see the MIRAGE wiki-site at http://mirage.cepii.free.fr/miragewiki.

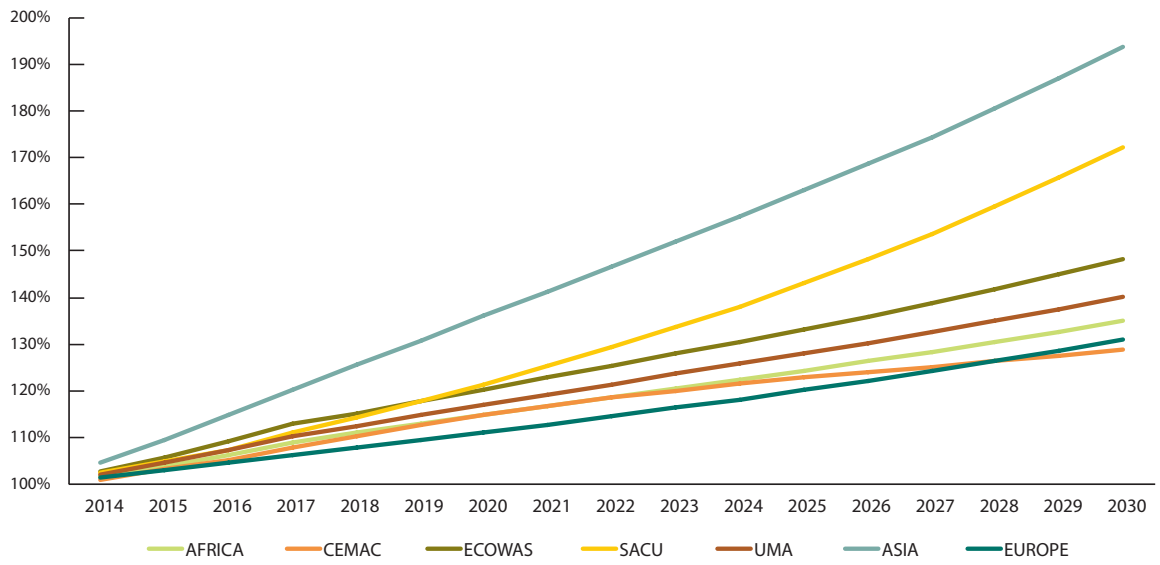
with the WTO Doha Round, it illustrates the potential challenges and opportunities of such a trend for Africa. Under the baseline and alternative scenarios, results are assessed at the continental and regional levels from 2013 to 2030.

Trade Outlook under Baseline Scenario at Continental Level

As Figure 2.5 shows, Africa's projected growth in agricultural imports per capita is slower than Asia's but slightly more rapid than Europe's. Within Africa, SACU is projected to be the fastest growing REC, followed by ECOWAS. Figure 2.6 breaks down the projected growth in Africa's overall agricultural net exports per capita (exports minus imports), by product. Specifically, growth is defined as the value of Africa's projected per capita agricultural net exports in a given (future) year minus Africa's per capita agricultural net exports in 2013. Overall, for commodities traditionally exported, the per capita exported value is projected to increase from $19 to $24 between 2013 and 2030. For imported commodities, however, the growth is larger, increasing from $25 to $35. The rising gap between exports and imports is caused by stronger economic and demographic growth in Africa (import demand) compared to the rest of the world (export demand), with insufficient regional agricultural productivity growth to compensate for the gap. A second effect also explains this projection: demand per capita grows more quickly for processed food, due to increases in income and urbanization, and thus increases the trade deficit for this category (from less than $1 per capita in 2013 to above $7 in 2030).

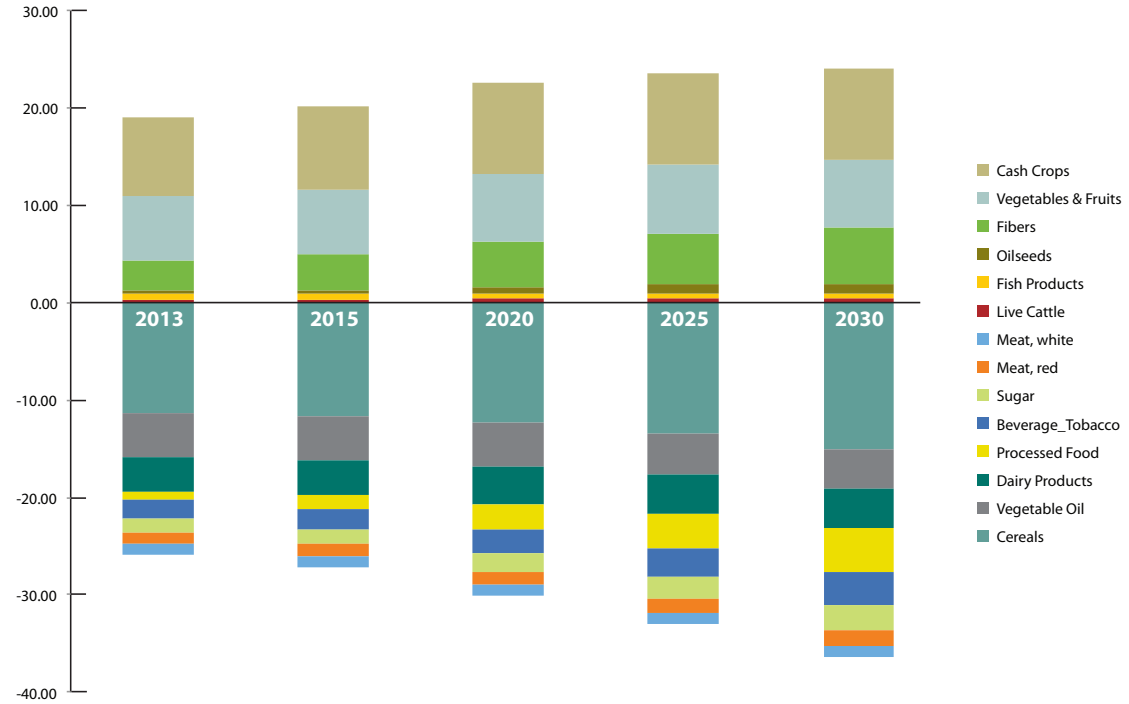
Between 2013 and 2030, the oilseed sector is projected to improve its net balance, with a very strong increase in per capita net exports of seeds (from $+0.24 to $+1.08), while the vegetable oil deficit is somewhat reduced (from $-4.52 to $-4.04). Over the same period, exports of fibers, especially cotton, are projected to nearly double—a trend that holds to some extent for other cash crops as well. In addition, net imports of meat, sugar, cereals, and processed food are projected to continue to increase, making up 70 per cent of the deficit increase for imported commodities.

FIGURE 2.5—AGRICULTURAL IMPORTS PER CAPITA BY 2030 (INDEX)



Source: COMTRADE and authors' calculation, 2014.
Notes: Base year 2014 = 100. CEMAC: Economic and Monetary Community of Central Africa; ECOWAS: Economic Community of West African States; SACU: Southern African Customs Union; and UMA:Arab Maghreb Union.

FIGURE 2.6—PRODUCT BREAKDOWN OF AFRICA'S PER CAPITA AGRICULTURAL NET EXPORTS (2013-2030, IN 2007 CONSTANT US$)



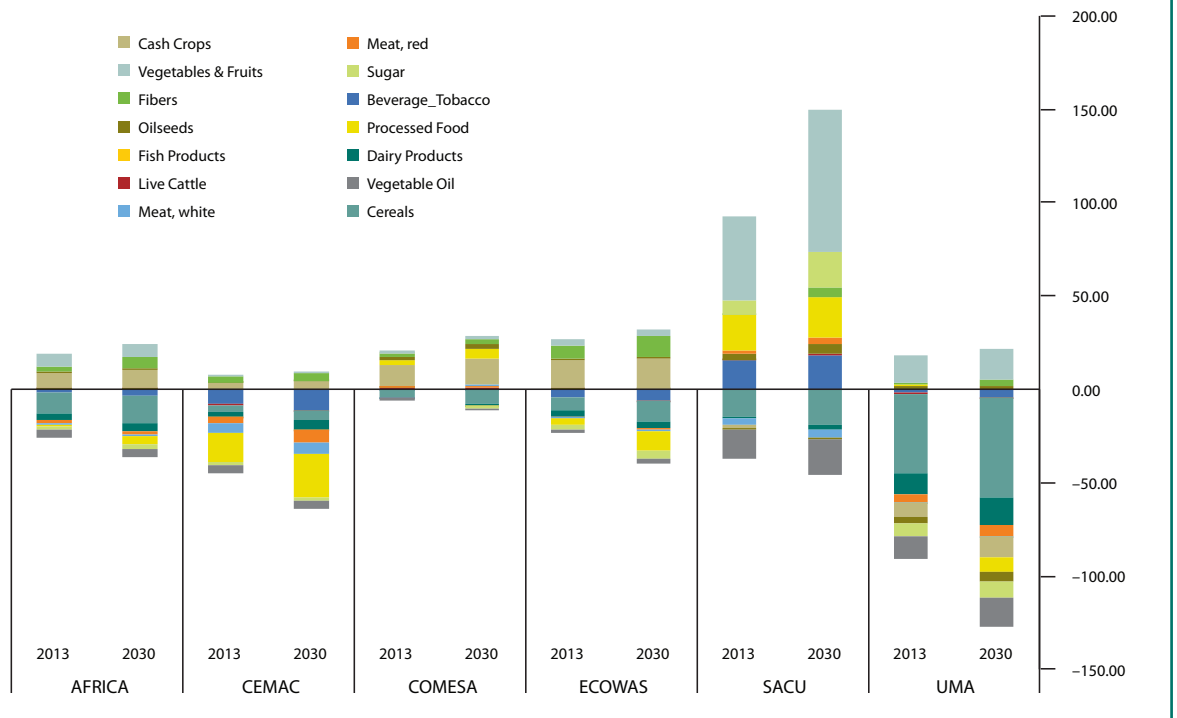
Source: MIRAGRODEP simulation results, 2014.

Trade Outlook under Baseline Scenario at REC Level

Figure 2.7 shows substantial variation in the projected growth of agricultural net exports per capita by RECs, between 2013 and 2030: little change in COMESA ($+3.2); a deepening of the deficit in CEMAC ($-17.6), ECOWAS ($-11.4), and especially UMA ($-32.4); and a relatively large surplus in SACU ($+49.3). Part of this overall pattern can be explained by the evolution of the real exchange rate. CEMAC's agricultural exports, for example, would suffer from a real exchange rate appreciation driven by mineral and oil exports (+3.5 percent in relation to the US$). However, this explanation does not hold for all regions. For SACU, the strong increase is driven by a boom in net exports of fruits and vegetable ($+32), sugar ($+10), fibers, and processed food, as well as beverages and tobacco; contributing factors are an initial good situation, a stronger capacity to mobilize production factors (especially land and capital), and a positive trend in technological change. Still, some products in SACU are projected to experience slightly deteriorating net exports: cereals, vegetable oils, and dairy products, where comparative advantages are smaller. For COMESA, additional cereals ($-4.4) and sugar imports are balanced by improved exports of processed food, cash crops, and oilseeds. ECOWAS is projected to improve its exports of fibers ($+4.5), but its overall deficit is deepened by increased imports of sugar ($-1.8), cereals ($-3.8), and processed food ($-7), as well as beverages and tobacco ($-2.4). For the CEMAC region, the changes are driven by a widening net deficit of processed food (-$7), meat and dairy products (-$7.2), and beverage and tobacco (-$3.3); only exports of fibers are projected to expand (+$1.4). And for UMA, the projected increase in vegetable and fruit exports ($+2.38) does not compensate for an increased deficit in cereals ($-11), processed food ($-9.18), vegetable oils ($-3), and sugar ($-2).

Intra-Africa agricultural trade began to increase significantly starting in the 2000s. MIRAGRODEP projections show a continued increase until

FIGURE 2.7—PRODUCT BREAKDOWN OF AFRICA'S PER CAPITA AGRICULTURAL NET EXPORTS BY RECS (2013-2030, IN 2007 CONSTANT US$)



Source: MIRAGRODEP simulation results, 2014.

Notes: CEMAC: Economic and Monetary Community of Central Africa; COMESA: Common Market for Eastern and Southern Africa; ECOWAS: Economic Community of West African States; SACU: Southern African Customs Union; and UMA: Arab Maghreb Union.

2030 (Table 2.6). In particular, intra-Africa trade in agrofood products is projected to more than double (+118 percent) between 2013 and 2030, due to a substantial augmentation of intra-ECOWAS trade (+136 percent) and intra-COMESA trade (+146 percent). COMESA also shows a substantial projected increase in its agrofood exports to Africa as a whole and other regions as well. These increases would occur without any trade reform or new regional trade agreements in Africa.

Trade Outlook under Alternative Scenario

The projected results of a hypothetical 50 percent cut in worldwide agricultural tariffs are presented in Table 2.7, by comparing projected outcomes at date *t* (2030) to the baseline. This implies that the changes shown are only attributable to the policy reform.

The changes are presented as a percentage change from the baseline value. Given the hypothetical worldwide policy reform, African agricultural exports would increase by 8.6 percent above the baseline value, while imports would increase by 14.5 percent, implying a continuing deterioration of the agricultural trade balance.[7] This reflects higher initial custom duties on agricultural products in Africa than in the rest of the world. The UMA region is the only REC that would benefit from this reform by improving its agricultural trade balance, while CEMAC would experience the largest deterioration.

The hypothetical trade liberalization reform would imply a slight contraction of agricultural value-added for Africa, by about 0.3 percent. This is a logical consequence of the projected increase in imports relative to exports. As expected, the trade reform would also mean that consumers gain the most, in terms of real incomes and unskilled wages. However, the real income gains are projected to be relatively stronger for some RECs, like

[7] In the baseline, African agricultural imports are greater than exports.

TABLE 2.6—INTRA-AFRICAN AGROFOOD TRADE OUTLOOK (2013–2030, EXPORT VALUE, IN 2007 CONSTANT US$)

% Increase between 2013 and 2030 (value in constant US$)	Rest of the world	Africa	CEMAC	COMESA	ECOWAS	SACU	UMA
Africa		118					
CEMAC	80	99	67	148	80	88	75
COMESA	97	136	148	146	179	116	107
ECOWAS	97	128	80	179	136	137	90
SACU	91	111	88	116	137	111	105
UMA	86	86	75	107	90	105	77

Source: MIRAGRODEP simulation results, 2014.

Notes: CEMAC: Economic and Monetary Community of Central Africa; COMESA: Common Market for Eastern and Southern Africa; ECOWAS: Economic Community of West African States; SACU: Southern Africa Customs Union; and UMA: Arab Maghreb Union.

TABLE 2.7—EFFECT OF A 50-PERCENT AVERAGE GLOBAL TARIFF REDUCTION IN AFRICAN AGRICULTURE (% CHANGE)

	Real Income	Unskilled Wages	Agrifood Value Added	Agricultural Exports	Agricultural Imports
UMA	0.08	0.09	-0.29	16.2	16
ECOWAS	0.01	0.03	-0.44	4	12.5
CEMAC	0.10	0.04	-1.06	3.2	15
COMESA	0.17	0.26	0.13	7.3	16.2
SACU	0.14	0.14	1.77	9.9	12.1
Africa	0.09		–0.28	8.6	14.5
	0.05		2.01	9.5	10.3
Asia	0.07		–0.19	14.8	10.8
Europe	0.08		–0.39	5.1	5.4

Source: MIRAGRODEP simulation results, 2014.

Notes: CEMAC: Economic and Monetary Community of Central Africa; COMESA: Common Market for Eastern and Southern Africa; ECOWAS: Economic Community of West African States; SACU: Southern Africa Customs Union; and UMA: Arab Maghreb Union.

COMESA (0.2 percent) and SACU (0.1 percent), and less substantial in other regions, like ECOWAS (0.0 percent). Nevertheless, the alternative scenario highlights the benefits of trade integration through a global tariff cut, in terms of not only increased trade but also improvements in real incomes and unskilled wages.

Conclusions

Africa's share of world exports of goods and services has shown an increasing trend since the 2000s, driven mostly by oil, gas, and mineral exports from North African countries. In contrast, SSA's share in total world exports of goods and services continued to decline into the 2000s and early 2010s. Between 1980 and 2000, declines in trade shares were quite pronounced in most RECs, including COMESA, ECOWAS, and SACU. Africa's trade share has been boosted by the recent increase in world prices of some raw materials, improved economic growth, and significant improvements in local trade infrastructure (such as telecommunications), as well as Africa's efforts to integrate into global and regional markets through global preferential trade agreements and regional trade agreements.

Africa's share of world agricultural trade has also been increasing since the early 2000s. Agricultural exports and imports have both increased in the last 10 years, although imports have increased much more rapidly, in both value terms and nutritional content. The faster growth in imports can to a large extent be attributed to improved economic growth, continued demographic growth, and rapid urbanization. This has resulted in a rapid widening of the agricultural trade deficit, which rose from less than $1 billion to nearly $40 billion during the last decade. In terms of nutritional content, imports of proteins have increased faster than imports of fats and calories, driven by growing incomes across the continent. African countries have also significantly expanded intra-Africa trade and become less dependent on OECD countries. In particular, the shares of African exports and imports of agricultural products destined for Africa (in calorie content) more than doubled between the 1990s and the 2000s.

Africa also experienced a slight diversification in its agricultural exports since the 2000s; recently, agricultural exports have been concentrated in cocoa, coffee, cotton, cashew nuts, oranges, tobacco, tea, and cut flowers. In addition, several African countries have managed to increase their world market shares for agricultural exports through improved domestic performance or geographic specialization. Those countries include Togo, Rwanda, Ghana, Ethiopia, Mozambique, Gabon, Malawi, Tunisia, Tanzania, and Niger.

The chapter uses MIRAGRODEP, a CGE model, to project future growth in Africa's trade under two scenarios: i) the continent stays on its current path and does not implement any trade reform; and ii) agricultural tariffs are reduced worldwide. The simulation results show that if current trends persist, Africa's agricultural trade (exports and imports) will continue to expand between 2013 and 2030. In particular, Africa would significantly increase its exports of cash crops, vegetable and fruits, and fibers, and would also increase its imports of cereals, meat and meat products, dairy products, processed food, and beverages and tobacco. Increased exports of cash crops are expected to occur more in COMESA and ECOWAS countries, while SACU countries would increase exports of vegetables and fruits. Under an alternative scenario that assumes a worldwide 50 percent cut in agricultural tariffs, agricultural imports are projected to grow faster than exports, leading to a deterioration in the trade deficit. But while the reform would lead to a slight contraction of Africa's agricultural value added, it would result in gains in real incomes and unskilled wages in some RECs, such as COMESA and SACU. Although the scenario seems improbable given the currently stalemated WTO negotiations, the simulation highlights the potential challenges and opportunities for Africa of such an ambitious reform.

Africa's recent improved trade performance and increased intra-Africa trade can, in part, be attributed to efforts by African countries to better integrate their markets globally and regionally. Especially given limited progress in achieving multilateral integration, regional trade integration offers clear opportunities to increase Africa's economic growth and improve incomes of the poor, especially for smallholder farmers with export opportunities. Moreover, as discussed in the following chapter, African countries occasionally face volatile and high food prices, which can lead to large fluctuations in domestic supply; trade can help to stabilize prices by creating upper and lower bounds on domestic prices. Thus, trade integration can help to ensure resilient communities and agricultural livelihoods as well as sustained growth and development, especially among Africa's vulnerable population.

3| Food Price Volatility: *Effects and Response Mechanisms in Africa*

Lauren Deason, David Laborde, Nicholas Minot, Shahid Rashid, and Maximo Torero

The high food prices of 2007/2008 caused food crises in many African countries, especially those whose domestic prices are closely linked to international prices. Country response to the food crisis varied across the continent, ranging from outright food export bans to doing nothing. Price fluctuations are a common feature of agricultural markets, and the level of price volatility significantly affects producers and consumers. The 2007/2008 prices were not only high but also extremely volatile.

High food prices may harm poorer consumers: because they need to spend more money on their food purchases, they may have to cut back on the quantity or the quality of the food they buy, or economize on other needed goods and services. For food producers, conversely, higher food prices could raise their incomes—but only under certain conditions: if they are net sellers of food, if increased global prices feed through to their local markets, and if the price developments on global markets do not also increase their production costs. Apart from these effects of high food prices, price volatility also has significant effects on food producers and consumers. Greater price volatility can lead to greater potential losses for producers, because it implies price changes that are larger and faster than they can adjust to. Uncertainty about prices makes it more difficult for farmers to make sound decisions about how and what to produce. Which crops should they produce? Should they invest in expensive fertilizers and pesticides? Should they pay for high-quality seeds? Without a good idea of how much they will earn from their products, farmers may become more pessimistic in their long-term planning and dampen their investments in areas that could improve their productivity. Therefore, price volatility contributes to reducing supply, especially for smallholders, leading to higher prices for consumers and lower income for producers. It also makes supply more inelastic, generating greater price volatility in the future.

In a situation of inelastic incomes and volatile prices, consumers are forced to adapt their consumption pattern, increasing the risk of hunger and under-nutrition (replacing high nutritional products by less nutritious staple products). Beyond the risk of short-term political instability, price volatility translates into negative long-term consequences for health and productivity. In addition, it is important to remember that in rural areas, many households both consume and produce agricultural commodities. Therefore, if prices become more volatile and these households are forced to reduce their spending on seeds, fertilizer, and other inputs, this may affect the amount of food available for their own consumption. Even for households that are net sellers of food, producing less and having less to sell will reduce their household income and thus affect their consumption decisions. Therefore, food price volatility has three consequences: higher food prices

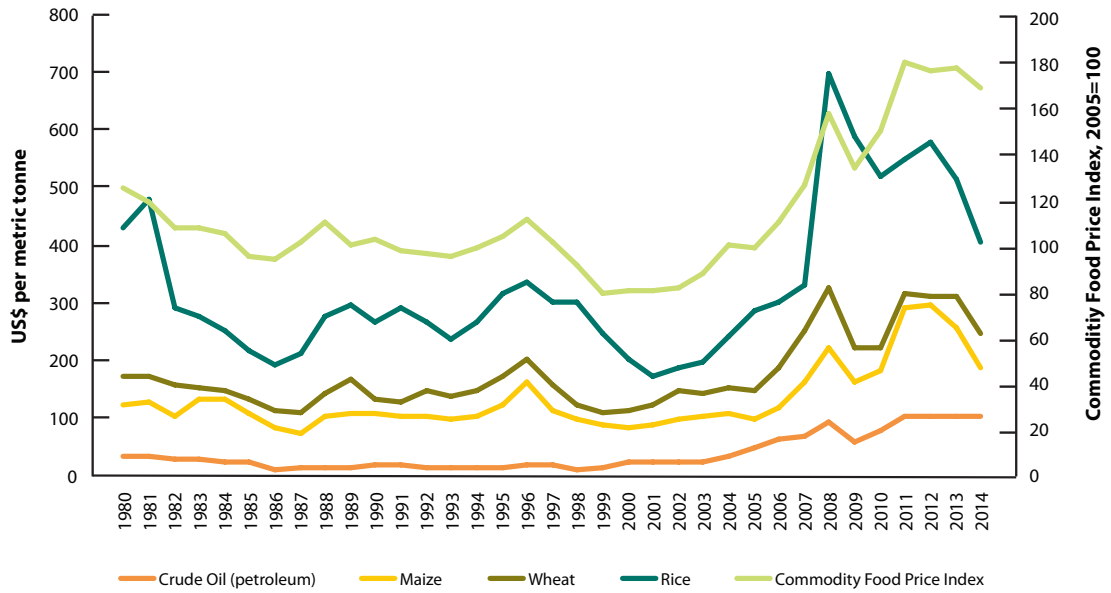
for consumers; lower income, both at the macro level and for smallholders in particular; and unstable food consumption patterns. All three factors contribute to higher levels of food insecurity.

This situation imposes several challenges. In the short run, the global food supply is relatively inelastic, leading to shortages and amplifying the impact of any shock. The poorest populations are hardest hit. As a large share of their income is already devoted to food, the poor will likely be forced to reduce their (already low) consumption. Infants and children may suffer lifelong consequences if they experience serious nutritional deficits during their early years. Thus, the short-term priority should be to provide temporary relief for vulnerable groups. In the long run, the goal should be to achieve food security. The drivers that have increased overall food demand in the last few years are likely to persist (and even expand). Thus, there will be escalating pressure to meet these demand requirements. Unfortunately, increases in agricultural productivity have been relatively meager in recent years. "The average annual rate of growth of cereal yields in developing countries fell steadily from 3 percent in the late 1970s to less than 1 percent currently, a rate less than that of population growth and much less than the rise of the use of cereals for other things besides direct use of food" (Delgado et al., 2010).

This chapter first addresses the issue of price volatility at the global level, and then focuses on the most important elements for Africa. Food prices have increased significantly in the past several years, with particularly sharp spikes during the 2007/2008 season. After the food price crisis of 2007/2008, food prices started rising again in June 2010, with international prices of maize and wheat roughly doubling by May 2011. The peak came in February 2011, with a spike that was even more pronounced than that of 2008, according to the food price index of the Food and Agriculture Organization (FAO) of the United Nations (Figure 3.1). When prices of specific commodities are adjusted for inflation, however, the 2011 price spike did not reach the levels of 2008.

Although the food price spikes of 2008 and 2011 did not reach the heights of the 1970s, price volatility—the amplitude of price movements over a particular period of time—was then at its highest level for the past 50 years. This volatility affected

FIGURE 3.1—COMMODITY PRICES AND FOOD PRICE INDEX (1980–2014)



Source: International Monetary Fund (IMF), 2014.

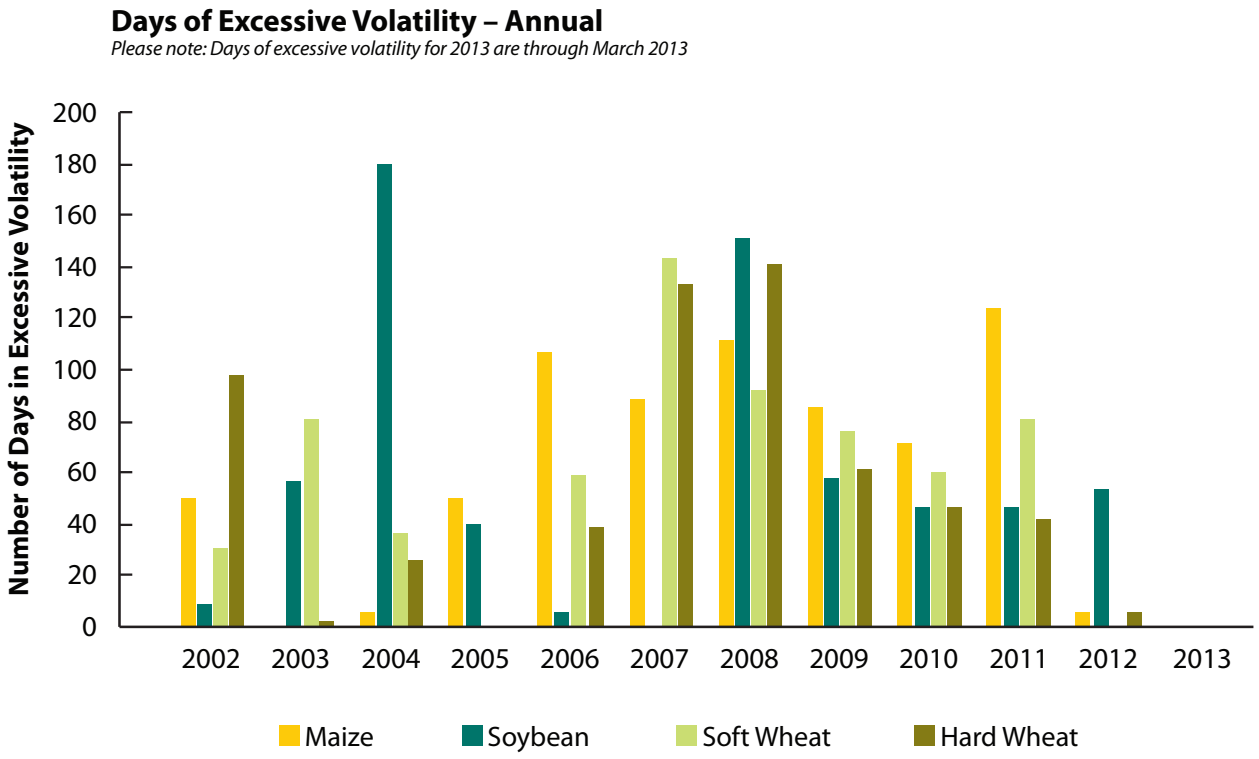
wheat and maize prices in particular. For soft wheat, for example, there were an average of 41 days of excessive price volatility a year between December 2001 and December 2006. These calculations are based on a measure of price volatility recently developed at the International Food Policy Research Institute (IFPRI) by Martins-Filho, Torero, and Yao (2010). From January 2007 to June 2011, the average number of days of excessive volatility more than doubled, to 88 a year (Figure 3.2). However, since then there has not been any period of excessive volatility.

Given the movement of food prices on international markets, Africa's vulnerability to external shocks will be based in part on the way the international price movement is transmitted to local markets. International trade is one pathway that would expose Africa to global price volatility. Yet, as shown by Minot (2012), tradable commodities such as wheat and rice have shown relatively low levels of volatility in Africa—even while volatility is increasing on global markets—compared to traditional grains (millet and sorghum). This finding challenges the view that access to global markets has exposed Africa to more price instability. Instead, it suggests that market integration and trade can serve to balance the higher level of price volatility shown in the non-tradable sector.

Causes of Food Price Volatility

In order to design policies and programs that reduce food price volatility or build resilience to volatility, it is useful to understand the causes. Policies designed to reduce price volatility caused by domestic supply fluctuation,

FIGURE 3.2—PERIODS OF EXCESSIVE PRICE VOLATILITY



Source: Martins-Filho, Torero, and Yao 2010. See details at http://www.foodsecurityportal.org/soft-wheat-price-volatility-alert-mechanism.

for example, would not be effective if the volatility were actually the result of instability in international prices.

There is some agreement on the causes of this price volatility: (a) seasonal variation in domestic production; (b) inter-annual variation in domestic production; (c) fluctuation in world prices; (d) changes in policy; and (e) other sources of price instability, including variation in demand, changes in closely linked markets, food stocks kept by a country, and market speculation. While there is no consensus on the relative importance of each of these factors, it is widely agreed that most of these factors will continue to put upward pressure on prices in the future. Prices may become more volatile as well, as evidenced by the food crisis in 2010. Climate change will induce more weather variability, leading to erratic production patterns. Moreover, the volatile nature of the market is likely to induce speculation, exacerbating price spikes. At the same time, some of these drivers will be factored in by global suppliers, so that long term supply will shift accordingly.

Seasonal Variation in Domestic Production

Seasonal variation in supply of agricultural commodities contributes to the seasonality of prices, since off-season prices are determined largely by the costs and feasibility of storage. This explains why the prices of fruits, vegetables, and other perishable products tend to show greater seasonality in prices than staple food grains. In addition, we expect prices to be more seasonal in countries with uni-modal rainfall and one harvest per year than in countries with irrigation or bi-modal rainfall. Finally, the prices of traded commodities are likely to show less seasonality than the prices of non-traded goods, because imports are generally scheduled for periods of local scarcity.

An analysis of 280 African cereal prices indicates that the seasonality of maize, sorghum, and millet, which are not widely traded, is higher than that of rice and wheat, which are imported by most African countries (Table 3.1). Seasonal variation in wheat and rice averages 15–17 percent of the average price, compared to 24–32 percent for maize, millet, and sorghum. The same analysis suggests that seasonality accounts for about 10 percent of the variation in local grain prices.

TABLE 3.1—SEASONALITY OF LOCAL PRICES IN AFRICA, SOUTH OF THE SAHARA, BY COMMODITY

Commodity	Number of price series	Seasonal price index
Maize	94	0.32
Sorghum	69	0.27
Millet	49	0.24
Rice	58	0.15
Wheat	10	0.17

Source: Analysis of price data from FEWS-NET (2014).

Note: Seasonality index is the average difference between the highest and lowest month as a ratio of the mean price, based on regressing prices (converted to US dollars) on monthly dummy variables.

Inter-annual Variation in Domestic Production

The size of the harvest varies from year to year as a result of random factors such as rainfall, pests, and disease, as well as policy variables. This is particularly true for commodities that are not widely traded—that are grown in areas with poor road infrastructure, in landlocked countries, or in countries that restrict international trade—and for commodities that have a low value-bulk ratio, making them costly to transport. Under these conditions, surpluses from a good harvest are not easily transported to deficit areas, and a poor harvest cannot be alleviated by imports, so the size of the harvest has a strong effect on local prices.

The factors at play in volatility transmission also show clear contrasts between coastal and landlocked areas, at the individual commodity level (Table 3.2). For four products, price volatility is significantly lower in landlocked markets than in coastal regions, but for maize, it is the reverse. The difference is more pronounced for non-tradable products such as sorghum and millet than for traded commodities like wheat, so it is difficult to estimate the role of trade as a transmission pathway. As suggested in Minot (2012), coastal countries are not necessarily integrated into world markets, especially in the presence of other market obstacles. Among traded commodities, both rice and wheat suffer from higher price volatility in coastal areas, suggesting a more pronounced vulnerability to foreign shocks.

It seems clear, then, that local factors are driving local price volatility, more than world market conditions. These local factors include: the lack of domestic and regional market integration due to limited infrastructure; different market failures along the value chains (asymmetry of information, for example); extreme dependence on rain-fed agriculture for SSA, and therefore higher exposure to weather shocks. These issues are addressed in Section "Country Experiences with Price Volatility" later in this chapter. In addition, periods of political instability, as major sources of market disruptions, increase price volatility. For example, post-election troubles in Kenya in 2007/2008 were a leading factor in maize price surge and instability for Eastern Africa, leading to high level of prices even after the turmoil in world food markets ended.

In illustration of the importance of local factors, for commodities that are widely traded within a country or between countries, poor weather in one production zone is likely to be offset by good weather in another. For example, food price volatility is significantly lower in the largest city in each country than in smaller, secondary cities (Minot, 2014). The probable explanation is that the largest city receives supplies from various regions within the country (and sometimes imports as well), while smaller, secondary cities rely much more on local supply, which is less stable. In addition, on the South African commodity exchange, the price volatility of yellow maize, which is internationally traded, is lower than that of white maize, which is only regionally traded (Geyser and Cutts, 2007).

TABLE 3.2—VOLATILITY IN COASTAL AND LANDLOCKED COUNTRIES, BY PRODUCT

PRODUCT	N	NUMBER OF PRICE SERIES	VOLATILITY		F STAT	ρ	
			Coastal	Landlocked			
Beans	878	12	0.134	0.121	1.23	0.28	
Bread	149	2	0.029	0.027	1.14	0.56	
Cooking oil	592	8	0.105	0.098	1.16	0.20	
Cowpea	369	5	0.246	0.218	1.27	0.10	
Maize	3,450	47	0.116	0.161	0.52	0.00	***
Millet	2,224	30	0.125	0.100	1.55	0.00	***
Rice	2,202	30	0.141	0.084	2.82	0.00	***
Sorghum	1,914	26	0.144	0.115	1.56	0.00	***
Wheat	224	3	0.122	0.076	2.60	0.00	***

Source: Analysis of price data from FEWS-NET cited in Minot (2012).
Note: N is no. of observations.

Fluctuation in World Prices

Another source of domestic food price instability is volatility in world prices. World prices are more likely to influence domestic prices of a commodity that is regularly traded (imported or exported) on the world market. This is more likely to be the case under certain conditions when: trade policy is relatively open; the costs of transporting goods to and from the port are relatively low; and the commodity is non-perishable. One study examined the contribution of world prices and domestic supply shocks to the variance in domestic prices in 12 African countries. In most cases, domestic supply shocks contributed a much larger share of the domestic price instability than did fluctuations in world prices (Hazell et al., 2005). Another study found a statistically significant relationship between monthly world prices and African prices of the same commodity in only 13 of the 62 prices tested. For maize, just 10 percent of domestic prices were linked to international prices, while for rice, half of the domestic prices were (Minot, 2010). These results suggest that, at least for maize and other non-tradable commodities, weather-related shocks in domestic production are probably a more important factor in price volatility than international prices.

Table 3.3 illustrates the higher price volatility of non-tradable products—25 percent higher than tradable products. Non-tradable products are also the main contributor to overall price volatility, due to their larger share in production and consumption. Indeed, other market characteristics seem to affect price volatility more than price transmission from global prices. In narrow and non-integrated markets (which is the case for many products in Africa), price volatility tends to be higher with fewer sellers and buyers, less flexibility in the value chain, and higher exposure to local weather conditions. In conclusion, while price volatility is an issue for both tradable and non-tradable products, it may differ in intensity depending on the contributing factors, indicating different policy responses. Overall, increased volatility in global markets does not imply that international trade is a source of price instability for Africa. It only means that the gains in price stability due to increased openness have declined compared to the previous period.

TABLE 3.3—PRICE VOLATILITY OF TRADABLE AND NON-TRADABLE PRODUCTS

Product	N	Number of price series	Volatility	F stat	ρ
Non-tradable products	9,280	126	0.133		
Tradable products	3,018	41	0.106	1.57	0.00 ***
Total	***12,298***	***167***	***0.127***		

Source: Analysis of price data from FEWS-NET cited in Minot (2012).
Note: N is no. of observations.

Changes in Policy

Food price instability caused by supply shocks or international markets can be exacerbated by sudden or unexpected changes in government policy, such as changes in barriers to international trade in staple foods, government-sponsored food imports and exports, export restrictions or bans, and the purchase/sale operations by state enterprises. Even an announcement of the government's intention to intervene in markets can affect food prices. For example, if the government announces that it plans to import a large quantity of grain, private importers will avoid placing import orders in expectation that the price will be dampened by the arrival of the government imports, particularly if the government is expected to subsidize the sale of its imports. Delays in implementing the government import order would then cause a significant spike in food prices, because neither public nor private

imports would be available to meet domestic demand (Chapoto and Jayne, 2009; Byerlee et al., 2006).

Other Sources of Domestic Food Price Instability

Other factors also contribute to domestic food price instability. First, variation in demand can, in principal, be a source of variability in domestic food prices. In practice, this is generally not an important source of price instability, partly because changes in demand tend to occur slowly over time.

Second, changes in closely-related markets can affect domestic food prices. For example, a sharp increase in the price of fuel can increase the cost of imported food. One study showed that maize prices in African markets far from the coast are more influenced by fuel prices than by the international price of maize (Dillon and Barrett, 2013).

Third, if food stocks are known to be low, then a given supply shock is likely to have a larger effect on prices. For example, the fact that the global stock-to-use ratio for grains had declined to a low point is often listed as a contributing factor in the global food crisis. (See Benson et al., 2009 and Tangermann, 2011; however, Dawe, 2009, disputes this factor.)

Fourth, some price changes may be the result of "endogenous" factors, such as a speculative bubble, in which the price rises because of widely held beliefs that it will rise. People then purchase and store the commodity, thus making the belief self-fulfilling. There is an ongoing debate about the possible role of a speculative bubble in the global food crisis of 2007/2008. It is clear that the policy reaction by governments (including grain export bans and increased import orders) exacerbated the spike in prices, but the evidence that speculation on futures markets contributed to the crisis is mixed (Robles et al., 2009; Sanders et al., 2008).

Country Experiences with Price Volatility

A number of countries in SSA operate grain reserves and attempt to stabilize prices, while others have no reserves and allow prices to be set largely by market forces. A review of the experiences of six countries in eastern and southern Africa reveals different objectives and contexts, but some similar lessons.

In Ethiopia, agricultural marketing has been substantially liberalized since the early 1990s. The Ethiopian Grain Trading Enterprise no longer has the financial resources or branch network to defend a price band or even a price floor over time. Nonetheless, it is used by the government for occasional intervention in grain markets, particularly when prices are unusually low or unusually high. The recent rise in grain prices appears to be the result of a combination of general price inflation, harvests that were smaller than estimated, and a foreign exchange "shortage" caused by the government's reluctance to allow the currency to depreciate. Policy responses included a grain export ban, government grain imports, and the creation of a system for distributing subsidized grain rations in urban areas. Private grain imports could have mitigated the spike in grain prices, but traders were unable to access foreign exchange and hesitant to try to compete with subsidized government imports.

Uganda follows a more market-oriented agricultural policy than many other countries in the region. There is no strategic grain reserve, nor any price stabilization policy. Food marketing and cross-border trade are relatively unrestricted. The stable policy environment and open borders have allowed the development of maize surpluses, which are sold to the World Food Programme and exported to Kenya and other neighbors. The price rise of 2007/2008 seems to be more closely related to political turmoil in Kenya than to events in world markets (Benson et al., 2008).

Like most other countries in the region, Kenya has liberalized agricultural marketing, but it continues to support a state-owned grain trading enterprise, the National Cereals and Produce Board (NCPB). The scale of operations of the NCPB declined during the 1990s as a result of liberalization, but has increased since 2000 because of political pressure, particularly from commercial farmers. NCPB operations and import restrictions have raised maize prices and reduced price variability, but most of the benefits have accrued to the small proportion of farmers who produce most of the marketed surplus. Kenya's food crisis occurred in 2008/2009, after the global food crisis had receded. Maize prices rose to the equivalent of $450 per ton, due to a combination of a high import tariff, a maize export ban in Tanzania, and delayed government imports. The NCPB was also tainted by a major corruption scandal involving the allocation of import contracts and the sale of subsidized maize (Ariga and Jayne, 2010; Ariga et al., 2010).

Although agricultural markets have been liberalized in Malawi, the government grain trading corporation, ADMARC, continues to play an important role in maize marketing and trade, particularly when prices are high. Malawi has one of the most interventionist maize policies in the region, yet the level of maize price volatility is one of the highest in the region (Minot, 2014). In examining three maize price spikes over the last ten years, it is clear that variation in the size of the harvest is an important factor. However, in each case, maize price instability appears to have been exacerbated by the lack of transparency in the size of public stocks, overestimates of the maize harvest, inappropriately-timed ADMARC procurement campaigns, and delays in carrying out announced government imports (Chirwa, 2010).

In Zambia, the Food Reserve Agency (FRA) plays an active role in domestic grain marketing and international trade, with the goal of stabilizing maize prices. Furthermore, it distributes large volumes of subsidized maize to consumers in selected regions. Yet there is evidence that the ad hoc nature of these interventions creates an unpredictable policy environment for grain traders. This uncertainty inhibits their participation in various activities, particularly maize imports and storage. It has been argued that, by crowding out private traders from arbitrage activities, the policies of the FRA may have exacerbated maize price volatility in the country (Chapoto et al., 2010). Indeed, cross-country comparisons show that maize price volatility in Zambia is higher than in many other African countries (Minot, 2014).

Mozambique has pursued a market-oriented staple food policy; it has no state grain trading enterprise, minimal barriers to staple crop imports and exports, and no efforts to stabilize food prices. Grain prices were quite stable in the early 2000s and relatively stable in recent years. The rise in prices in 2007/2008 associated with the global food crisis has, however, led the government to plan the creation of a public-private food reserve.

Somewhat surprisingly, maize price volatility over the period 2005–2011 was found to be significantly higher in a group of four countries with active price stabilization efforts (Malawi, Zambia, Zimbabwe, and Kenya) than in a group with more market-oriented policies (Ethiopia, Uganda, Tanzania, and Mozambique) (Minot, 2014). It is possible that the former set of countries have inherently unstable prices, and that stabilization policies are only partially successful in dampening this volatility. Alternatively, it may be that government efforts to intervene in maize markets, through procurement, sales, and government-managed trade, have created an unpredictable policy environment in which private traders are inhibited from carrying out storage and trade activities that would otherwise dampen price fluctuations.

In general, grain reserves in SSA have not been managed according to pure buffer stock principles: 1) the reserves are managed with multiple objectives, not just price stabilization; 2) they do not announce or defend

a price band, but rather intervene on an ad hoc basis; and 3) they often intervene in a variety of ways, including trade policy, marketing regulation, and subsidized grain distribution. Some argue that grain reserves could be used to stabilize grain prices if they were more predictable and transparent, by announcing and defending an explicit price band (Galtier, 2013; Timmer, 2010). Others argue that even a well-designed buffer stock with explicit bands will inevitably fail, because stock managers will not have enough information to distinguish price shifts due to fundamentals from those due to speculative bubbles or imperfect information. Given the statistical properties of commodity prices, it is likely that a buffer fund will over time exhaust its budget or its stocks, resulting in an expensive and destabilizing collapse of the scheme (Wright, 2010).

Effects and Response Mechanisms to Price Volatility

Effect of Price Volatility

Food price instability has a negative effect on household welfare in three ways. First, it may contribute directly to fluctuations in household income and consumption, which is undesirable given that most people are risk-averse. Negative consumption shocks are particularly harmful to those households with incomes close to the minimum subsistence level. Second, households may adopt livelihoods strategies that reduce risk but that also lower average income. An example would be farmers deciding to grow staple food crops rather than higher-value commercial crops, even if the latter would generate higher revenues on average. Third, food price volatility and other risks may inhibit investment, reducing future income-generating capacity.

Early studies of the effects of price volatility showed that consumers are adversely affected by the price volatility of a commodity only if they are risk averse and if the income elasticity of demand for the commodity is low. These conditions are likely to hold in the case of food price volatility, especially for the poor in developing countries (Turnovsky et al., 1980).

Price Stabilization

Policymakers in SSA and elsewhere have, over time, implemented a wide range of policies and programs to try to stabilize the price of staple food grains. In the 1970s and 1980s, many governments maintained consumer price controls, producer price supports, taxes and restrictions on international trade, restrictions on internal movement of grains, and programs for public procurement and distribution of food. In many cases, state-owned grain trading enterprises were given a legal monopoly over buying, processing, and distributing staple grains and export crops, although it was often not possible to completely suppress private-sector trade in these commodities.

In the late 1980s and 1990s, the high fiscal cost of these policies, together with growing evidence of their ineffectiveness and pressure from the international financial institutions, led to a period of economic reform and liberalization (Jayne and Jones, 1997; Kherallah et al., 2000). Because of the political sensitivity of the issue, however, liberalization of food markets has been slow, uneven, and subject to reversals. As a result, the state may continue to intervene in staple crop markets in various ways. For example, many countries in eastern and southern Africa have state-owned enterprises that buy, sell, import, and export grain, in competition with private traders (Jayne et al, 2002).

The role of these state-owned grain marketing enterprises is controversial. Some argue that they play a necessary role in stabilizing food prices in light of the weakness of the private sector, which is constrained by lack of credit and limited storage capacity. These enterprises therefore can and should operate like a buffer stock, buying when prices are low and selling when they are high (Poulton et al., 2006; Timmer, 2010). Others argue that unpredictable interventions by these enterprises is one of the main constraints faced by private traders and that, in some cases, these interventions actually exacerbate the instability of food prices (Chapoto and Jayne, 2009; Byerlee et al., 2006). The global food crisis of 2007/2008 revived interest in food price stabilization. A number of countries increased the size of their food reserves, and the topic of international food reserves again came under discussion (Murphy, 2009; von Braun and Torero, 2008). And because of the high cost and uncertain effectiveness of price stabilization efforts based on public grain reserves, researchers and policymakers have explored a number of alternative approaches to food price stabilization that do not involve direct intervention in grain markets including efforts to make markets work better by reducing transaction costs and broadening markets.

The Specific Role of Trade Policies

Even if the overall contribution of international price volatility to African food price volatility is limited, trade policies remain an important tool for policymakers in coping with price fluctuations. Both export and import measures are used to disconnect domestic prices from international fluctuations. The attractiveness of such measures for some countries is straightforward for key traded commodities, whether imported (such as rice in West Africa) or exported (such as maize in southern or eastern Africa). But many policymakers will also use trade policy because it is a tool easy to implement at low fiscal cost, even if it is an inadequate or highly distortive instrument. For example, Burkina Faso suspended import taxes on four commodities, after the country experienced riots over food prices in February, 2008; and Tanzania imposed bans on maize exports.

When faced with increasing food prices, net exporters of food can impose export taxes or bans, to disconnect domestic markets from world markets and to redirect local production to domestic markets. Certainly, the lower prices hurt local producers; however, these policies do benefit domestic consumers while boosting government revenue. Thus, it is not surprising that many food-producing countries enacted some form of export restriction during the 2007/2008 food crisis. Demecke et al. (2008) surveyed government policies in 81 developing countries and found that 25 of them either banned exports completely or increased export taxes. Among many others, Pakistan, Bangladesh, China, Egypt, India, Nepal, and Argentina enforced such policies.

Similarly, net importers can decrease their tariffs (or even subsidize imports) to buffer the impact of rising international food prices. At least in the short run, they may be able to temporarily reduce internal prices. However, some argue that tariff reductions might not have been effective in shielding importing countries from the 2007/2008 food crisis. In this spirit, FAO et al. (2011) argue that "the scale of price increases was such that for many countries reducing import tariffs had relatively modest impact because the initial tariffs were low or the scale of the price increases was so large. In any event, this instrument was quickly exhausted as tariffs were reduced to zero" (p. 14). Additionally, reduction of tariffs reduces government revenue, leaving fewer resources for other policies to palliate the impact of food price increases. The situation might be especially serious when there are few alternative sources of revenue (because of weak tax

collection or a large informal sector, among other reasons). Eventually, this approach might lead to serious fiscal deficits.

These strategies should not entail any consequences for international markets if the countries implementing them are relatively small. These countries' food exports or imports are not substantial relative to international trade, and they are mostly price-takers of the world markets. However, trade policies of large food exporters or importers do have an effect on international supply or demand of a commodity. When large exporters impose export restrictions during a food emergency, they tighten the already short global supply and further increase international prices. In a similar fashion, as large food importers reduce their tariffs, they increase internal consumption, fueling global demand and generating further escalations of food prices in external markets. If exporting and importing countries both follow such strategies, their efforts to insulate themselves might cancel out each other's efforts.

All in all, trade policies may be an effective instrument for short-term price stabilization purposes in some nations: countries facing political unrest, or those lacking adequate food distribution networks and safety nets. However, absolute symmetry between insulating actions taken through export restrictions and import barrier reductions needs to be taken into account. It is also important to underline that implementing a short-term trade policy response can be a huge institutional challenge. Defining the framework— rule-based or discretionary—will have important consequences for how the private sector will adapt. Will it invest in trading capacity, or will it invest in influencing policymakers' decisions? With the growing trend of regional integration in Africa, having variable national trade policy instruments will lead to additional coordination costs and may weaken regional integration.

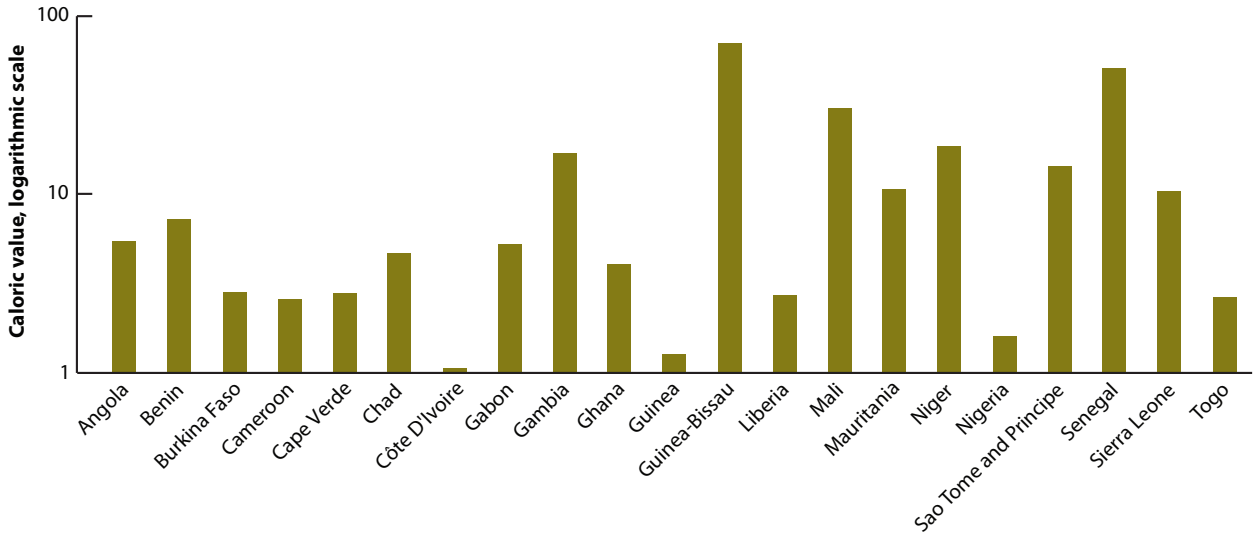
Other studies have pointed out that the objective of policy should not be price stabilization per se. Rather, price stabilization is only useful to the extent that it reduces the instability of the income of farmers and consumers. This distinction is important, because price volatility may actually serve to stabilize farm income. Supply shocks create a negative correlation between aggregate farm output and prices: during good years, output is high but prices are low; and during bad years, the reverse is true. Thus, a program that is successful in stabilizing agricultural prices could actually destabilize farm income and reduce farmers' welfare, in situations where the output of individual farms is correlated with aggregate output (Newberry and Stiglitz, 1981).

Another factor is that food price stabilization is likely to have a positive effect on food supply, motivating farmers to produce more at a given price. However, for products that are non-tradable, this will reduce the equilibrium price, transferring some of the benefits of price stabilization to consumers (Newberry and Stiglitz, 1981).

Trade Integration as a Way to Mitigate Weather Shocks: Potential and Limits

Although trade openness has been blamed for increasing price volatility, it is clear that the opportunities offered by international trade, through participation in larger and more diversified markets, have helped improve price stability and food access at the global level over the last four decades. As discussed in the previous section, African consumers in many countries have to deal with high food price volatility due to local market failures, lack of market integration, and fragmented value chains. In addition, volatile trade policies (discussed in the previous section) reduce the scope of international cooperation, weaken regional coordination, and shift the

FIGURE 3.3—NATIONAL FOOD SUPPLY VOLATILITY COMPARED TO AFRICA-WIDE FOOD SUPPLY VOLATILITY



Source: Authors' computation based on Deason and Laborde (2011).

Note: This indicator represents the ratio between national food supply volatility and the Africa-wide food supply volatility. Food supply volatility is computed over the last 20 years as the normalized de-trended yield volatility, expressed in calories per ha and aggregated using fixed area allocation.

costs of price stabilization from large countries to small ones. Therefore, Africa will benefit significantly from increasing market integration at the domestic, regional, and international levels. The regional dimension is particularly attractive: it will reduce the risk of beggar-thy-neighbor trade policies among African countries, and will lead to the emergence of larger trade blocks that can respond to non-cooperative trade policies implemented by other trade entities at the global level.

Figure 3.3 shows that gains from trade integration may be most significant at the country level. The chart shows the ratio between the food supply volatility for each country and food supply volatility for Africa as a whole. For small countries, such as Guinea-Bissau, yearly domestic supply is 70 times more volatile than the consolidated African supply. Even for large countries, continental trade can serve as a source of stability: for Nigeria, local supply is 60 percent more volatile than the continental supply.

Reducing Transport Costs

Food price volatility is influenced by the spatial breadth of the market: the broader the area over which agricultural commodities are traded, the more stable the supply and the lower the price volatility. As discussed above, good rainfall and a bumper harvest in one region can offset poor rains and a small harvest in another. This is consistent with the finding that food price volatility is lower in large cities than in small cities in SSA (Minot, 2014).

Policy reforms implemented in the 1980s and 1990s have largely eliminated restrictions on internal movement of grains and other commodities, but high transportation costs and other transactions costs still impede this trade. The lower the cost of transportation between two regions, the more likely it is that trade between them will be profitable, allowing surpluses in one region to be transported to remedy deficits in another region.

A World Bank study found that the cost of transportation in SSA ranged from $0.06 to $0.11 per ton-kilometer, compared to $0.04-0.05 in Brazil, China, the United States, and Western Europe. The study identified several factors behind the high costs: poor road conditions, lack of competition in trucking markets, delays in crossing borders, and the high cost of fuel

and spare parts. In some countries, particularly in West Africa, government regulation facilitates the formation of trucking cartels which raise transportation costs. Deregulation and privatization of the trucking industry in Rwanda in the 1990s resulted in a 75 percent reduction in real transport costs (Teravaninthorn and Raballand, 2009). Another study found that high transportation costs in SSA are a larger impediment to trade than tariffs and other trade policy restrictions (Limao and Venables, 2001).

International Trade

The food price crisis of 2007/2008 served as a reminder of the potential volatility in international grain markets. For policymakers in many developing countries, it prompted a renewed interest in domestic price stabilization programs such as public grain reserves. Clearly, a country with a steady domestic supply of food would be able to reduce price volatility by isolating itself from international markets. But if a country has large fluctuations in domestic supply, international trade will prevent extreme movements in food prices: the import parity price sets a ceiling on domestic prices, while the export parity price sets a floor. However, the band between the import and export parity prices may be quite wide, allowing for domestic price volatility. For landlocked countries, moreover, the cost of transport to a major port may exceed the domestic price of staple grains, meaning that even if the domestic grain price fell to zero, it would not be profitable to export. Thus, the question of whether international trade increases or decreases domestic price volatility is an empirical one.

Nevertheless, there are three reasons to believe that the net effect of a more open trade policy would reduce food price volatility in most African countries. First (as discussed above), domestic grain price volatility in SSA is significantly higher than the price volatility of the same commodities in the world market. Second, the price volatility of internationally-traded commodities in Africa, such as rice and wheat, is lower than the volatility of most non-traded food commodities. And third, there is evidence that some of the price spikes in African grain prices in recent years have risen above the import parity price. In Ethiopia, wheat prices spiked above import parity because of the rationing of foreign exchange, a side-effect of an overvalued exchange rate (Rashid, 2010). Malawi has experienced a number of spikes in maize prices as a result of delays in government imports, unexpected exhaustion of public grain reserves, and overestimates of the harvest. Since prices rose above the import parity price, these spikes might have been dampened if private traders had not been "crowded out" of import activity by government intervention (Rubey, 2003; Jayne et al., 2008).

There are important complementarities between an open trade policy and reducing transportation costs. If the costs of transportation and port handling can be reduced, this lowers the import parity price and raises the export parity price, thus narrowing the band within which domestic prices may vary.

Commodity Exchanges

A commodity exchange is a market where standardized contracts to deliver a specified quantity of a commodity (usually crops or minerals) can be bought and sold. The commodities are graded to allow anonymous transactions without product inspection. A simple spot market can reduce the cost of searching for a buyer or seller and make prices more transparent. Moreover, the centralization of traders and transparency of transactions may reduce volatility associated with lack of information. Commodity

exchanges may also offer futures contracts, which provide opportunities for participants to manage agricultural price risk.

In the wake of liberalization of agricultural markets in SSA in the 1990s, commodity exchanges were opened in five countries in an effort to manage commodity price risk. More exchanges have been opened since 2004. The South African Futures Exchange (SAFEX) has grown significantly and offers a variety of spot and futures products, based on wheat, maize, soybean, sunflower, and metals markets. However, other African countries have struggled to attract enough volume to make their commodity exchanges viable. The exchanges formed in the 1990s in Zambia and Zimbabwe initially showed promise, but were suspended after price movements that were considered unacceptable prompted the governments to suspend operations. The Kenya Agricultural Commodity Exchange and the Malawi Agricultural Commodity Exchange struggled to achieve the necessary volumes; they have since evolved into serving primarily as providers of agricultural market information services. The Ethiopia Commodity Exchange (ECX) initially handled limited volumes of grains, but is now focused on coffee, thanks to legislation that requires most coffee exports to be channeled through the ECX. Exchanges have been created in Uganda, Nigeria, and Ghana, among others, but these still handle limited volumes (Rashid et al., 2010; Galtier, 2013).

There are several factors behind the limited success of agricultural commodity exchanges in SSA. One of the main constraints is the limited volume of cereals and other commodities being marketed. The volume of marketed cereals in most African countries is quite small, relative to the volumes in countries such as South Africa that have active commodity exchanges. Second, grading systems are not widely used, so buying contracts without inspection may be risky. Third, the prices of maize and other staple foods are politically sensitive and subject to occasional price controls or trade restrictions. Indeed, traders and commodity exchanges have sometimes been blamed for contributing to price volatility, inhibiting interest in participating in commodity exchanges (Rashid et al., 2010).

Market Information Systems

Some price volatility and spatial dispersion of prices is due to the fact that not all participants in markets have full information about prices. Agricultural market information systems (MISs) are designed to collect and disseminate prices and other information about market conditions. MISs are generally assumed to help farmers negotiate with traders, though traders themselves face challenges keeping track of market conditions in different parts of the country. Early MIS programs disseminated prices by radio and newspaper, but the growth of mobile phone ownership has created new opportunities.

In some cases, a commodity exchange has taken on market information service functions. As mentioned, the Kenya Agricultural Commodity Exchange and the Malawi Agricultural Commodity Exchange evolved into providers of agricultural price information (Galtier, 2010). In other cases, private firms have begun collecting and disseminating agricultural prices. Esoko provides price information to farmers and traders in text messages sent to the mobile phones of subscribers in Ghana. The company is expanding its services to other countries in the region, including Rwanda and Malawi. FIT-Uganda provides a similar services in Uganda. Both companies are experimenting with other agricultural services, such as

local weather forecasts, extension messages, and providing a platform for agricultural transactions.

A number of studies confirm the value of this information. A study of the offshore fishing industry in Kerela (India) found that the volatility of sardine prices was dramatically reduced when fishermen started using mobile phones to call processing plants for quotes before returning to shore (Jensen, 2007). Similarly, a study of grain trade in Niger demonstrated that the phasing-in of mobile phone signals over 2001–2006 reduced spatial dispersion in the price of millet (Aker, 2010).

Market information systems will not reduce price volatility or spatial price dispersion caused by fluctuations in supply and storage costs. However, they can reduce volatility and price dispersion associated with imperfect competition and lack of information by market participants, particularly farmers. As such, they can be considered an important component of strategies to reduce price volatility by making markets work better.

Reducing the Impact of Food Price Volatility

Volatile food prices can cause volatility in household food consumption and well-being. This section discusses a number of policies and programs that can dampen consumption volatility, particularly negative shocks in food consumption for poor households. In other words, these policies help build resilience to food price volatility.

Contract Farming

Contract farming involves agricultural production carried out in the context of an agreement between the buyer and the farmer. The buyer is often a processor, exporter, or large retailer who needs particular set of quality characteristics that are not available on the market. The buyer may provide technical assistance, inputs on credit, and often a guaranteed price to farmers, who agree to follow production guidelines and to sell the output to the buyer. Contract farming has the potential to address a number of problems facing small-scale farmers in developing countries, including lack of access to technology and inputs as well as credit and marketing risks.

In practice, contract farming is often used in the production of cash crops such as tea, cotton, tobacco, oil palm, and rubber, as well as fruits, and vegetables, particularly when destined for processing, export, or other quality-sensitive markets. Commercial production of poultry and milk is often carried out on a contract basis as well (Minot, 2011).

Critics of contract farming point to potential negative outcomes for farmers: a contract may "lock" farmers into disadvantageous agreements; contractors may exclude small farmers, preferring to work with fewer large farmers; and the buyers may take advantage of the willingness of farmers to work for low implicit wages. However, studies of the impact of contract farming in SSA and elsewhere consistently show that contract farmers are better off than similar farmers without contracts. The inputs and technical assistance may help them get higher yields, and the buyer may pay above-market prices for the higher-quality product (see Porter and Phillips-Howard, 1997; Warning and Key, 2002; Bolwig et al., 2007; Minten et al., 2009).

The evidence is mixed on the question of whether small farmers are excluded from contract farming schemes. Some crops, such as tea, tobacco, and vegetables, can generally be produced more economically and at a higher quality by small-scale farmers. Others, like sugarcane and poultry,

seem to have economies of scale that lead processors to select medium- and large-scale farmers (Sartorius and Kirsten, 2004; Minten et al., 2009).

One of the most common problems with contract farming is side-selling, when farmers find they can get a better price on the open market and refuse to deliver the agreed quantities to the buyer. The risk of side-selling is even greater if the farmers receive inputs on credit that they can avoid repaying by selling elsewhere. The literature on contract farming provides many examples of contracts which collapsed because of side-selling. In some cases, buyers renege on their commitment because of financial problems, resulting in the end of the contract (Coulter et al., 2000; Jaffee, 1994; Sartorius and Kirsten, 2004).

Although contract farming has the potential to deliver technological inputs and assured markets to farmers, it is still not widespread in SSA. Farm surveys in Uganda, Ethiopia, and Ghana reveal that less than 3 percent of farmers have contracts with buyers. One reason is that staple cereals, pulses, and root crops are generally not grown under contract; it is difficult to justify the coordination and enforcement costs of contract farming when the product has low monetary value and little quality variation. Furthermore, the milling and processing of these crops is often done at a small scale, and it usually takes a large processor or exporter to establish a contract farming scheme.

In summary, contract farming offers a solution to the problem of price volatility and market risk in the production of selected higher-value crops. Contract farming tends to improve the livelihoods of participating small farmers, but it is probably not economically justified in the production of all crops, particularly low-value staple grains and roots.

Futures Markets

Commodity price risk can be managed by making use of futures markets. A futures market organizes the purchase and sale of standardized contracts to deliver a specified quantity and quality of a commodity at some specified time in the future, ranging from one month to several years later. For example, a coffee exporter could sell a contract to deliver a specific grade of coffee in four months for a specified price, thus "locking in" the price and eliminating the risk of falling prices. Alternatively, an importer could purchase a futures contract for delivery of maize in order to "lock in" a price and avoid the risk of rising prices. A trader who prefers not to commit to the transaction can purchase an option, which gives the right, but not an obligation, to carry out the transaction in the future. A "call option" to buy a commodity puts an upper limit on the price the trader will pay, while a "put option" to sell a commodity puts a lower limit on the price. Thus, while futures markets do not reduce price volatility, they help participants manage agricultural price risk.

In 2005, the government of Malawi purchased two call options on the SAFEX market for a total of 60,000 tons of maize, including delivery to Malawi. Although the maize price did not rise, the cost of transportation rose, and Malawi saved $2 million in import costs (Rohrbach, 2010).

This is probably the only time a government in SSA has made use of futures markets to manage price risk associated with food grains. There are three obstacles to wider use of futures markets to manage food price volatility. The first is cost. An option costs roughly 8–10 percent of the value of the contract, whether or not the option is exercised. For this strategy to be politically acceptable, it must be seen as a form of long-term insurance

rather than evaluated on the basis of its pay-off each year. Second, the use of call options on the SAFEX market is probably limited to southern Africa, where delivery costs are lower and the basis risk is smaller. Third, making use of futures markets requires a high level of technical expertise to evaluate various options and select the most appropriate one.

Safety Nets

Contract farming and futures markets, as discussed above, help farmers manage agricultural price risk. Weather index insurance may also be available to farmers, to provide partial coverage of production risks. However, neither of these strategies directly addresses the presumed objective of households: to reduce variability and uncertainty in consumption, particularly food consumption. Safety net programs are designed to assist poor households, including not only chronically poor households but also those that are temporarily poor due to negative income shocks.

Safety net programs vary widely in terms of the type of assistance provided, conditionality of assistance, and targeting method. The types of assistance may include food, cash, inputs, and assets; the assistance may be unconditional or subject to behavioral conditions; and in-kind assistance may be free, subsidized, or provided in voucher form (Galtier, 2013).

One approach to providing a social safety net is the guaranteed employment program, sometimes referred to as food-for-work or cash-for-work. These programs often involve labor-intensive public works activities that combine infrastructure development (such as road building) with hiring policies designed to maximize the pro-poor impact. If designed well, they may improve community infrastructure while providing assistance to the poorest households with able-bodied members. If the wage rate is set appropriately (near the market wage for unskilled labor), the program is self-targeting, in that the more well-off members of the community will not find it worthwhile to participate, while the poor will.

One of the largest programs of this type is the National Rural Employment Guarantee Scheme in India, which guarantees up to 100 days of work at the minimum wage. At a cost of $8.9 billion per year in 2010/2011, the program provided 3 billion person-days of employment. An evaluation of the program in Andhra Pradesh using panel survey data found that it increased caloric and protein intake of participants in the short run and also helped build assets in the medium run. In addition, it was well targeted toward women and the poor (Deninger and Liu, 2013). One drawback of these programs is that they do not reach those unable to work because of age or disability. In addition, the cost of supervising and inspecting the work reduces the share of government funding that reaches beneficiaries.

The largest such program in SSA (outside South Africa) is the Ethiopian Productive Safety Net Program (PSNP). Started in 2005, the objective was to move away from chronic food aid payments toward a more targeted combination of food-for-work, cash-for-work, and cash transfers that would help poor household accumulate productive assets. It includes a public works program that pays selected beneficiaries to build community assets, as well as a direct support program that provides cash or food to selected households that cannot work. The PSNP reaches more than 7 million poor Ethiopians. A study of the impact of the program found variation in the size of benefits received, but those that received at least half of the intended benefits showed significant gains in food security. After the study was completed, the size of the payments was increased to offset inflation (Gilligan et al., 2008).

An alternative to employment guarantee programs is conditional cash transfer (CCT) programs, which provide cash grants to poor households that comply with certain requirements such as keeping children in school, attending health clinics, or receiving pre- and postnatal care. Conditional cash transfers serve a dual purpose: providing assistance to poor households for immediate poverty reduction, and encouraging investments in human capital to reduce the chance of poverty being transmitted to the next generation. CCTs have generated considerable interest among researchers and policymakers in the last 10–15 years. As of 2009, CCT programs could be found in most Latin American countries, in eight countries in Asia, and in a few African countries (Fiszbein et al., 2009).

One of the first national CCT programs was Progresa (later renamed Oportunidades), which was launched in Mexico in 1997 to be phased in over three years. Eligibility is determined in two stages, by first selecting poor villages and then selecting poor families within these villages. Studies show that it has been successful in increasing school attendance, reducing the incidence of child labor, and improving child health (Gertler, 2004; Skoufias, 2005). The Oportunidades program now covers about five million households in Mexico.

The Bolsa Familia program in Brazil was created in 2003 to consolidate and replace a variety of smaller poverty programs. It provides a conditional per-child payment to poor households that keep their children in school, as well as an additional payment to households in extreme poverty. It has grown to cover 11 million households. A recent study found that the program increased school participation and grade progression, particularly among girls and older children and in rural areas (de Brauw et al., 2014).

In summary, safety net programs have been proven to provide significant benefits in terms of short-term food security and long-term investment in human capital. However, the budgetary cost is relatively high, and they require administrative capacity to identify poor households and monitor their compliance with the conditions.

Conclusions

Commodity price instability has been a long-term issue and an important challenge for Africa's growth. Even if the continent has entered a structural transformation, public and private income will still strongly depend on commodity market conditions in the future. Therefore, adopting the right set of policies to tackle this instability is critical. The recent years have even brought a new dimension to the issue: the most vulnerable part of the population, the poor, is faced with high levels of price volatility of food products, threatening their food security. The world faces a new food economy that likely involves both higher and more volatile food prices, and evidence of both conditions was clear in 2007/2008 and 2011. After the food price crisis of 2007/2008, food prices started rising again in June 2010, with international prices of maize and wheat roughly doubling by May 2011. Africa has to cope with high levels of price volatility on both the international and domestic fronts: international for tradable commodities, and domestic for non-tradable food items.

This situation poses several challenges for the continent. In the short run, the global food supply is relatively inelastic, leading to shortages and amplifying the impact of any shock. The poor are the hardest hit. In the long run, the goal should be to achieve food security and to enhance resilience. The drivers that have increased food demand in the last few years are likely to persist (and even expand). There is a significant role for

both governments and international organizations, in increasing countries' capacity to cope with this new world scenario, in promoting appropriate policies that will help to minimize the adverse effects of increasing prices and price volatility, and avoiding policies that might exacerbate the crisis.

Improving global market conditions will enhance the role of international trade as a driver of price stability. Similarly, reinforcing market integration in Africa, at domestic and regional levels, will be a key instrument to reduce price volatility. Trade policies should not be seen as an instrument to insulate domestic markets from global or regional conditions, but should rather strengthen economic ties among countries (and other economic agents) by being transparent, predictable, and cooperative.

The post-2008 recommendations on dealing with price volatility have been careful to avoid any potentially pervasive market distortions. Indeed, regarding trade policies, most of the evidence-based recommendations advised against any trade restrictions (on both the import and the export side). With respect to food reserves, the discussion seems to highlight the need to establish food reserves, to ease the effect of shocks during periods of commodity price spikes and volatility. While there is some consensus around this idea, there is disagreement regarding specific mechanisms to implement food reserves. As in the case of trade interventions, the choice is likely to depend on the characteristics of the specific market under intervention, the country's capacity to cope with crises, and the possibility of establishing international coordination mechanisms. In general, however, regional reserves with strong governance and clear triggers are preferred. When managed by individual countries, buffer stocks usually entail high costs and market distortions and are prone to corruption as well. Thus, most countries—especially those with weak institutions and scarce resources—should probably refrain from using buffer stocks. Many African countries had grain price stabilization programs in the 1970s and 1980s, using public grain reserves (with purchases and sales) in an attempt to reduce grain price volatility. These programs were very costly, poorly managed, and often politicized. Furthermore, there is mixed evidence regarding their effectiveness in reducing price instability. In some cases, these programs may have in fact contributed to price instability through unpredictable interventions, occasional stock-outs, and crowding out private trade and storage activity. Although many of these programs were shut down or scaled back in the 1990s, interest has renewed in the wake of the food crisis of 2007/2008.

Coping with existing and future food price volatility will required more targeted and sophisticated policies to avoid wasting scarce fiscal resources while protecting the most vulnerable consumers in Africa and contributing positively to the reinforcement of agricultural supply in Africa. In support of the poor, lessons from safety net programs already in place on the continent, for example Ethiopia, could be used by other countries to design similar programs.

In the medium and long run, trade policies should be aimed at both reducing transportation and other transaction costs and increasing agricultural productivity. While short-term price stabilization may be an effective instrument for dealing with high food prices, balance is needed between insulating actions (export restrictions) and easing actions (import barrier reductions). Moreover, a government's response to high and volatile prices needs to be well crafted, as it is likely to have important consequences for the incomes of vulnerable farmers and even their future livelihoods. Government responses also affect how the private sector

adapts—specifically, its propensity to invest in future trading capacity to meet the needs of a growing economy. In the medium to long run, expanding markets and improving transport infrastructure will reduce spatial price dispersion and food price volatility by making it easier to move grains from surplus to deficit zones. Similarly, investing in agricultural productivity raises the capacity of the domestic agricultural sector to supply local markets and to adjust to shocks effectively. In particular, investments in irrigation and agricultural research and development can help raise yields. Irrigation also protects farmers from droughts, thus helping to promote resilience. Other options to boost productivity include market-smart input subsidies. To be effective, subsidy programs must be carefully designed to target poor farmers; avoid displacing existing commercial sales; utilize vouchers, matching grants, or other instruments to strengthen private distribution systems; and operate for a limited period of time, with clear exit strategies. Market information systems can also play a role in reducing food price volatility; the spread of mobile phones in rural areas creates new opportunities for disseminating market information widely at a low cost.

Reducing barriers to trade, among African countries and between Africa and the rest of the world, also serves to broaden food markets and dilute the effect of local supply shocks. Although it exposes African markets to the volatility of international markets, this volatility is generally less than that of non-traded food grains subject to weather-related supply shocks. Commodity exchanges have the potential to make commodity markets more transparent and stable, but they have not yet proven their value in food grains outside South Africa.

Reducing the incidence of food insecurity is not just a matter of increasing availability of and access to food; it also requires ensuring that availability and access are maintained over time, avoiding the negative shocks in food consumption associated with crop failure, price volatility, loss of assets, and other risks. A comprehensive strategy should include both risk mitigation and risk adaptation. Risk mitigation refers to programs and policies to decrease the frequency and severity of shocks such as price volatility and droughts, while risk adaptation refers to increasing the ability of households to tolerate negative shocks—that is, building resilience to shocks.

Safety net programs are designed to reduce the incidence of food insecurity among poor and vulnerable households by making targeted transfers. India has launched a national employment-guarantee (or cash-for-work) scheme, while Mexico and Brazil have large conditional cash transfer programs that have catalyzed similar programs elsewhere. The Productive Safety Net Program in Ethiopia combines unconditional cash transfers with food-for-work and cash-for-work programs. These programs have been shown to deliver improved food security and schooling outcomes among poor households. They can be costly, and targeting is a major challenge, particularly in SSA; but, if well designed, their short- and long-term benefits in terms of food security and investment in productive capacity are significant.

4| More Resilient Domestic Food Markets Through Regional Trade

Ousmane Badiane, Sunday Odjo, and Samson Jemaneh

By promoting competition and specialization in production, regional trade, like global trade, can contribute to resilience through long-term impacts on output and productivity growth and induced effects on employment and incomes. Where these effects are positive, trade raises the availability of food as well as the ability of affected groups to access food. Trade also helps reduce the unit cost of supplying food to local markets, thereby lowering food prices or reducing the pace at which they rise, which in turn improves the affordability of food. Finally, trade contributes to resilience by helping stabilize domestic supplies of food and reducing the associated risks for vulnerable groups.

All of the above benefits can be obtained—perhaps to a greater degree—through trade with the rest of world. One might question why a given country should pursue efforts to expand regional trade as opposed to trade in general for the purpose of stabilizing domestic food supplies, given that world production can be expected to be more stable than regional production. Several factors, such as transport costs, foreign exchange availability, responsiveness of the import sector, and dietary preferences, provide valid economic justification for country efforts to boost regional trade, as part of a broader supply stabilization strategy which would also include increased trade with extra-regional markets. Regional and global trade should therefore be seen as complementary rather than as substitutes.

The preceding chapter dealt with the role of global trade in fostering the resilience of domestic food markets. The current chapter is focusing on regional trade. Its objectives are to: (i) analyze the current performance of African countries in regional agricultural markets; (ii) assess the potential contribution of regional trade to local food market stabilization; and (iii) examine the scope to expand cross-border trade within the three main RECs.

Trade performance by African Countries in Regional Agricultural Markets

The extent to which regional trade can contribute to resilience through growth and reduced market volatility depends partly on the capacity of African countries to raise their competitiveness and thereby benefit from rising demand in regional markets. For this purpose, a market share decomposition model is used to analyze the performance of African countries, first at the level of Africa as a whole and then at the REC level. The model decomposes the change in a given country's share in total world trade into a

"competitive effect" and a "market effect," for various products and export market destinations.[8] The competitive effect evaluates the extent to which African countries have been able to raise their competitiveness in regional markets compared to non-African exporters, and how this has contributed to raising their share in global trade. The market effect measures the extent to which trading with regional partners has boosted countries' overall trade performance and raised their share in global trade.

Trade in three categories of products is considered when estimating the competitive and market effects: trade in all goods (in monetary value); trade in agricultural products (in value); and trade in agricultural products (in caloric equivalent). In view of the importance of access to sufficient food to resilience, agricultural trade needs to be measured in terms of caloric content as well as monetary value. The results for Africa as a whole and for each of the main RECs are shown in Tables 4.1, based on data for the period from 2007 to 2011. For Africa as a whole, the results show the competitive and market effects for all African exporters in intra-African markets. For each of the RECs, the results show the competitive and market effects for their member states as a group. A competitive effect greater than 1.00 suggests that the considered group of countries has succeeded in raising its level of competitiveness in the considered market, by expanding its exports to that market faster than the group of competitors. As can be seen from Table 4.1a, African countries have experienced rising competitiveness in trade for all goods in all four markets during the period under consideration. SADC members, in particular, have raised their competitiveness in regional markets considerably, and the next strongest region was ECOWAS.

African countries have, as a group, also grown more competitive in intra-African agricultural trade, as have all regions except COMESA. The strongest gain in competitiveness among regional groupings is in agricultural trade in caloric equivalent. In value terms, ECOWAS experienced the strongest gains in competitiveness; in caloric terms, however, COMESA member countries have led the increase in competitiveness. Looking at the figures for the three regions, it is very likely that the loss of competitiveness in intra-African agricultural markets by the group of all African countries (in caloric equivalent) is driven by changes among North African countries. In sum, the results indicate that African countries have generally become more competitive in intra-African and regional markets over the period under consideration.

The increased competitiveness has in general translated into higher shares of regional markets in total exports, for each of the country groupings. For instance, Africa's share of exports has risen sharply in value terms: from 5 to 21 for all goods, and from 15 to 34 percent for agricultural products. This is in line with the stronger competitive position of African exporters described above. The SADC region has also been able to translate its strong gains in competitiveness into higher regional market shares across all product groups. ECOWAS, in contrast, has seen its regional market shares stagnate or decline, despite increased competitiveness of regional exports, except in the case of agricultural exports in caloric terms. It is interesting to note that all three regions are directing a significantly larger share of their agricultural exports in caloric terms to the regional markets. In contrast, African exports of agricultural products to Africa shows a

[8] See Badiane, 1988 and Magge, 1975.

considerable decline, from 86 to 44 percent in caloric terms. The inclusion of North Africa in the all-Africa group may explain the difference.

Table 4.1b shows the results of the market effect, that is, the impact of relative growth of demand in regional markets on export performance, for the various country groupings. A market effect greater than one indicates that demand for the product in question has increased relatively faster in the considered market than it has globally. The market effect expresses the extent to which relatively faster growth in intra-African and intra-regional markets has contributed to raising the export performance of the country groupings. The idea behind the market effect is that, assuming unchanged competitiveness or constant market shares, the contribution of a given intra-African or intra-regional market to the overall (global) trade performance of the corresponding group of countries will rise or decline depending on whether that market expands faster or slower than world trade on average. The market effect thus measures the change, during the study period, in the importance of intra-African and intra-regional markets as destinations for exports by African countries (as a group and by REC member states, respectively). The figures suggest slightly positive market effects (> 1.00) associated with intra-African and intra-regional markets as destinations of African exports—with the exception of the COMESA market, for trade in agricultural products by its member countries.

To give a better picture of the contribution of African and regional markets to export performance, by country groupings, the market effects

TABLE 4.1a—EXPORT GROWTH DECOMPOSITION: COMPETITIVE EFFECT (2007–2011)

	INITIAL REGIONAL MARKET SHARE, % (2007)*			COMPETITIVE EFFECT			FINAL REGIONAL MARKET SHARE ,% (2011)		
	Goods (Value)	Agriculture (Value)	Agriculture (Kcal)	Goods (Value)	Agriculture (Value)	Agriculture (Kcal)	Goods (Value)	Agriculture (Value)	Agriculture (Kcal)
Africa	5	15	86	1.39	1.25	0.52	21	34	44
COMESA	13	11	6	1.21	0.81	4.57	12	20	32
ECOWAS	22	10	9	1.38	1.75	2.14	11	6	37
SADC	14	7	94	2.40	1.59	5.53	28	42	56

Source: Authors' calculations based on data from FAOSTAT, 2014.
* Share of regional markets in total exports of individual products.

TABLE 4.1b—EXPORT GROWTH DECOMPOSITION: MARKET EFFECT (2007–2011)

	MARKET EFFECT			INITIAL REGIONAL MARKET SHARE, % (2007)*			VALUE OF MARKET EFFECT		
	Goods (Value)	Agriculture (Value)	Agriculture (Kcal)	Goods (Value)	Agriculture (Value)	Agriculture (Kcal)	Goods (US$ millions)	Agriculture (US$ millions)	Agriculture (Kcal Billions)
Africa	1.03	1.04	0.99	5	15	86	339.03	171.10	–1098.65
COMESA	1.02	0.80	0.20	13	11	6	155.86	–222.53	–1146.30
ECOWAS	1.04	1.03	1.17	22	10	9	158.10	20.44	1177.41
SADC	1.04	1.03	1.26	14	7	94	642.84	38.11	11388.13

Source: Authors' calculations based on data from FAOSTAT, 2014.
* Share of regional markets in total exports of individual products.

are expressed in terms of the absolute change in the value of exports (shown in the last three columns of the table). The figures show the actual change in the value of exports of the various products by the different country groupings, compared to the scenario with intra-African and intra-regional markets growing at the same rate as the global average and maintaining constant shares in the exports of their respective country groupings over the entire period. The faster growing intra-African markets have increased the value of all-African overall exports by less than $0.50 billion ($339.03 million), reflecting the initially very low share of intra-African markets in total African exports, at less than 5 percent. Combined, exports by member states of ECOWAS and COMESA to their respective regional markets have risen by virtually the same amount, driven by their higher initial shares of 22 and 13 percent, respectively. The SADC regional market made, by far, the largest contribution in terms of boosting the value of all goods exports by its member countries, amounting to $642.84 billion, nearly twice as much as the contribution of the African destination to overall African exports.

In the case of agricultural trade, the contribution of African and regional markets to exports by African countries is more varied. The COMESA region as a destination has contributed negatively to exports from its member countries, with a market effect value of $-222.53 million, due to slower expansion of demand compared to the global average. In contrast, the ECOWAS market, with $20.44 million, and the SADC market, with $38.1 million, made positive contributions to country exports, as did the African market as a whole, with $171.1 million. In terms of agricultural exports in caloric equivalent, the contribution of the COMESA market is again negative, as it is for the intra-African market as a whole.

The above analysis indicates relatively strong trade performance in general by Africa as a whole and by the main RECs during the period under consideration. Countries have gained in competitiveness, and the continental and regional markets have boosted export growth, except in the case of agricultural exports among COMESA member countries. Countries are also, in general, directing larger shares of their agricultural exports, especially in caloric terms, to continental and regional markets. There are indications, therefore, that trade among African countries is contributing to competitiveness, growth, and increased food supplies. Hence, the longer term impact pathway from trade to resilience seems to be working. Another impact pathway of trade, in the shorter run, is to make domestic food and agricultural markets more resilient to shocks, the subject of the next section.

Regional Potential for Stabilization of Domestic Food Markets Through Trade

Variability of domestic production is a major contributor to local food price instability among low income countries. The causes of production variability tend to affect individual countries rather than an entire region. Moreover, fluctuations in national production tend to partially offset each other. To the extent that such fluctuations are less than perfectly correlated, food production can be expected to be more stable at the regional level than at the individual country level. If that is the case, expanding cross-border trade and allowing greater integration of domestic food markets would reduce supply volatility and price instability in these markets. Integration of regional markets through increased trade raises the capacity of domestic markets to absorb local price risks by: (i) enlarging the areas of production and consumption, and thus increasing the volume of demand and supply that can be adjusted to dampen the effects of shocks; (ii) providing incentives to invest in marketing services and to expand capacities and activities in the marketing sector, which raises the capacity of the private

sector to respond to future shocks; and (iii) lowering the size of needed carry-over stocks, thereby reducing the cost of supplying markets during periods of shortage and hence the likely amplitude of price variation.

A simple comparison of the variability of cereal production in individual countries against the regional average illustrates the potential for local market stabilization through greater market integration. For that purpose, a trend-corrected coefficient of variation is used as a measure of production variability at the country and regional levels. Country coefficients are then normalized, by dividing by the respective regional coefficients. Calculations are carried out for each of three regional economic groupings (COMESA, ECOWAS, and SADC). The results are presented in Supplementary Annex Table S.4.1 and plotted in Figures 4.1a–c. The bars represent the normalized coefficients of variation, which indicate by how much an individual country production level is either more volatile (>1) or less volatile (<1) than production in the respective regions.

Of the three regions, SADC has the highest level of aggregate volatility, with a coefficient of variation of 18.58, or more than twice that of ECOWAS and three times that of COMESA. For the vast majority of countries, national production volatility is considerably larger than regional level volatility. The only exceptions are the Democratic Republic of Congo (DRC) in SADC and, to a lesser extent, Côte d'Ivoire in ECOWAS. None of the COMESA countries has production that is more stable than the regional aggregate. The COMESA countries comprise two main sub-groups: a relatively low volatility sub-group, with normalized coefficients of less than twice the regional average, including Burundi, Comoros, DRC, Egypt, and Uganda; and a high volatility regional sub-group, with volatility levels that are at least five times higher than the regional level, comprised of Malawi, Mauritius,[9] Rwanda, Sudan, Swaziland, Zambia, and Zimbabwe. Kenya and Madagascar from a third sub-group, with moderate levels of volatility. In SADC and ECOWAS, most countries would be in the moderate category. A few countries in those regions show volatility levels more than three times higher than the respective regional levels: Botswana and Mauritius, in SADC; and Gambia, Liberia, Mali, and Senegal, in ECOWAS. Countries in the moderate and high volatility sub-groups would be the biggest beneficiaries of increased regional trade, in ensuring greater stability of domestic supplies.

A given country is more likely to benefit from the trade stabilization potential suggested by the difference between its volatility level and the regional average, if its fluctuation in production shows weaker correlation with that of other countries in the region. Coefficients of correlation for the three groups of countries are presented in Supplementary Annex Tables S.4.2–4.4. Figures 4.2a-c present the distribution of correlation coefficients among individual country production levels, for each regional group. For each country, the lower segment of the bar shows the percentage of correlation coefficients that are 0.65 or less—that is, the share of its regional partner countries whose production fluctuations are relatively weakly correlated with the country's own production movements. The top segment represents the share of countries with highly correlated production fluctuations, with coefficients that are higher than 0.75. The middle segment is the share of moderately correlated country productions, with coefficients that fall between 0.65 and 0.75.

[9] Mauritius has a coefficient that is more than 18 times the regional average and is not shown on the figure for the sake of clarity.

FIGURE 4.1—CEREAL PRODUCTION INSTABILITY (1980–2010)

Figure 4.1a: COMESA Cereal Production Instability (normalized)

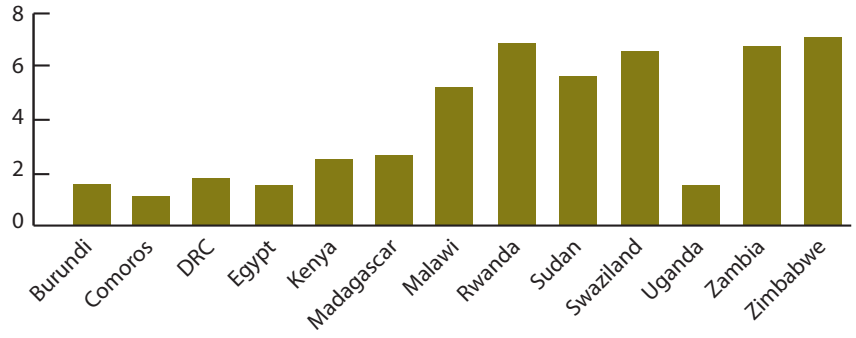


Figure 4.1b: ECOWAS Cereal Production Instability (normalized)

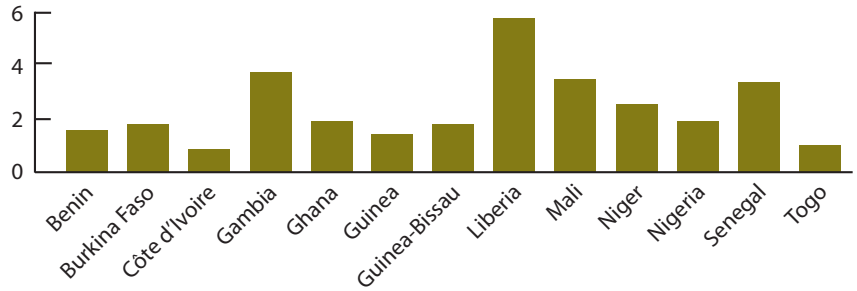
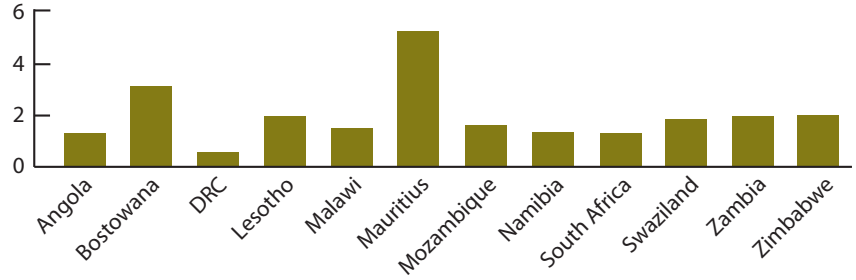


Figure 4.1c: SADC Cereal Production Instability (normalized)



Source: Authors' calculations based on FAOSTAT 2014 data for the period 1980–2010.

FIGURE 4.2—DISTRIBUTION OF CORRELATION COEFFICIENTS

Figure 4.2a: Distribution of production correlation coefficients, COMESA

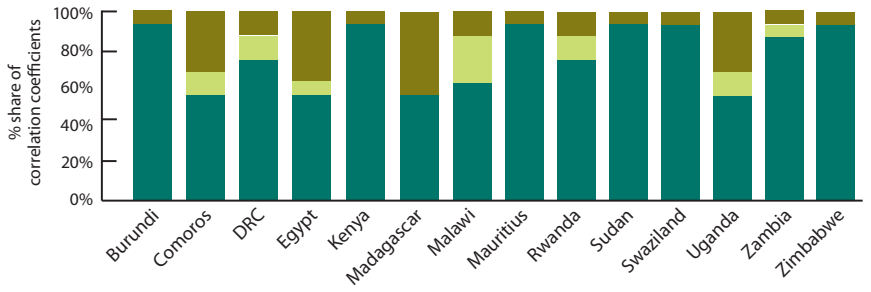


Figure 4.2b: Distribution of production correlation coefficients, ECOWAS

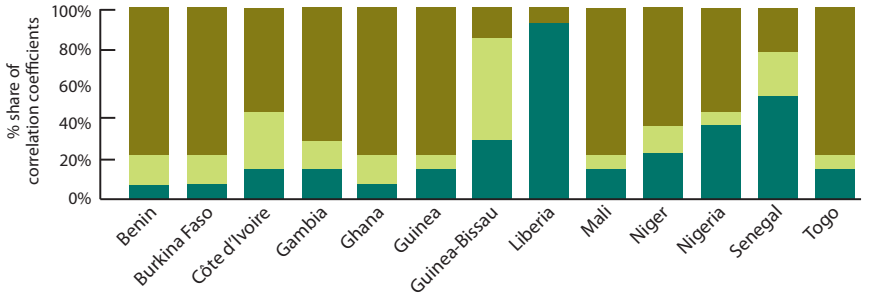
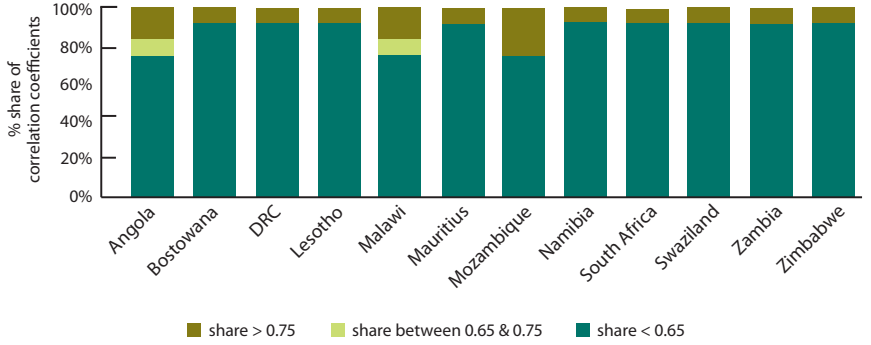


Figure 4.2c: Distribution of production correlation coefficients, SADC



Source: Authors' calculations based on FAOSTAT 2014 data for the period 1980–2010.

Using these criteria, countries in the most volatile region, SADC, have the highest concentration of weakly correlated country production levels. As seen in Figure 4.2c, all but three of its countries have a greater than 80-percent share of correlation coefficients below 0.65. The combination of high volatility and weak correlation suggests that countries in this region would reap the largest benefit from increased regional trade in terms of domestic market stabilization. They are followed by COMESA countries, where 60 percent of the correlation coefficients for any given country are below 0.65. In contrast, country level production levels in the ECOWAS region tend to fluctuate in tandem, more than in the other two regions, as shown by the high share of coefficients that are above 0.75. The division of the ECOWAS region into two nearly uniform sub-regions, Sahelian and coastal, may contribute to this pattern. In general, however, the patterns and distribution of production fluctuations across countries in all three regions are such that increased trade could be expected to contribute to stabilizing domestic agricultural and food markets.

Scope for Specialization and Regional Trade Expansion in Agriculture

The intra-African and intra-regional trade shares presented in Table 4.1a, though higher than a couple of decades ago, are still very low in the case of trade for all goods. SADC has the highest shares of intra-regional trade and ECOWAS the lowest. Intra-regional trade in agricultural products in value terms remains low in COMESA and ECOWAS, in particular, with shares of 20 and 6 percent respectively. SADC has a higher share, but its member countries still account for far less than half of the value of agricultural trade within the region.

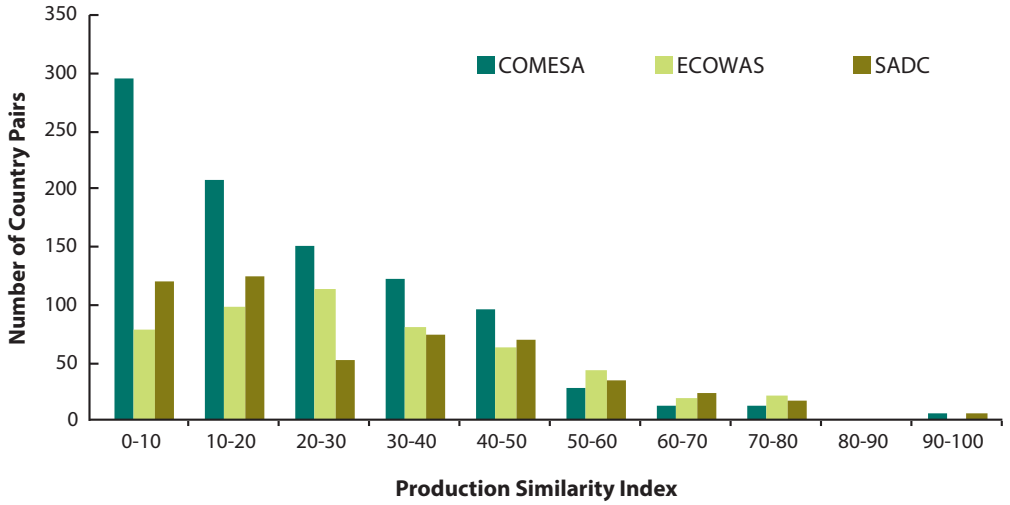
As discussed in more detail below, several factors contribute to low intra-regional trade, making trading with extra-regional partners more attractive while raising the cost of supplying regional markets from intra-regional sources. Regional stabilization (in regions where it shows promise) would require measures to lower the barriers to trans-border trade, to stimulate the expansion of regional supply capacities—assuming that there is sufficient scope for specialization between the sub-regions. It is often assumed that neighboring developing countries have similar production and trading patterns, because of similarities in their resource bases. However, several factors may lead to differences in specialization patterns among such countries: (i) differences in historical investments in technologies, and thus the level and structure of accumulated production capacities and skills; (ii) the economic distance to distant markets; and (iii) differences in dietary patterns and other consumer preferences that affect the structure of local production. The distinctive patterns of specialization of Senegal as compared to the rest of Sahelian West Africa, and of Kenya as compared to other East African countries, illustrate the influence of these factors.

A series of indicators is used to assess the actual degree of country specialization in agricultural production and trade. This can show whether expanded trans-border trade might successfully exploit the regional divergence in national production levels, to enhance the resilience of domestic food markets to shocks. The first two indicators are the production index and export similarity index, which measure (and rank) the importance of the production and export of individual agricultural products for each country. The level of importance of each product is then compared for all relevant pairs of countries within each sub-region.[10] Each

[10] See Koester, 1986.

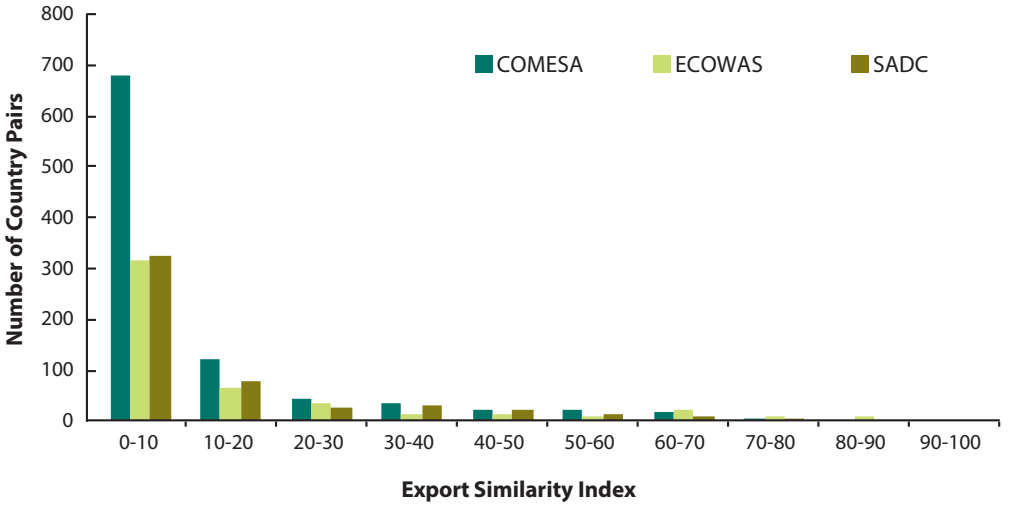
of the two indices has a maximum value of 100, which would reflect complete similarity of production or trade patterns between the pair of countries. The lower the value of the indices, the greater the degree of specialization between the two countries. Index values of around 50 and below indicate patterns of specialization that are considered compatible with higher potential trade expansion. The results of the calculations for the three regional groupings, covering 150 products, are presented in Supplementary Annex Table S.4.5 and plotted in Figures 4.3 a and b. Each bar represents the number of country pairs that falls within the corresponding range of index values. The graphs show that, for all three regions, the vast majority of country pairs fall within the 0-50 range. In other words, the current dissimilarity in country production and trading patterns indicates that scope exists for trans-border trade expansion in all three sub-regions.A third indicator, the revealed comparative advantage (RCA) index, is designed to further assess the degree of country specialization in production and trade. The index compares the share of a given product in a country's export basket with the share of the same product in total world exports. A value greater than 1 indicates that the country performs better than the world average; the higher the value, the stronger the country's performance in exporting the product. For COMESA countries, of the nearly 600 RCA indicators estimated for various exports, 70 percent have a value higher than 1.

FIGURE 4.3a—SIMILARITY OF PRODUCTION PATTERNS (2007–2011)



Source: Authors' calculations based on data from FAOSTAT, 2014.

FIGURE 4.3b—SIMILARITY OF TRADING PATTERNS (2007–2011)



Source: Authors' calculations based on data from FAOSTAT, 2014.

ECOWAS and SADC, with about 450 indicators each, show results similar to COMESA: 68 percent for SADC, and 73 percent for ECOWAS. For each regional grouping, the 20 products with the highest normalized RCA index values are presented in Table 4.2. The normalized RCA is positive for RCA indicators that are greater than 1 and negative otherwise.[11] For very high RCA indicators, the normalized value tends toward 1. RCA estimates

TABLE 4.2—PRODUCTS WITH HIGHEST REVEALED COMPARATIVE ADVANTAGE (RCA) INDICES BY REGION (AVERAGE 2007-2011)

COMESA		ECOWAS		SADC	
Commodity	**Country**	**Commodity**	**Country**	**Commodity**	**Country**
Cloves	Comoros	Cashew nuts, with shell	Guinea-Bissau	Vanilla	Madagascar
Vanilla	Comoros	Cake of groundnuts	Gambia	Cloves	Madagascar
Vanilla	Madagascar	Groundnut oil	Gambia	Coffee husks and skins	Tanzania
Coffee husks and skins	Uganda	Cashew nuts, with shell	Benin	Tobacco, unmanufactured	Malawi
Cloves	Madagascar	Groundnuts shelled	Gambia	Cotton carded, combed	Malawi
Oil essential nes	Comoros	Cashew nuts, with shell	Gambia	Cashew nuts, with shell	Tanzania
Coffee husks and skins	Burundi	Groundnut oil	Senegal	Cake of cottonseed	Zimbabwe
Sesame seed	Ethiopia	Copra	Gambia	Cake of cottonseed	Tanzania
Skins dry sltsheep	Ethiopia	Cake of groundnuts	Senegal	Cotton carded,combed	Tanzania
Coffee subst. cont. coffee	Rwanda	Cake of cottonseed	Benin	Cloves	Tanzania
Coffee husks and skins	Kenya	Rubber nat dry	Liberia	Coffee subst. cont. coffee	Malawi
Goat meat	Ethiopia	Cottonseed oil	Togo	Sesame oil	Tanzania
Cotton carded, combed	Uganda	Cottonseed oil	Benin	Cashew nuts, with shell	Mozambique
Sesame seed	Eriteria	Sugar beet	Gambia	Hides nes	Zimbabwe
Tobacco, unmanufactured	Malawi	Cashew nuts, with shell	Côte d'Ivoire	Cotton linter	Zimbabwe
Oilseeds, nes	Ethiopia	Cotton linter	Benin	Tobacco, unmanufactured	Zimbabwe
Broad beans, horse beans, dry	Ethiopia	Cocoa beans	Côte d'Ivoire	Cotton linter	Malawi
Cotton carded, combed	Burundi	Cake of groundnuts	Togo	Tea	Malawi
Skinsdry sltsheep	Rwanda	Cocoa paste	Côte d'Ivoire	Cotton waste	Malawi
Tea	Rwanda	Cocoa beans	Ghana	Peas, green	Zimbabwe

Source: Authors' calculations based on FAOSTAT, 2014.

[11] The formula for the normalized RCA is (RCA-1)/(RCA+1).

for the highest ranking products are presented in Supplementary Annex Tables S.4.6–8.

All the products listed in the table have normalized RCA values above 0.98. The rankings reflect the degree of cross-country specialization within each REC. In ECOWAS, for instance, a total of 12 products, spread across 8 of the 15 member countries, account for the highest 20 indicators for the region. COMESA has 13 products in that category, produced by 9 of its 19 countries. SADC has the highest number of products in that category—a total of 14, produced by only 5 of its 15 countries.

The table also illustrates the difference in degree of specialization among the three major regions. Of the top ranking products, only two are common to both the ECOWAS and SADC regions (carded/combed cotton and cashew nuts in shell). Between COMESA and SADC, only six of the top ranking products are common to the two regions, while no common top ranking products are found between COMESA and ECOWAS.

By looking at the RCA values for the entire set of products and countries, we can see more clearly the degree of specialization across all countries in the three regions. For two or more countries with similar patterns of specialization, the same products would tend to rank equally high, and the values of the RCA indicator for the same product would not vary significantly across countries. However, for countries with dissimilar patterns of specialization, exports by individual countries would be concentrated around a few products, with substantial variation of the indicator value across products. An analysis of the variance of the RCA index is used to indicate the relative weight of these two possibilities. The results of the analysis, presented in Table 4.3, show that for the entire sample of African countries, nearly two-thirds (63 percent) of the total variation of the RCA index across countries and commodities is accounted for by country-to-country variation. The balance of variation is explained by variation across products. The RCA index, like the previous two indicators, thus confirms the existence of dissimilar patterns of trade specialization in agricultural products.

TABLE 4.3—ESTIMATION OF RCA VARIABILITY ACROSS COUNTRIES AND PRODUCTS

Source of variance		Sequential Sum of Square	Mean squared	F	P-value	Share of variation explained
Model		1489.66	6.03	46.63	0.00	72.86%
	Countries	936.94	23.42	181.09	0.00	45.82%
	Products	552.44	2.68	20.73	0.00	27.02%
	Years	0.28	0.28	2.19	0.14	0.01%
Residual		555.03	0.129			27.14%
Total		2044.69	0.45			
Number of obs.	4539	R-squared	0.73	R-squared adj	0.71	

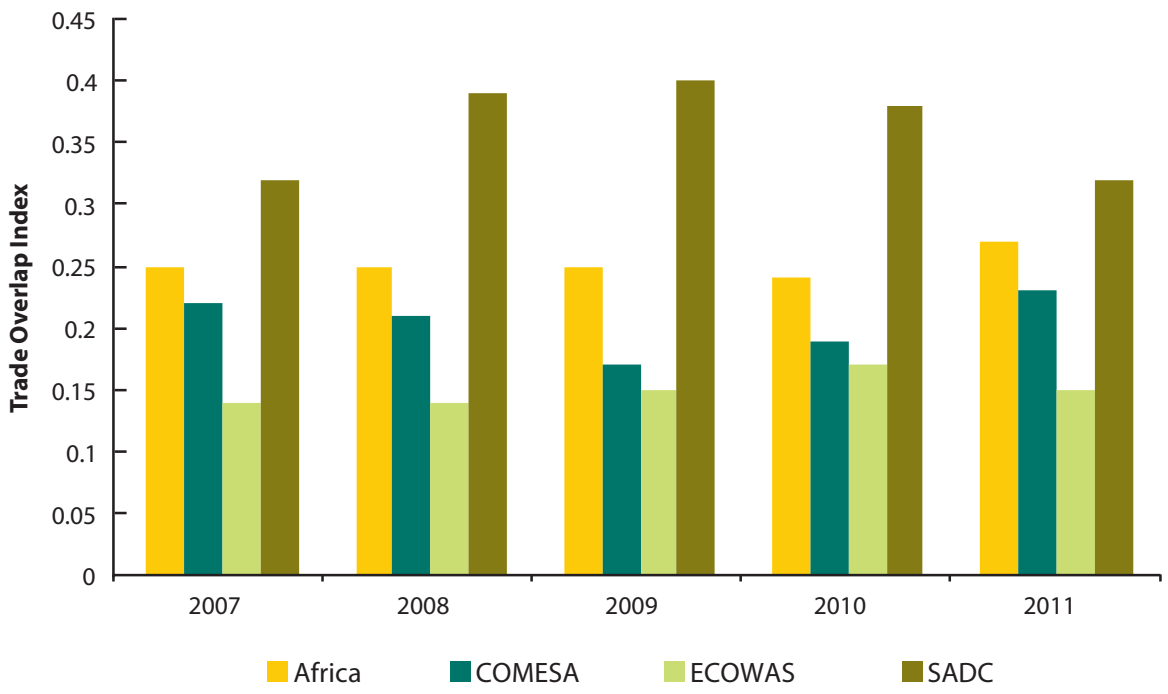
Notes: RCA: revealed comparative advantage. The mean square (defined as the partial sum of squares /degrees of freedom) is used to compute the F-statistic and determine the significant amounts of variation. This ANOVA is without interaction terms, due to missing values from the data. A time factor is included.

So far, the analysis has established the existence of dissimilar patterns of specialization in production and trade of agricultural products among countries within and across the three major regions. Two final indicators, the Trade Overlap Indicator (TOI) and the Trade Expansion Indicator (TEI), are then calculated to examine

the potential to expand trade within the three blocks of countries, based on current trade patterns. They measure how much of a given product a particular country (or region) exports and imports at the same time. The TOI measures the overall degree of overlapping trade flows for a country or region as a whole, while the TEI measures the overlapping trade flows at the level of individual products for a country or region. The results are presented in Figure 4.4 and Table 4.4. Figure 4.4 indicates a considerable degree of overlapping trade flows: 25 percent for Africa as whole, and as much as 40 percent for the SADC region.

A comparison of the regional TOI values in Figure 4.4 and the TOI values of individual countries (Supplementary Annex Tables S.4.12 to S.4.14) shows that regional indicators are significantly higher. The tables show the normalized TOI, obtained by dividing country values by the value for the respective region. The numbers express country TOI as a fraction of regional TOI, which in the vast majority of cases is found to be significantly less than 1. The overlapping regional trade flows must therefore be from different importing and exporting countries. In other words, some countries are exporting (importing) the same products that are being imported (exported) by other member countries in their respective groupings, but trade with countries outside the region. By redirecting such flows, countries should be able to expand trans-border trade within each of the groupings. The TEI indicates which products have the highest potential for increased trans-border trade, based on the degree of overlapping trade flows. Table 4.4 lists the 20 products with the highest TEI value for each of the three regions. The lowest indicator value for any of the products across the three regions is 0.41. The RCA values for those products are listed in Supplementary Annex Tables S.4.9 to S.4.11. Only three products—fresh fruits in ECOWAS, bananas in COMESA, and chocolate

FIGURE 4.4—TRADE OVERLAP INDICATORS (AVERAGE 2007–2011)



Source: Authors' calculations based on FAOSTAT, 2014.

products in SADC—have RCA values less than 1. The fact that products with high TEI also have high RCA indicator values points to real scope for trans-border trade expansion in all three sub-regions.

Outlook for Regional Cross-Border Trade Among Leading RECs

The preceding analysis presents evidence showing that African countries could use increased regional trade to enhance the resilience of domestic markets to volatility in food supply. The analysis also showed that, even with current production and trade patterns, there is real scope to expand cross-border trade beyond the levels shown in Tables 4.1. The high cost of moving goods across domestic and trans-border markets and an outwardly-biased trading infrastructure are major determinants of the level and direction of trade among African countries. A strategy to exploit Africa's regional stabilization potential, therefore, has to include measures to lower the general cost of trading and remove additional barriers to cross-border trade. This section simulates the impact on regional trade flows of such changes. Simulations of changes are carried out using IFPRI's regional Economy-wide Multimarket Model (EMM). (See Diao et al., 2007, and Nin-Pratt et al., 2010.)

The original multi-market model is augmented in this study to account for intra- versus extra-regional trade sources and destinations, as well as informal versus formal trade costs in intra-regional trade transactions. In its original version, the EMM solves for optimal levels of supply, demand, and net trade (either import or export) of different commodities in several interlinked crop and non-crop markets. In the version used in this study, the net export of any commodity is an aggregate of two output varieties based on intended market outlet (regional or extra-regional), while assuming an imperfect transformability between these two export varieties. Similarly, the net import of any commodity is composed of two varieties differentiated by their origins (regional or extra-regional), while assuming an imperfect substitutability between the two import varieties.

The model is then calibrated so as to replicate production, consumption, and net trade data as observed for disaggregated agricultural subsectors as well as two aggregate non-agricultural sectors for individual countries in 2007–2008. Baseline trend scenarios are constructed such that, until 2025, changes in crop yields, cultivated areas, outputs, and GDP reflect changes observed in historical data. Supplementary Annex Table S.4.15 compares the calibrated agricultural and economy-wide GDP growth rates under the baseline scenario with the observed rates in recent years. Although the model is calibrated to the state of national economies seven years earlier, it reproduces closely the countries' current growth performances.

Four different scenarios are simulated using the EMM model. The first is a baseline scenario that assumes a continuation of current trends up to 2025; this is later used as a reference to evaluate the impact of changes under the remaining three scenarios. The latter scenarios introduce three different sets of changes to examine their impacts on regional trade levels: (1) a reduction of 10 percent in the overall cost of trading across the economy; (2) a removal of all cross-border trade barriers, that is, a reduction of their tariff equivalent to zero; and (3) an across-the-board 10-percent increase in yields. These changes are to take place between 2008, the base year, and 2025. The projected change in cross-border exports is used as an indicator of the impact on intra-regional trade. In the original data, there are large discrepancies between recorded regional exports and import levels, the latter often being a multiple of the former. The more conservative export figures are therefore the preferred indicator of intra-regional trade.

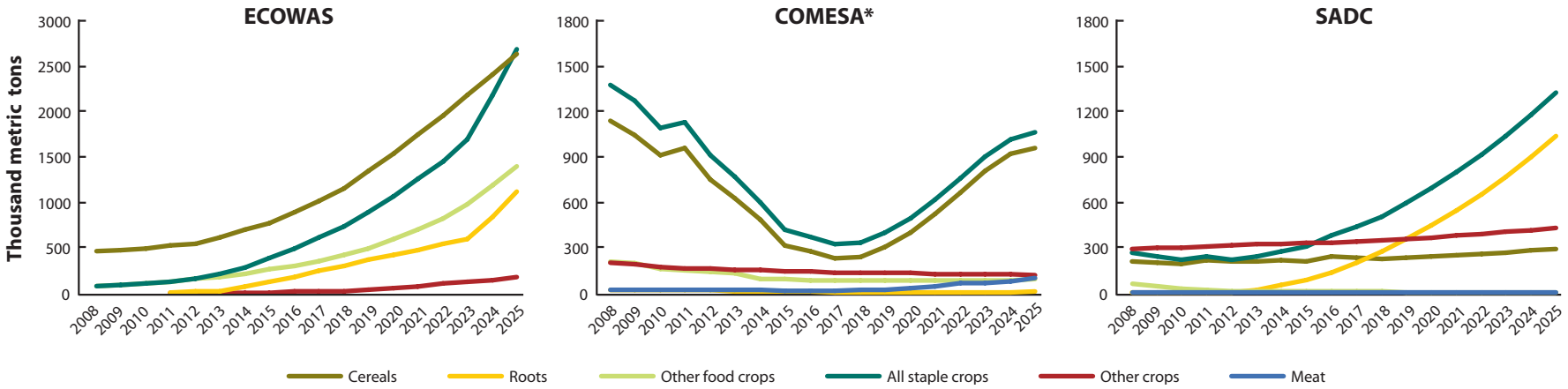
The results for the different regions are presented in Figures 4.5. The figures on the top present the results of the baseline scenarios for the three regions from 2008 to 2025. Assuming a continuation of current trends, intra-regional trade in both ECOWAS and SADC is expected to expand rapidly but with marked differences between crops. In the aggregate, the volume of intra-regional trade in staples would approach 3 million tons in the case of ECOWAS and about half that amount in the case of SADC, if the current rates of growth in yields, cultivated areas, and income growth are sustained

TABLE 4.4—TRADE EXPANSION INDICATORS (AVERAGE 2007–2011)

COMESA		ECOWAS		SADC	
Commodity	**TEI value**	**Commodity**	**TEI value**	**Commodity**	**TEI value**
Beans, dry	0.825	Tobacco products	0.926	Pepper (piper spp.)	0.919
Sugar confectionery	0.821	Fatty acids	0.763	Cake, cottonseed	0.856
Vegetables, preserved	0.819	Groundnuts, shelled	0.744	Cottonseed	0.849
Juice, fruit	0.819	Hides, cattle, wet salted	0.681	Cigarettes	0.815
Cigarettes	0.782	Coffee, extracts	0.676	Hair, fine	0.811
Spices,	0.716	*Fruit, fresh*	0.620	Bran, wheat	0.797
Sugar raw centrifugal	0.716	Fruit, tropical fresh	0.592	Waters, ice etc	0.783
Fruit, prepared	0.703	Cigarettes	0.573	Bran, maize	0.782
Groundnuts, shelled	0.700	Tea, mate extracts	0.535	Fruit, dried	0.776
Cake, cottonseed	0.680	Oilseeds	0.524	Sugar	0.774
Pineapples	0.677	Onions, dry	0.513	Cider etc	0.762
Cereal preparations	0.665	Oil, cottonseed	0.510	Molasses	0.759
Anise, badian, fennel, coriander	0.655	Pepper (piper spp.)	0.479	Juice, fruit	0.749
Waters, ice etc	0.655	Margarine Short	0.456	Onions, dry	0.743
Cheese, whole cow milk	0.604	Roots and tubers	0.454	Flour, cereals	0.730
Bananas	0.592	Cereal preparations	0.439	*Chocolate products*	0.723
Bran, wheat	0.586	Chickpeas	0.415	Meat, pig, preparations	0.715
Tobacco products	0.586	Vegetables fresh or dried products	0.412	Cauliflowers and broccoli	0.712
Pepper (piper spp.)	0.578	Fruit, prepared	0.412	Coconut(copra) oil	0.705
Orange juice, single strength	0.566	Pineapple, canned	0.406	Vegetables frozen	0.697

Source: Authors' calculations based on FAOSTAT, 2014.
Note: Italics designate products with RCA < 1. Products with high TEI but which are not being produced in the regions are included, as they relate to re-export trade; there are two each for COMESA and SADC and six for ECOWAS.

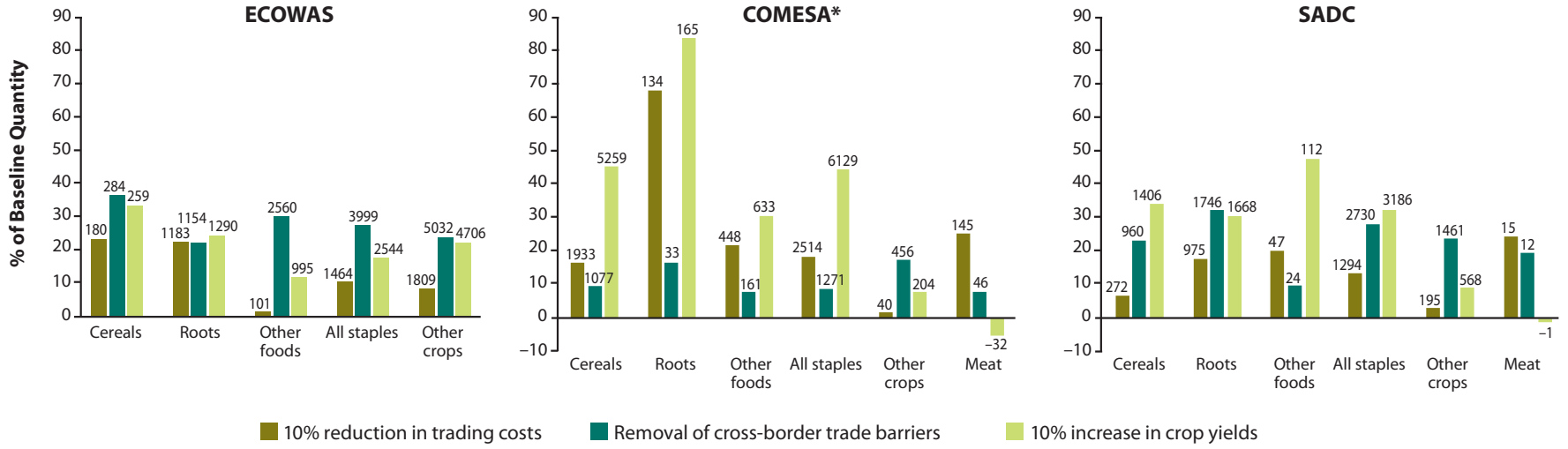
FIGURE 4.5a—REGIONAL EXPORTS OUTLOOK, BASELINE



Source: Authors' calculations.

Note: * COMESA+Tanzania

FIGURE 4.5b—THE IMPACT OF CHANGES IN TRADING COSTS AND YIELDS ON REGIONAL EXPORTS



Source: Authors' calculations.

Notes: Notes: * COMESA+Tanzania. Figures on top of bars indicate cumulative increases in regional export supply in 1000 mt.

to 2025. Cereals would see the smallest gains, while trade in roots and tubers as well as other food crops would experience much faster growth in the case of ECOWAS. This is in line with the current structure of, and trends in, commodity demand and trade. While the increase in demand for roots of tubers is being met almost exclusively from local sources, the fast-growing demand in cereals is heavily tilted towards rice, which is supplied from outside of the region. The two leading cereals that are traded regionally, maize and cereals, therefore benefit less from the expansion of regional demand and have historically seen slower growth in trade than roots and tubers. In the case of SADC, the rise of Angola as a main exporter of roots and tubers (starting in 2013) mainly accounts for the strong boost in regional trade for that commodity. The sole exporter before was Zimbabwe, with very modest quantities, hence the high rates of growth of overall regional exports.

The story is a bit different in the case of COMESA. As was already apparent from the market share analysis carried out in section 4.1, the COMESA regional market has been the least dynamic of the three regional markets and the only one associated with a negative market effect. COMESA is the only region where member countries as a group have experienced a decline in competitiveness. The underwhelming performance is reflected in the baseline scenario. If current trends were to continue, COMESA's levels of intra-regional trade would continue to stagnate, except in the case of cereals. And even in the latter case, the decline in trade volumes would be reversed, but not enough to restore their initial levels. The projected evolution of the cereals trade reflects country dynamics and a shift in the sources of regional exports. The fall in regional trade levels at the beginning of the period is a result of continuing decline in exports from the two main traditional suppliers, Egypt and Malawi. At the same time, faster growth in several other countries, particularly Tanzania and Ethiopia, results in rising exports from these countries (starting from 2011 for Tanzania and from 2019 for Ethiopia). The result is a U-shaped pattern in COMESA cereals exports, as the declines in some countries are eventually outweighed by increases in others.

The graphs in Figure 4.5b show the cumulated changes in intra-regional export levels by 2025, as compared to the baselines, that would result from a reduction in total trading cost, removal of trans-border trade barriers, and an increase in yields. The bars represent the proportional changes in percent, and the numbers on top of the bars indicate the corresponding absolute changes in 1000 metric tons. The results invariably show considerable increases in intra-regional trade in cereals and roots and tubers, the main food crops, in response to changes in trading costs and yields. In ECOWAS, intra-community trade levels climb by between 10 and 35 percent for most products over the entire period. The volume of cereal trade increases by a cumulative total of between 200,000 and 300,000 mt for individual products, and that of overall trade in staples by between 1.5 and 4.0 million tons by 2025, compared to baseline trends. Cereals seem to respond better than other products in general. It also appears that removal of trans-border barriers to trade would have the strongest impact on trade flows across the board.

The COMESA region shows similar increases in overall trade in staples. Cereals trade tends to respond less in proportional terms but, because of initially higher levels, the accumulated additional volume of regional trade is much higher, ranging from 0.7 million to more than 3.0 million tons above the baseline. Also, compared to ECOWAS, COMESA intra-regional trade seems to respond more to changes in overall costs of trading and yields than to changes cross-border barriers. This may be explained by the fact that equivalent tariffs constitute a smaller fraction of producer prices, and hence changes in barriers result in smaller changes in incentives. Trade in the SADC region too seems to respond more to changes in trans-border

trade barriers and yields, as in the case of ECOWAS. A 10 percent increase in yields would raise SADC trade in staples by a cumulative volume of slightly more than 3.0 million tons by 2025 compared to the baseline scenario.

Conclusions

The potential to use increase intra-regional trade among Africa's main RECs presents one means to increase the resilience of domestic food markets to supply and price shocks. The distribution and correlation of production volatility, as well as the current country patterns of specialization in production and trade of agricultural products, suggest that it is indeed possible to raise cross-border trade to address the instability of local food markets. The fact that countries, in general, have been able to improve export competitiveness in regional markets and raise regional trade shares is encouraging in this regard. The results of the baseline scenario indicate that continuation of recent trends would sustain the expansion of intra-regional trade flows in all three regions, particularly in the ECOWAS region. The findings also reveal that it is possible to significantly boost the pace of regional trade expansion, and thus its contribution to creating more resilient domestic food markets, through a modest reduction in the overall cost of trading, a similarly modest increase in crop yields, or the removal of barriers to trans-border trade.

5| Regional Trade Flows and Resilience in COMESA and ECOWAS Countries

Carlo Azzarri, Gianfranco Piras, Cleo Roberts, Jawoo Koo, Zhe Guo, and Queenie Yue Gong

The production landscape and its characteristics influence the relationship between trade, biophysical conditions, and climate variability. Agricultural production directly affects the level of potential output that can be exported and is indirectly (and inversely) correlated with the level of imports, given the substitution effect between internally produced and externally procured goods to maintain a steady level of internal consumption. Production characteristics and conditions are extremely heterogeneous across SSA, indicating spatial variability in production. Moreover, local natural conditions are strongly correlated with the ability of households to adapt to or manage shocks, that is, their "resilience."

A shock that occurs in a specific country also affects all commercial partners: on the import side, through variation in income and associated changes in demand; and on the export side, through changes in production. The purpose of this chapter is to shed light on the mechanisms that create these ripple effects in SSA. The chapter explores the relationship between biophysical characteristics and trade flows, and specifically the way the former impacts the latter (both imports and exports). It also examines to what extent trade flows are dependent on households' resilience to shock. The geographical focus is countries in the ECOWAS and COMESA regions, with their extensive country-level commercial relations.[12]

COMESA represents 19 countries in Africa, which together represent over 400 million people, $32 billion/year in imports, and $82 billion/year in exports. ECOWAS comprises 15 west African countries which in total represent about 300 million people and $316 billion in GDP. In 2008, ECOWAS imports and exports with the rest of the world were valued at $53 billion and $64 billion, respectively (Ecostat, 2009), and trade volume continues to grow. This study focuses on 23 countries across COMESA and ECOWAS for which all required data for the analysis are available; it covers the period from 1993 to 2010.

Food consumption in the two regions is highly responsive to income, and any shock that reduces income is likely to be accompanied by a reduction in food consumption (Rakotoarisoa et al., 2011). Climate change will likely exacerbate African countries' difficulties in meeting the needs of their residents. Exposure to climate change will be most serious in rural areas, where the population is dependent on agricultural markets for both food and their livelihoods (Winters et al., 1998).

[12] Because most SADC countries are included in COMESA, the analysis did not include the former community.

Agricultural Production, Imports and Exports

The Food and Agriculture Organization's (FAO's) FAOSTAT provides comprehensive trade statistics for all countries, collected from national authorities and international organizations. Most countries report export values as Free-On-Board (FOB: excluding insurance/transport costs); import values are mostly reported as Cost-Insurance-Freight (CIF: including insurance/transport costs).

The reported exports of one country do not always coincide with the reported imports of its partner country. There are several reasons for these differences, including: time lag between exports and imports (goods leaving country A in 2002 may not reach country B until 2003); goods that are transported and processed via third party countries; and different classification of goods in reporting countries. For a given agricultural commodity, in most cases the export value is lower than the corresponding import value. FAOSTAT applies a standard incremental factor of 12 percent to all export values in order to standardize the statistics, even though actual adjustments may vary by commodity, distance, packaging, and other factors. Analysis of individual/specific data show that the range of necessary adjustments could be between 10 percent and 35 percent at a minimum (FAOSTAT, 2014).

In addition to FAOSTAT, the analysis uses spatially-explicit data for 42 crops based on IFPRI/HarvestChoice's Spatial Production Allocation Model (SPAM), relating to the extent of total cropland area, production, and yield (You et al., 2014). The SPAM model starts with production statistics by sub-national administrative (geopolitical) units, and analyzes the land cover imagery as crop land or non-crop land. SPAM then integrates crop-specific suitability information based on local climate and soil conditions, at the pixel level. Finally, SPAM utilizes all these input data and applies a cross-entropy approach to obtain the final estimation of crop distribution across the globe. SPAM output reveals differences in yield according to technology practices as well as emergent patterns between geography and agriculture. This study examines these differences by using the SPAM model alongside FAO trade data.

Variables

Biophysical Risk

This study takes into account the effects of agroecological variables on agricultural trade, such as rainfall, temperature, vegetation, land degradation, and forest coverage. Monthly rainfall and temperature data (0.5 degree grids; 60 km resolution) were obtained for the years 1993–2010 from the University of East Anglia CRU-TS database. Trend of vegetation, measured using NDVI (Normalized Difference Vegetation Index), was provided by two data products from NASA: AVHRR for 1993–2009; and MODIS for 2010. NDVI, derived from remote sensing of satellite imageries at moderate resolution, has been in use since the 1980s to measure and monitor plant growth (vigor), vegetation cover, and biomass production, based on multispectral satellite data. It is one of the widely used vegetation indices to identify vegetated areas and assess their conditions based on the detection of live green plant canopies in multispectral remote sensing data (Running et al., 1995, Doraiswamy et al., 2004). NDVI summarizes the effect of soil characteristics, rainfall, temperature, length of growing period, and irrigation (Dixon et al., 2001; NASA, 2011; Sanchez et al., 2003; Hijmans et al., 2005; Fischer et al., 2007). Low soil nutrients data comes from CIESIN, Columbia University, 2000. It is one of the standard product from the fertility capability soil classification (FCC) system that has been widely used to interpret soil taxonomy and additional soil attributes in a way that is directly relevant to plant growth. The tree coverage data was provided by University of Maryland, 2000. The tree cover continuous field product is

offered at 1 kilometer resolution, and vegetation is represented as continuous fields of land cover, so that every pixel has a percentage value for tree cover.

Crop and Livestock Disease Risk

We used crop disease, pest, and weed prevalence data from a recent study (Rosegrant et al., 2014) that compiled the agroclimatic prevalence of regionally representative crop diseases, insect pests, and weed species, at 0.5 degree grids for maize, rice, and wheat. These data were aggregated across the three crops as weights, using the gridded harvested area from SPAM (You et al., 2014).

Socioeconomic Setting

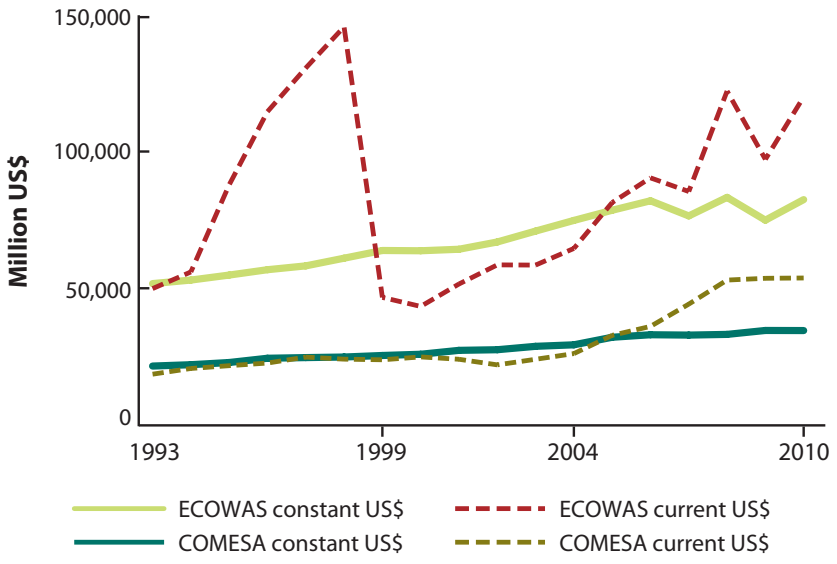
This study considers two main socioeconomic indicators: population growth, and GDP per capita. Population is fundamental in the socioeconomic context, as humans are the main source of labor and energy in African agriculture. A sudden population boom or bust can affect all aspects of the society. A dramatic instance was the Rwanda genocide in the early 1990s, when a large portion of the population became refugees as the social structure broke down. Abandoned farms and fields would take years to recover, even after the population recovered from this social tragedy.

This analysis uses global demographic estimates and projections from *World Population Prospects: The 2012 Revision*, undertaken by the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (UN, 2013). GDP per capita is based on purchasing power parity (PPP) data from the World Bank. PPP GDP is the gross domestic product converted to international dollars using purchasing power parity rates. Data are in current international dollars, based on the 2011 International Comparison Program round.[13]

Descriptive Analysis of Data

This section provides a general overview on how the variables in this study are associated to trade, focusing on the spatial distribution of both time-invariant characteristics (soil quality, tree coverage, prevalence of insect pests, diseases, and weeds) and time-varying characteristics (trade flows of

FIGURE 5.1—GROSS PRODUCTION VALUE (TOTAL AGRICULTURAL PRODUCTION), ECOWAS AND COMESA



Source: FAO, 2014.

[13] An international dollar has the same purchasing power relative to GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products (World Bank, 2014). It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

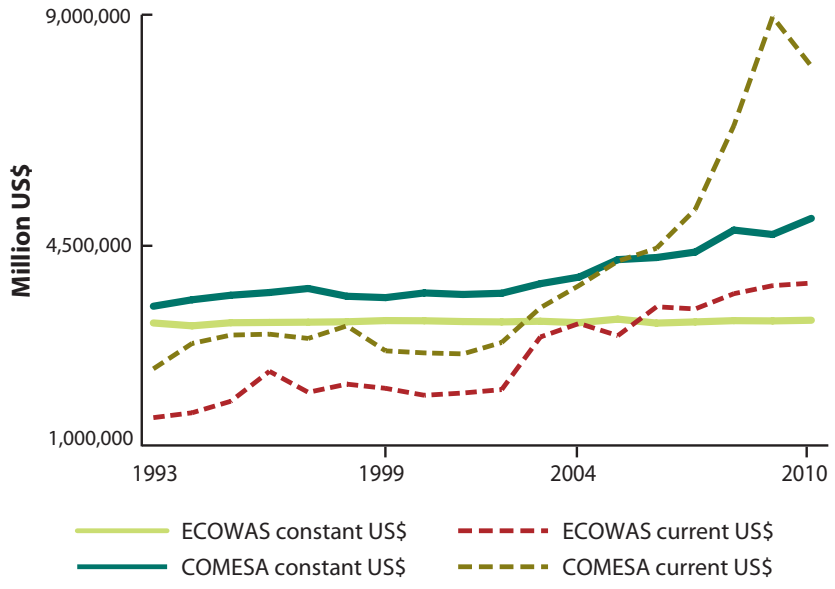
imports and exports; agricultural production; population, GDP per capita; rainfall; temperature; NDVI).

Agricultural Production, Imports and Exports

Figure 5.1 shows the evolution over time (for the period 1993–2010) of the total agricultural production value for ECOWAS and COMESA, both in constant US$ (solid lines) and current US$ (dashed lines). Except for the red line (showing ECOWAS current US$), all series present a steady though almost negligible increasing pattern. Of course, the series in constant price looks flatter. The spike apparent in 1998 is mostly driven by a large increase in production for Nigeria.

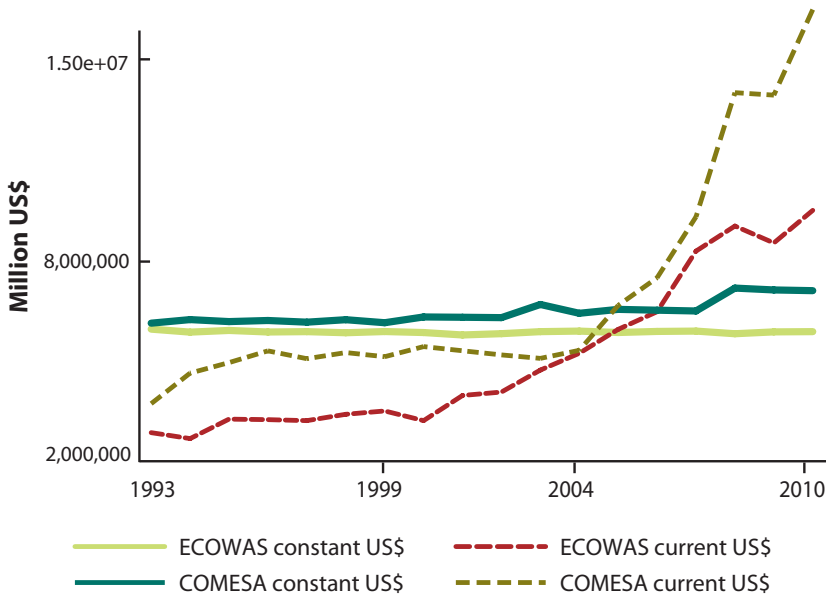
The total value of agricultural exports by ECOWAS and COMESA are shown in Figure 5.2, in both constant and current US$. In constant US$, the total quantity of agricultural export for the ECOWAS countries has remained almost stable over this period, with very mild variations at the beginning and end of the time span. COMESA countries, however, show a substantial increase in exports, especially over the 2004–2010 period. Current US$ show a more dramatic pattern. Over the entire period, both ECOWAS and COMESA show increasing exports of agricultural products, almost at the same rate, except in recent years, when COMESA had a sharper increase until 2009.

FIGURE 5.2—TOTAL AGRICULTURAL EXPORTS, ECOWAS AND COMESA



Source: FAO, 2014.

FIGURE 5.3—TOTAL AGRICULTURAL IMPORTS, ECOWAS AND COMESA



Source: FAO, 2014.

Figure 5.3 shows total agricultural imports for ECOWAS and COMESA countries. In current US$, there is a fairly large increase in the quantity imported for both regions. Before 2003, ECOWAS imports grew more than COMESA imports; after 2003, COMESA shows much more rapid import growth than ECOWAS, a trend also shown in constant US$.

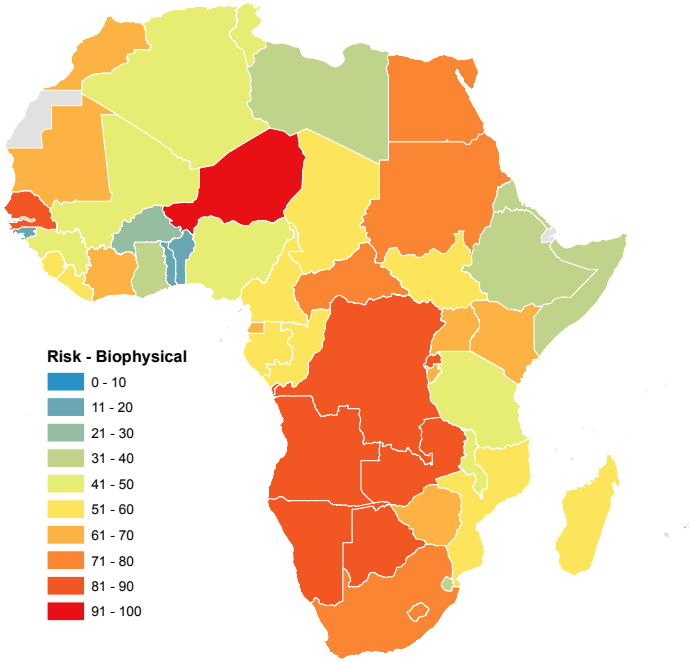
Biophysical Risk

Two country-level indices describe the biophysical risks to agriculture across the continent. Figure 5.4a shows the growing conditions risk index, including temporal variability of NDVI, rainfall, and temperature, as well as a low soil nutrient capital indicator. Figure 5.4b shows the disease index, combining prevalence indicators of diseases, pests, and weeds.

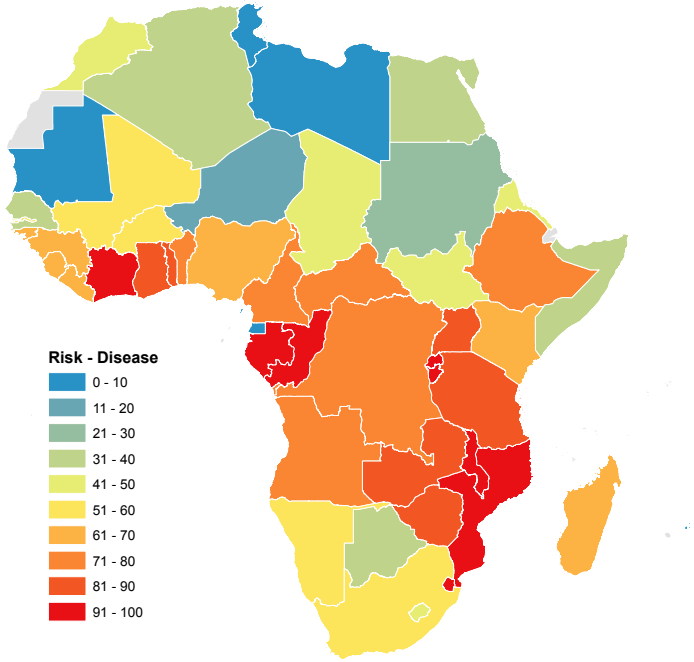
For the analysis of biophysical risk of crop cultivation across Africa, seven indicators were compiled at 30 arc-minute resolution: temporal variability of NDVI, rainfall, and temperature represented as the coefficient of variation; the prevalence of diseases, pests, and weeds; and the area of low soil nutrient capital. For each of the indicators, grid cell-level values across the continent were feature-scaled for 0–100 range. Using the

FIGURE 5.4—BIOPHYSICAL RISKS, BY COUNTRY

a. Growing conditions risk index



b. Pests/disease/weeds prevalence index



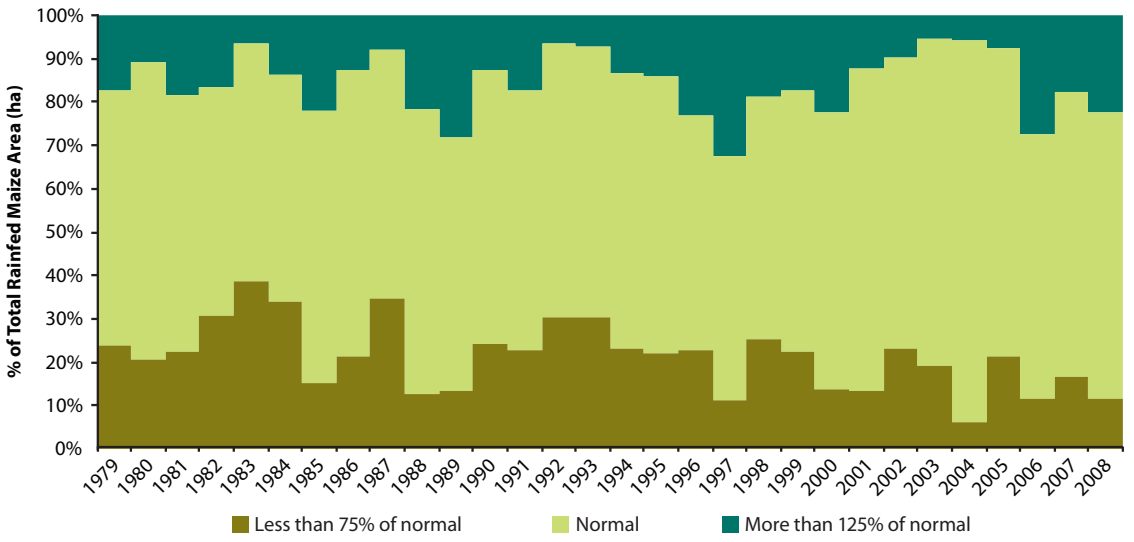
Source: NASA, 2011.

seven indicators, two indices were generated at grid-cell level, a growing conditions risk index and a disease risk index, and aggregated at country level, using the remote sensing-estimated cropland area data as a weight. The resulting maps (Figures 5.4a and 5.4b) indicate that these two indices do not necessarily agree with each other. The ten countries with the highest level of growing conditions risk were Niger, Democratic Republic of the Congo, Namibia, Botswana, Zambia, Senegal, Rwanda, Angola, Lesotho, and Central African Republic. For the disease risk, however, the top ten countries were Rwanda, Swaziland, Gabon, Burundi, Republic of Congo, Malawi, Cote d'Ivoire, Mozambique, Zambia, and Tanzania. Overall, most crop-producing countries in Africa were exposed to notable levels of risk in both indices.

Spatial Pattern and Frequency of Drought

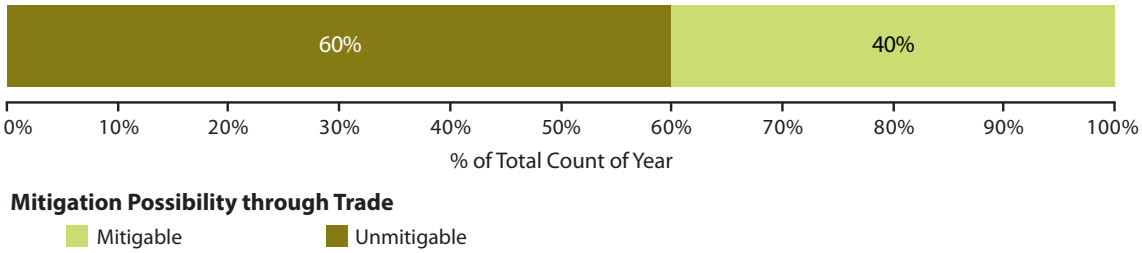
To examine the frequency and extent of drought events in Africa dating back to 1979, historical rainfall data was obtained for the areas under rainfed maize production. Drought was defined as an amount of rainfall below 75 percent of the long-term mean, for the first two months of the maize-growing season. Results were recorded within each grid cell (0.5-degree resolution). Rainfall data is from the University of East Anglia Climatic Research Unit (UEA CRU-TS, 2014), for each season of the 30-year period (1979–2008, or the latest year for which data is available). The total rainfed maize-growing area was calculated

FIGURE 5.5—FREQUENCY OF DROUGHT OCCURRENCES AND THEIR EXTENTS



Source: Authors' calculation.

FIGURE 5.6—MITIGATION POSSIBILITY THROUGH TRADE, AFRICAN CONTINENT



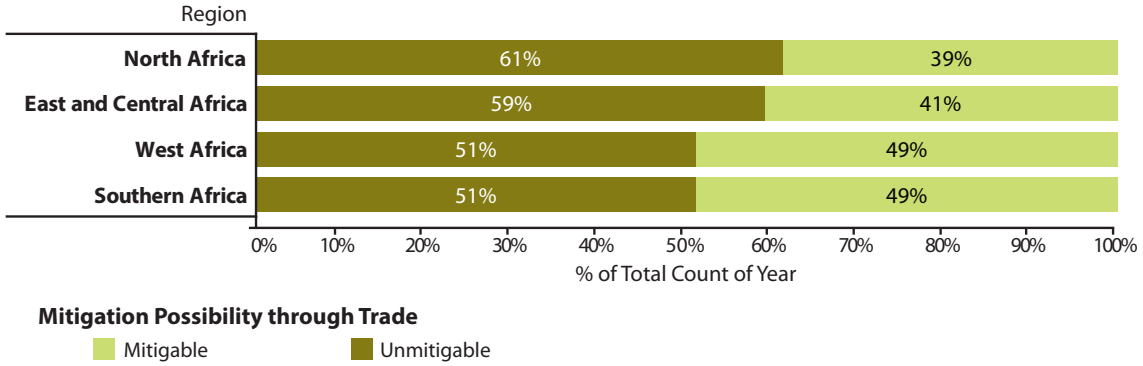
Source: Authors' calculation.

according to SPAM 2005 (You et al., 2014; assumed to be constant over the time period). This area was disaggregated into three classes: i) normal; ii) less than 75 percent of normal, drought; and iii) more than 125 percent of normal (Figure 5.5). The result illustrates the varying degree of the extent of drought and non-drought seasons; there is no clear long-term trend of drought extent, when aggregated. If losses in maize production within areas of drought stress can be, hypothetically, balanced by surplus production from areas of above-normal rainfall, the spatial pattern of drought and non-drought areas is an important factor in gauging readily available trade across the continent.

To simplify the analysis, we compared the size of above-normal and below-normal rainfall areas to test this hypothetical assumption. In reality, obviously, there are many other factors to consider: trade policies, regional and national economic dynamics, and the total production capacity of each area.

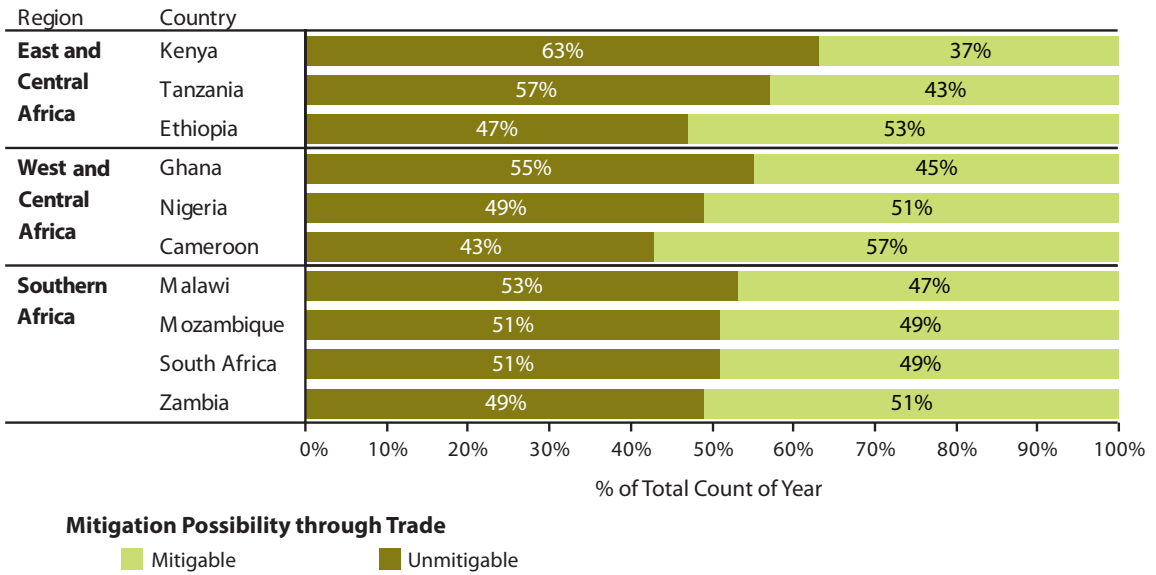
The assumption is that, if the area with above-normal rainfall is larger than that experiencing below-normal rainfall in a given year, then production loss (or deficit) from drought is mitigable by transporting additional production (or surplus) from above-normal rainfall areas, under the assumption of no trade restictions. However, if the area of drought is

FIGURE 5.7—MITIGATION POSSIBILITY THROUGH TRADE, AFRICAN REGIONS



Source: Authors' calculation.

FIGURE 5.8—MITIGATION POSSIBILITY THROUGH TRADE, AFRICAN COUNTRY LEVEL

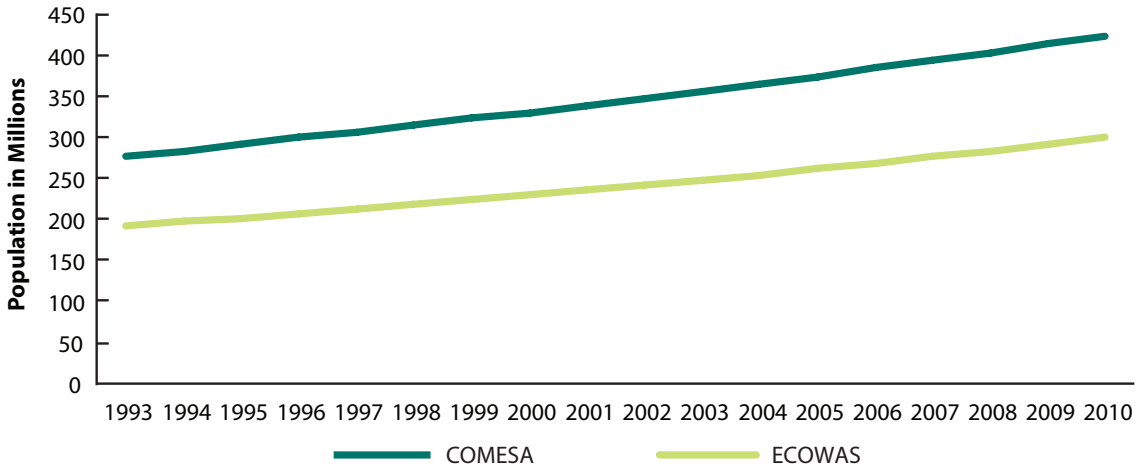


Source: Authors' calculation.

greater than the area of surplus rains, the drought in that year is considered unmitigable. At continent-level, this simple analysis showed that for about 40 percent of the 30-year period (that is, 4 out of every 10 years), the losses in maize production due to drought might have been mitigated by trade (Figure 5.6). The remaining 60 percent of the time, there were more areas of drought than rain surplus, and trade was constrained by overt losses in maize production. When the analysis was carried out at the regional level (Figure 5.7), it appeared that such drought-mitigation potential is more prominent in West and Southern Africa (about 50 percent of years) than North, East, and Central Africa (about 40 percent).

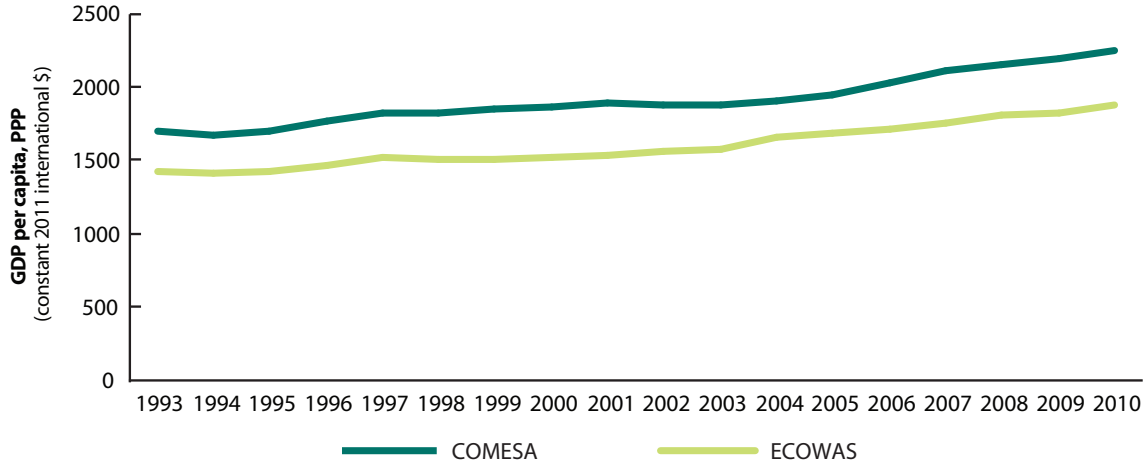
At the country level, for the top ten maize producing countries in SSA , the drought-mitigating potential for all countries is about 40–50 percent, or 4–5 seasons out of 10 (Figure 5.8). Kenya has the least potential for mitigation through trade (mitigable in 37 percent of the seasons) and Cameroon has the most (mitigable in 57 percent of the seasons). Overall, this quick analysis of historical rainfall patterns across Africa shows good potential for mitigating losses in maize production through trade flows, at country, regional, or continental levels, if the complexities of trade allow.

FIGURE 5.9—POPULATION, COMESA AND ECOWAS (MILLIONS)



Source: World Bank, 2014.

FIGURE 5.10—GDP PER CAPITA, COMESA AND ECOWAS (PPP, CONSTANT 2011 INTERNATIONAL $)



Source: World Bank, 2014.

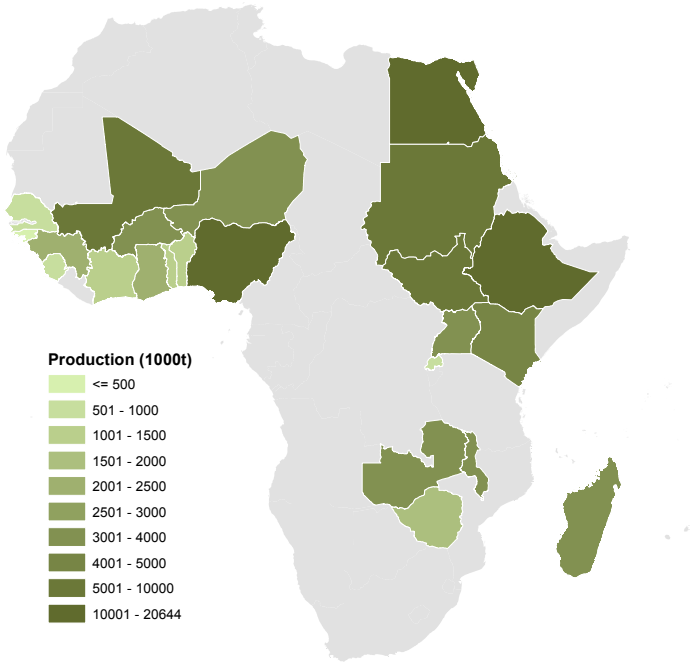
Socioeconomic Environment

Agricultural production and consumption are affected by socioeconomic factors, such as population and size of the economy. Population affects the potential of the economic system, as in prospective workforce, but it also puts pressure on the agricultural and consumption system. Figure 5. 9 and Figure 5. 10 show monotonic patterns of steady increase, without evident shocks that could produce erratic trade flows. Nevertheless, a multivariate analysis should control for socioeconomic factors, due to their likely effect on trade.

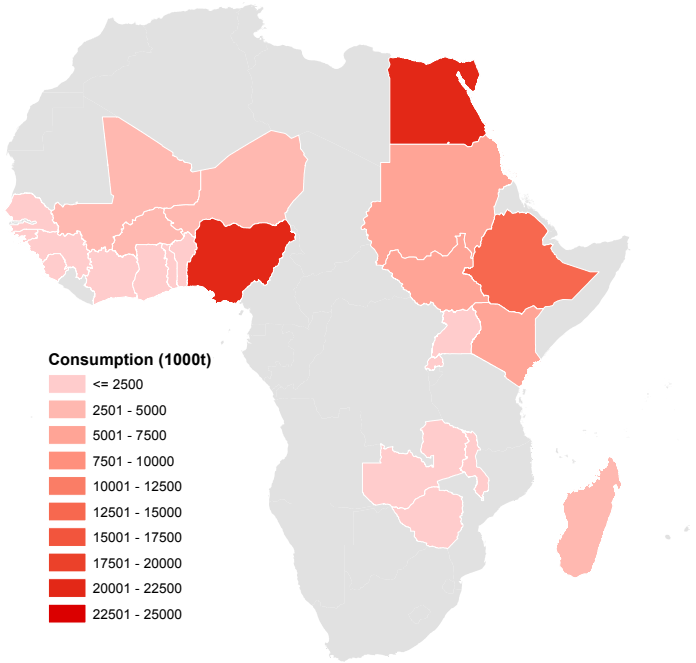
Since an important component of the food system is consumption of cereals, it is illuminating to identify cereal surplus and deficit countries in SSA. Figure 5.11 (a and b) show the total quantity of cereals produced and the quantity consumed, in selected ECOWAS and COMESA countries (see FAO, 2014). While production is relatively homogeneous among several countries (especially in COMESA), the consumption pattern shows some hotspots in specific countries (Egypt, Ethiopia, and Nigeria). Combining these two images,

FIGURE 5.11—TOTAL CEREAL PRODUCTION AND CONSUMPTION IN 2011, SELECTED ECOWAS AND COMESA COUNTRIES

a. Total cereal production (2011)



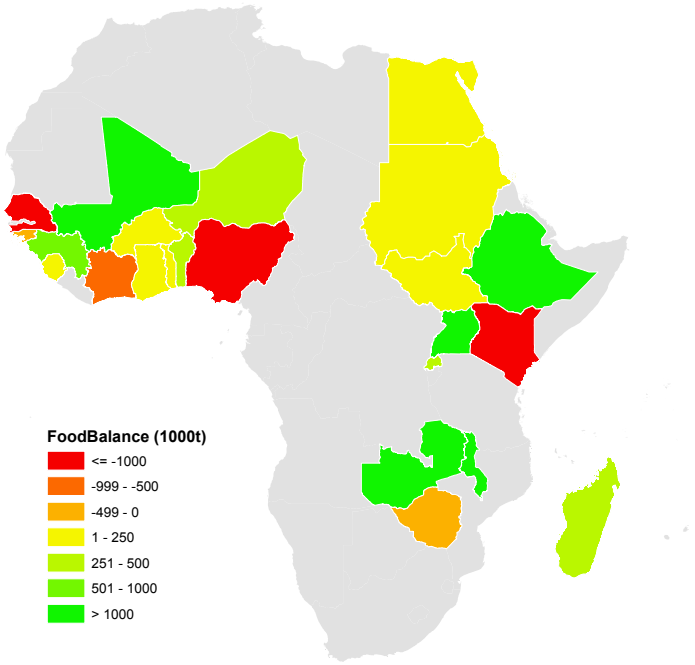
b. Total cereal consumption (2011)



Source: FAOSTAT

Figure 5.12 illustrates the cereal balance (production-consumption), showing five production surplus countries (Ethiopia, Mali, Uganda, Zambia, Malawi) and five production deficit countries (Nigeria, Senegal, Cote d'Ivoire, Kenya, Zimbabwe). These maps confirm the high spatial variation in cereal availability, not only among regions, but also among countries within the same region.

FIGURE 5.12—FOOD BALANCE FOR CEREAL CROPS SELECTED ECOWAS AND COMESA COUNTRIES (2011)



Source: FAOSTAT, 2014.

Econometric Specification and Methods

Model Description

The main objective of the simulation is to quantify the linkages between biophysical characteristics and trade flows while controlling for other factors affecting net exports. More specifically, the study is designed to examine the extent of the impact of extreme weather shocks (excessive rain, prolonged drought, soil depletion, deforestation, water logging periods, and so forth) on exports and imports among countries in the ECOWAS and COMESA regions. The hypothesis is that if one country experiences a shock, this will affect all its commercial partners as well, both on the import side (through variation in income and/or changes in demand) and on the export side (through production).

The dependent variable is net export (exports-imports), regressed on a set of exogenous variables—mostly linked to biophysical characteristics—that are grouped as follows:

- Biophysical risk (proxied by long-term rainfall, long-term temperature, long-term NDVI, soil nutrient reserves, and tree coverage)
- Crop and livestock disease risk (proxied by crop disease, insect pest, and weed prevalence)
- Socioeconomic factors (proxied by population, GDP per capita (PPP), and total crop land area)

The advantage of FAOSTAT trade data is that panel data methods can be used to look at the impact across countries and over time, highlighting the ripple effect or impact of an exogenous shock that occurs in one country in relation to all other ECOWAS and COMESA countries. More formally, a linear panel data model can be expressed as

$$Y_{it}=N_{it}+C_{it}+S_{it}+\mu_{it}+\varepsilon_{it}$$

Where Y_{it} is the net exports in country i at time t; N_{it} is a matrix of biophysical risk variables in country i at time t; C_{it} is a matrix of crop and livestock disease risk variables in country i at time t; and S_{it} are the variables related to socioeconomic risk in country i at time t. The fixed effects (μ_{it}) control for the heterogeneity among countries, and ε_{it} is the common error term.

The crucial identification issue in these types of regressions stems from the fact that biophysical variables, as well as climate factors, affect net exports only through their influence on total agricultural production. In other words, biophysical and climate variables could be considered as ideal instruments in a regression model that relates net exports to total agricultural production. However, data on total value of agricultural production are incomplete, and therefore the number of observations greatly decreases if this variable is considered in the model. Moreover, in the analysis by commodity, the sample size decreases even further, as data on a single crop is more problematic to obtain. For this reason, the empirical analysis includes the fixed- and random-effects version of the instrumental variables estimator only for total agricultural production. This approximation is necessary to attain the best prediction in the simulations proposed, if the objective is to obtain the best possible fit together with high explanatory power of the model, rather than precise parameter estimates.

The set of biophysical variables include long term NDVI, soil quality, percentage of tree coverage, and prevalence of crop diseases, weeds, and insect pests. The two climate variables are rainfall and temperature; temperature squared is also included, to control for possible nonlinearities in the temperature variable. Higher temperature is assumed to contribute to lower production, at a decreasing rate, in turn affecting net exports.

Several potential controls are included in the regression model. Over the last few years, Africa consistently ranks highest as the continent with the highest population growth rate (FAOSTAT, 2014). Population growth is potentially related to net export: if population rises, imports rise and therefore net exports decrease. This would imply that the coefficient of total population will be negative. Another factor in decreasing net export is the possibility that food consumption per capita increased over the period under consideration, but that indicator is unfortunately unavailable.

GDP per capita (in constant international $) is included as a proxy for per-capita income. An increase in per-capita income corresponds to an increase in food consumption (since income elasticity for food consumption is, in general, relatively high), which, in turn, could lead to an increase in imports. The GDP per-capita coefficient is thus expected to be negative.[14]

Urbanization might influence consumers' preferences for the quantity (and quality) of food that they consume. With increasing education, which is generally related to urbanization, consumers become more aware of the diversity of nutrient sources. It is also true that as people move to cities to seek new job opportunities, they are faced with a greater selection of different food outlets that increase their access to more nutrient sources. A variable that measures the population of the largest city in the country is therefore included as a proxy of urbanization. However, this variable can also be considered as a proxy of the infrastructure and markets that facilitate export. The geographical coordinates (longitude and latitude) of the

[14] While GDP per capita is not a perfect proxy for per-capita income, it is one of the best measures consistently reported across countries and is thus highly comparable.

major city are used to suggest a sort of trend surface analysis. Finally, total cropland area is included, since different parts of the African continent face different situations in terms of land availability. The coefficient of total crop availability is expected to be positive.

Econometric Methodology

Two estimation methodologies are used in this chapter. The first method considers the estimation of a static panel data model by both random as well as fixed effects. This methodology does not contemplate the presence of any endogenous variable in the model. The second method extends the first, in that it allows for the presence of endogenous variables. For a more detailed treatment of the methods, see Baltagi (2008) or Wooldridge (2002). In a linear regression model, the presence of endogeneity causes inconsistency of the usual ordinary least square (OLS) estimates and requires an instrumental variable procedure to obtain consistent parameter estimates.

A proper set of instruments is one that is uncorrelated with the errors in the model and is correlated with the regressors. This analysis considers as instruments the following variables: rainfall, temperature, temperature squared, NDVI, soil quality, percent of tree coverage, crop disease prevalence, weed prevalence, insect pest prevalence, and total crop land area. Having used the same variables directly in a regression on value of agricultural production admittedly violates one of the assumptions on the instruments. However, given the problem of data availability, there is no other appropriate instrument available.

Results

Applying the two models discussed in the previous paragraph, important findings emerge by regressing the value of total agricultural production on a set of covariates (Table 5.1). Maize and wheat estimates are reported in Supplementary Annex Tables S.5.1 and S.5.2. First, almost all the biophysical variables are significant and with the expected sign when applying OLS; but only rainfall, NDVI, and soil quality seem to have a statistically significant effect when applying panel random-effect models. Using fixed-effects (more suitable for the data at hand), only rainfall and NDVI are associated with significant coefficients, given that the time-invariant factors are dropped from the regression due to the assumed correlation between the individual-country effects and the regressors (a less restrictive assumption of the absence of correlation in the random-effects model). Control variables (total population, GDP per capita, location and population of the largest city, and total crop land area) show expected signs.

Instrumental variables (in the form of Two Stage Least Squares) were also run, controlling for the endogeneity of total production with exports and imports. Nevertheless, for the reasons described above, the most useful model to look at is the OLS, if the objective is to examine the impact of biophysical conditions based on scenario simulations. This analysis focuses on OLS, given its higher explanatory power as compared to the other models, although parameters estimates are robust to the various econometric models used.

Simulations

A set of scenarios have been simulated according to different agroclimatic shocks, and their impact assessed using the equations (and associated parameters) shown above. The shocks are assumed to hit all countries in both regions (ECOWAS and COMESA), to look at their sensitivity on aggregate net exports. The idea is to assess how the shock in each region would be impacting aggregated trade flows. The shocks considered are:

TABLE 5.1—CORRELATES OF TOTAL NET EXPORTS, VARIOUS ECONOMETRIC METHODS

OLS, PANEL LINEAR AND IV FIXED-EFFECT, RANDOM-EFFECTS, BETWEEN-EFFECTS AND ERROR-CORRECTION ON VALUE OF NET EXPORTS

	OLS		Random–effects		Fixed–effects		IV Panel fixed–effects		IV Panel error–correction	
	coef	se	coef	se	coef	se	coef	se	coef	se
Rainfall	0.000	0.000	0.000**	0.000	0.000**	0.000				
Temperature	–1.131***	0.403	–0.364	0.431	–0.361	0.440				
Temperature (squared)	0.022***	0.008	0.005	0.009	0.005	0.009				
NDVI	1.570**	0.774	1.482***	0.516	1.478***	0.518				
Soil quality	–0.094***	0.013	–0.106**	0.046						
Tree coverage (%)	0.015***	0.003	0.018	0.012						
Crop disease prevalence	2.863***	0.631	3.889	2.692						
Weeds prevalence	0.206	0.507	–0.155	1.467						
Pest prevalence	4.694**	1.950	1.779	6.384						
Total population (million)	–0.023***	0.007	–0.015***	0.006	–0.014**	0.006	–0.021**	0.008	–0.022***	0.007
GDP per capita, PPP (constant 2011 international $)	–0.000***	0.000	–0.001***	0.000	–0.001***	0.000	–0.001***	0.000	–0.001***	0.000
Latitude of largest city	–0.011	0.007	–0.014	0.030					0.004	0.027
Longitude of largest city	0.014***	0.004	0.014	0.017					–0.004	0.013
Population of largest city (million)	0.553***	0.083	0.942***	0.258					0.506**	0.208
Total crop land area	0.000	0.000	–0.000	0.000					–0.000**	0.000
Log of gross production value in constant prices 2004–6							0.880***	0.277	0.811***	0.232
Constant	11.480***	4.251	6.275	7.062	6.502	5.452	–4.166**	1.926	–4.024**	1.627
Number of observations	414		414		414		306		306	
Adjusted R2	0.605				0.381					

Source: Authors' calculation.
Notes: OLS: ordinary least squares; IV: Instrumental Variables; se: standard errors; coef: coefficient.

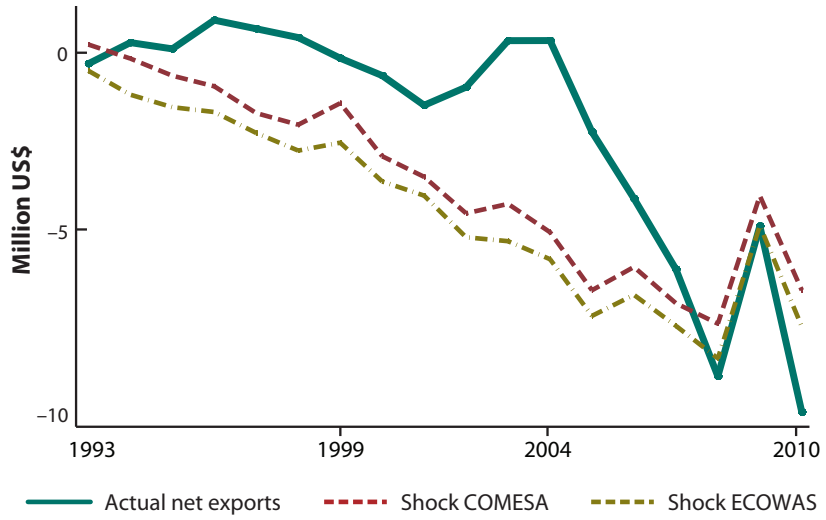
- Total annual rainfall decrease by 50 percent (drought)
- Average NDVI decrease by 25 percent
- Temperature increase by 1°C

First the actual observed value is compared to the prediction of the model, and then the aggregate effect is estimated according to the shock, by region (ECOWAS and COMESA).

When only a 50-percent rainfall decrease is simulated, the value of aggregated net exports shifts downward, as expected, given the associated decrease in production (Figure 5.13). Drought hits ECOWAS countries more than countries in COMESA (shown by the aggregated shift downward), although the difference is not striking. Adding a 25 percent NDVI decrease (since the relationship between rainfall and NDVI is not linear), the predicted net exports line shifts even further downward, suggesting that the shock does not modify the spatial distribution but rather magnifies the impact (Figure 5.14). Indeed, the time pattern of the simulated net exports is similar across regions.

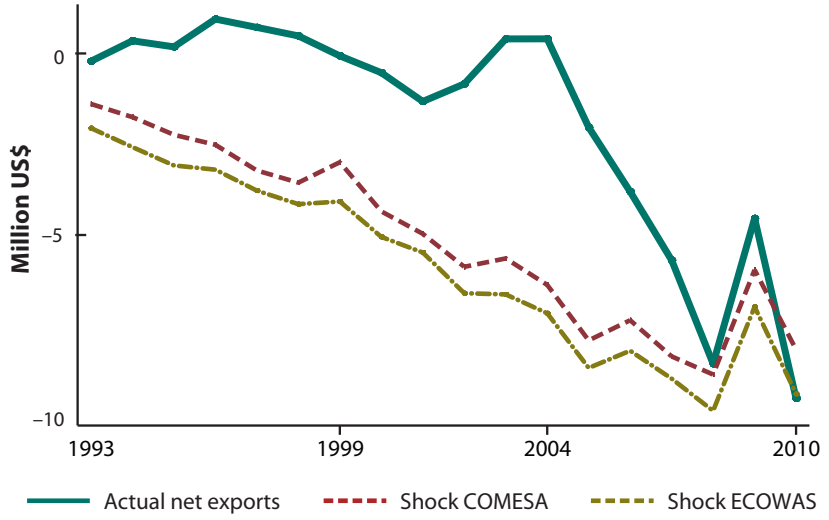
In contrast, the combined effect of the previous shocks plus a 1 °C increase in temperature does change the spatial distribution of the impact (Figure 5.15). Local warming affects aggregated flows more negatively for shocks that occur in the COMESA region rather than in ECOWAS. This interesting result provides evidence that agricultural production in West African countries is already adjusted to face extreme temperature, suggesting potentially substantial implications for trade flows in case biophysical shocks occur in East Africa and southern Africa. Crops grown in the latter regions are more sensitive to warmer temperature than crops planted in West Africa.

FIGURE 5.13—ACTUAL AND SIMULATED NET EXPORTS AFFECTED BY 50-PERCENT RAINFALL DECREASE, BY REGION



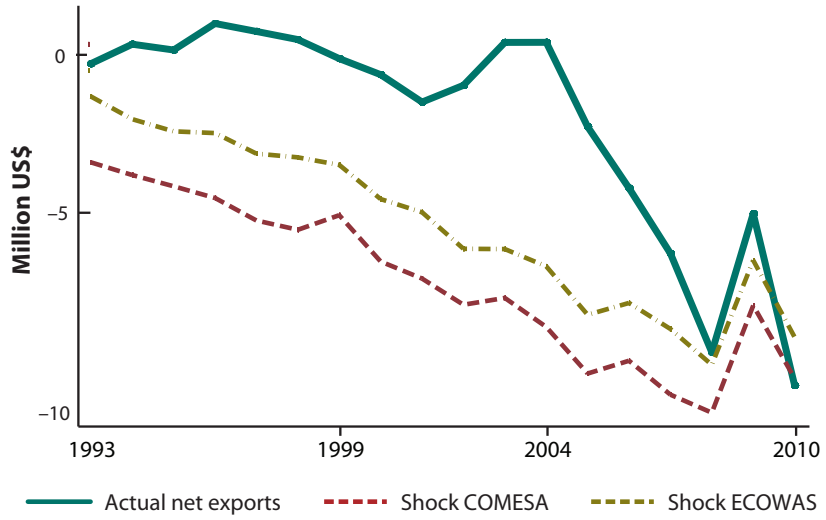
Source: Author's calculation.

FIGURE 5.14—ACTUAL AND SIMULATED NET EXPORTS AFFECTED BY COMBINED 50-PERCENT RAINFALL AND 25-PERCENT NDVI DECREASE, BY REGION



Source: Author's calculation.

FIGURE 5.15—ACTUAL AND SIMULATED NET EXPORTS AFFECTED BY COMBINED 50-PERCENT RAINFALL DECREASE, 25-PERCENT NDVI DECREASE, AND 1 °C TEMPERATURE INCREASE, BY REGION



Source: Author's calculation.

A carefully tailored agricultural policy then becomes crucial, since crop decisions can greatly affect production and, in turn, trade.

Conclusions

Patterns of trade are influenced by a suite of factors strongly linked over time and across space. Spatial distribution of biophysical as well as socioeconomic variables play an important role in shaping the relationship between resilience and trade. This analysis tries to shed light on the various factors, linking them spatially for an in-depth examination.

Simulation findings show that biophysical variables are strongly correlated with net exports, when agricultural production is not controlled for. However, when a 2SLS model is adopted (controlling for endogeneity of production), biophysical variables are excellent predictors of total agricultural output, which, in turn, is the highest determinant of trade flows. This suggests that climate-related variables are key for profitable farming as well as flourishing trade flows, indicating the importance of agriculture adaptation and mitigation strategies to increase smallholder farmers' resilience to natural shocks.

At the continent level, the analysis showed that about 40 percent of the time over the 30-year period (4 out of every 10 years), the losses in maize production due to drought might have been mitigated by trade; for the remaining 60 percent of the time, there were more areas of drought than rain surplus, and trade was constrained by overt losses in maize production. Overall, the historic rainfall patterns in non-irrigated maize-growing areas across Africa showed good potential for mitigating losses in maize production through enhanced trade flows, at country, regional, or continental levels.

The spatial visualization of cereal-producing and -consuming countries confirms the high spatial variation in availability of cereals, not only among regions, but also among countries within the same region. Future analysis should be focused on the sub-national representation of cereal balance, to indicate regional hotspot distribution.

A model simulating the impact of climate-related shock, on production and on trade flows, examined the relationship between resilience, production, and trade. Simulations were conducted by region (ECOWAS and COMESA), illustrating the heterogeneity in responses according to the openness of the regional economic system and the sensitivity of the region to climate conditions.

In summary, findings of the chapter indicate that biophysical risks associated with climate change, if unmitigated, would, in the long run, erode the capacity of countries to use trans-border trade to stabilize domestic food markets—highlighting the intricate relationships between ecosystem resilience and food system resilience, and the role of trade in linking the two. While trade can enhance food system resilience to current ecosystem shocks, such shocks, if persistent and severe enough, would gradually undermine the ability of food systems to absorb them. In other words, trade can at best offer temporary relief from the effects of climate shocks. Strategies to enhance food system resilience should therefore consider trade as an important part of a broader agenda to fight climate shocks and reduce their impacts on production systems.

6| Tracking Key CAADP Indicators and Implementation

Godfrey Bahiigwa, Julia Collins, Tsitsi Makombe, Samson Jemaneh, and Wondwosen Tefera

This chapter presents the current status and trends captured by key CAADP indicators that ReSAKSS has been tracking since 2008, at continental and regional levels. ReSAKSS was established by the CAADP Partnership Platform, and later endorsed by the African Union Conference of agricultural ministers, to serve as the formal CAADP review and learning platform, charged with tracking 30 core CAADP indicators. These indicators will be revised to reflect the commitments in the new CAADP Results Framework that is expected to define a new and expanded set of targets for the next phase of CAADP, starting in 2015. The data for the current indicators, derived from publicly available sources, are published in the ATORs and on the ReSAKSS website (www.resakss.org), where they can be accessed in form of maps and graphs and can be freely downloaded in excel format and used for analysis.

This chapter highlights indicators for five areas: (i) enabling environment (the broader context of the CAADP process and related policies, investments and outcomes); (ii) agricultural spending; (iii) agricultural sector performance; (iv) agricultural trade; and (v) poverty and hunger. The indicators are presented in four different breakdowns: for Africa as a whole; by the five geographic regions of the African Union (central, eastern, northern, southern, and western); by four economic categories (countries with less favorable agricultural conditions, countries with more favorable agricultural conditions, mineral-rich countries, and middle-income countries); and by the eight regional economic communities (CEN-SAD, COMESA, EAC, ECCAS, ECOWAS, IGAD, SADC, and UMA). For most indicators, the post-CAADP levels (average levels from 2003–2012, or in some cases 2003-2011) are compared with levels of the pre-CAADP base periods, 1990–1995 and 1995–2003. The tables referred to in this chapter can be found in the Annex to this report.

Finally, the chapter presents the current status of CAADP implementation, indicating the progress of each country with regard to the different stages of implementation. The CAADP stages and related processes and initiatives include: signing a CAADP compact; holding a roundtable; developing a national agriculture and food security investment plan (NAFSIP); holding a business meeting; receiving a grant from the Global Agriculture and Food Security Programme (GAFSP); participating in the New Alliance for Food Security and Nutrition; participating in Grow Africa; establishing a country SAKSS (Strategic Analysis and Knowledge Support System) platform; and undertaking an assessment of the agriculture joint sector review (JSR) process.

Enabling Environment

The key indicators presented in this section include official development assistance (ODA), food aid, and macroeconomic performance (covering GDP growth, inflation, and government debt as a share of GDP).

Macroeconomic Performance

Africa's economy grew at an impressive annual average of 5.2 percent during 2003–2012 (Table A.4). This growth, sustained for over 10 years, is remarkably higher than the average growth rate of less than 2 percent in the early 1990s. The recovery that started in the mid-1990s has continued into the 2000s. Regardless of classification, economic growth has taken place across the continent, in all regions and under all economic conditions. As Table A.4 shows, the *average GDP growth* for Africa was 1.6 percent in 1990–1995, more than doubling to 3.9 percent in 1995–2003 and further increasing to 5.2 percent in the 2003–2012 period. At the regional level, the highest GDP growth rate was seen in western Africa, at 7.7 percent during 2003–2012, while the lowest was in southern Africa at 4.4 percent. Among the RECs, the highest growth rate was recorded in ECOWAS at 7.7 percent, and the lowest was UMA at 4.4 percent. It is important to note that the average GDP growth rates across the continent were higher than the average population growth rates, implying that per capita GDP has been rising on the continent. Indeed as Table A.5 shows, *per capita GDP* has risen across the continent in all geographic regions, across all economic classifications, and in all RECs. Africa as a whole has experienced an annual average increase in per capita GDP of almost 2 percent during 2003–2013.

At the continental level, the average level of *inflation* is just below 10 percent, at 9.8 for 2003–12. However, the eastern and western Africa regions experienced double-digit inflation during this period, at 11.1 percent and 14.5 percent, respectively. The regional inflation differences are reflected in the inflation rates of the RECs, with the highest rates of inflation registered in COMESA and IGAD (in eastern Africa) and ECOWAS (in western Africa) (Table A.6.)

Government debt as a share of GDP has dramatically declined over the last several decades for Africa as a whole, as well as for most regions, economic classifications, and RECs (Table A.7). At the continental level, the share of debt in GDP declined from 95.6 percent in 1990–1995 to 80.8 percent in 1995–2003, and reached a low of 43.4 percent in 2003–2012. Consistent declines were also seen regionally, in central, eastern, and northern Africa, with especially large declines in eastern Africa. Western Africa saw an initial increase in the share of debt in GDP, rising from 64.4 percent in 1990–1995 to 90.6 percent in 1995–2003, before dropping to 36.1 percent in 2003–2012. In southern Africa, the debt share also rose and later declined, but it remained higher in 2003–2012 (at 34.9 percent) than its average level in 1990–1995 (30.7 percent). By economic classification, most categories of countries registered consistently declining debt shares. The mineral-rich countries, however, saw increased debt levels in 1995–2003 compared to 1990–1995, but managed to reduce their debt shares in 2003–2012 to just above the levels of the first period. Each of the RECs had lower average debt shares in 2003–2012 than in 1990–1995. Most RECs saw consistently declining shares, but ECOWAS, and to a lesser extent EAC, initially showed rising shares. Debt shares have since continued to decline across the board, with annual average percentage point decreases from 2003 to 2012 in every region, economic classification, and REC. Mineral-rich countries, which had an especially high debt share in GDP of 192.5 percent in 2003, have since then reduced their debt share by an average of 17.3 percentage points per year—the most of any region or economic grouping. Africa as a whole has reduced its debt share in GDP by 2.7 percentage points per year from 2003 to 2012.

For Africa as a whole, the share of *government revenue* in GDP has registered small but consistent increases, from 24.7 percent in 1990–1995 to 25.5 percent in 1995–2003 and to 29.6 percent in 2003–2012 (Table A.8). All regions, economic classifications, and RECs also increased their government revenue shares in 2003–2012, compared to the two previous

periods. Almost all areas also saw positive annual percentage point changes in the revenue share from 2003 to 2012; only western Africa at the regional level, and ECOWAS and IGAD at the REC level, showed small percentage-point decreases. African countries are increasing revenue collection, and with sustained economic growth they can rely less on foreign borrowing to finance their budgets. This trend is consistent with the reduced debt-to-GDP ratio across the continent, as presented in Table A.7.

Official Development Assistance

Data on *Official Development Assistance* (ODA) are not available prior to the 2000s, so this section examines ODA annual average levels and percentage changes during the period 2003-2012. During this period, ODA per capita averaged $39.2 for Africa as a whole, with higher per capita annual average levels registered in 3 regions: central Africa ($52.1), eastern Africa ($42.2), and southern Africa (45.2) (Table A.1). Per capita ODA decreased, between 2003 and 2012, for Africa as a whole, as well as most regions, economic classifications, and RECs. Only northern Africa, EAC, and UMA experienced increases: UMA witnessed the largest increase of 6.2 percent while the largest decline of 5.9 percent occurred in ECCAS.

The share of *agricultural ODA* in total ODA remained low, averaging 4.2 percent but growing by 6.3 percent for Africa as whole between 2003 and 2012 (Table A.2). Although shares of agricultural ODA in total ODA have remained low, it is reassuring to note that the shares have increased in all regions, economic classifications, and RECs. Shares of above 5 percent were witnessed in western Africa, both less and more favorable agriculture conditions, EAC, and ECOWAS.

The average share of *emergency food aid* in total ODA was 4.4 percent in Africa as a whole in 2003–2012, a slight change from 4.0 in 2003 (Table A.3). By geographic region, the largest share of food aid in total ODA was registered in eastern Africa (9.8 percent), mainly accounted for by Ethiopia, Somalia, and Sudan. Likewise by economic classification, countries with less favorable agricultural conditions had the largest share of their ODA (7.2 percent) going to food aid. Among the RECs, IGAD stands out, with 14.5 percent of its ODA going to food aid—a reflection of the harsh agricultural conditions in that region as well as the civil conflicts in several member states, especially Somalia and South Sudan, resulting in large numbers of refugees and displaced persons requiring food aid.

Agricultural Expenditure

Tables C.1, C.2, C.3a and C.3b show growth rates of public agricultural expenditure (PAE) and the share of PAE in total expenditure, agricultural GDP, and total GDP, respectively. Here we present two post-CAADP periods, 2003–2008 and 2008–2013, in order to highlight two distinct developments in the evolution of PAE: significant growth in the first half of the decade followed by stalling or even negative growth in later years. Following the launch of CAADP in 2003, African countries saw rapid growth in PAE (Table C.1). From 2003 to 2008, expenditures increased by an average of 7.67 percent per year, an improvement over the pre-CAADP annual average growth rate of 6.63 percent in 1995–2003. Growth was especially high in the central, southern and western regions, with annual average rates of over 12 percent. However, the pace of growth of agricultural expenditures decreased markedly after the Maputo target date of 2008. The continent as a whole saw an annual decrease in the rate of agricultural expenditure of -1.34 percent from 2008 to 2013. The magnitude of this decrease is affected by large drops in Nigeria and Angola, which accounted for a significant share of PAE in Africa in the years following CAADP's launch. Excluding these two countries, the continent as a

whole registered positive but very slow annual growth of PAE of 0.03 percent. The picture that emerges from an examination of trends in the continent excluding Nigeria and Angola is thus one of stagnant PAE growth rather than an absolute decrease in PAE. During the 2008–2013 period, only the central region and one REC, EAC, registered higher PAE growth rates than those of the 2003–2008 period.

Upon closer look, it appears that the global food and financial market crises may have played a role in the drop in agricultural expenditures after 2008. Table 6.1 shows selected fiscal indicators for African countries in 2003–2008 and 2008–2012. GDP growth was significantly lower in the second period than in the first, growth in ODA fell by half, and previously strong growth in government revenues excluding grants even turned negative. Governments responded to the more difficult financial situation by reducing overall expenditure growth by nearly half in the second period. However, the steeper drop in PAE than in overall public expenditure indicates that agriculture budgets were particularly hard-hit.

TABLE 6.1—FISCAL TRENDS IN AFRICAN COUNTRIES, 2003-2008 AND 2008-2012

Commodity	Annual average growth (percent)	
	2003-2008	2008-2012
GDP	6.12	3.72
ODA	3.38	1.64
Revenue, excluding grants	9.78	-0.07
Total public expenditure	8.73	4.48

Source: Authors' calculations based on data from World Bank 2014, IFPRI 2013, AUC 2008, and national sources.

Notes: Data on revenue are for 2003–2008 and 2008–2011, and refer to the set of 20 African countries with complete data for 2003–2011..

These trends of initial rapid growth in agricultural expenditures followed by stagnation or even decline underline the vital importance of sustaining the momentum of CAADP's early years into the next decade. In June 2014, African leaders met at the AU summit in Malabo, and recommitted to the goal of increasing public agricultural expenditures to reach the 10 percent target. The Malabo recommitment comes at the right time, when the impact of crises may be fading and CAADP contemplates its next ten years.

Despite rapid early growth in PAE, neither the continent as a whole nor any of the regions or RECs met the CAADP goal of devoting 10 percent of total public expenditure to agriculture during the 2003–2008 and 2008–2013 periods (Table C.2). The continent-wide share of 3.66 percent in 2003–2008 represents a moderate improvement over the 3.15 percent share reached in 1995–2003, but the share decreased to 3.11 percent in 2008–2013, reflecting the declining PAE growth shown in Table C.1. Of the geographic regions, eastern and western Africa had the largest shares in both post-CAADP periods, of around 5 to 6 percent. The group of countries with less favorable agricultural conditions exceeded the 10 percent goal in 2003–2008, allocating 11.05 of total expenditures to agriculture, and registered a 7.93 percent share in 2008–2013. Two countries met the CAADP goal in both of the post-CAADP periods, while four others met the goal in one period and came close to meeting it in the other. In spite of the sustained strong performances of a handful of countries, the PAE share of Africa as a whole has declined over the 2008–2013 period, with an annual average percentage change of -5.58 percent.

The shares of PAE in agricultural GDP and in overall GDP were slightly higher in both the 2003–2008 and 2008–2012 periods than in 1995–2003 (Tables C.3a and C.3b). However, echoing the declining trends seen previously during the crisis years, PAE shares were lower in the second

post-CAADP period than in the first. Among the geographic regions, southern Africa had the highest PAE share in agricultural GDP in both 2003–2008 and 2008–2012, while the eastern region had the highest PAE share in total GDP in both periods. For Africa as a whole, PAE shares in agricultural and total GDP in 2008–2012 were 6.14 percent and 0.90 percent, respectively. Both shares declined throughout the period, with annual average decreases of over 5 percent.

Agricultural Sector Performance

Agricultural sector growth increased remarkably between 1990–95 and 1995–2003 across the continent, except for mineral-rich countries. Most regions doubled their average rates of growth during this period. For Africa as a whole, the annual average rate of growth of agricultural value added declined from 6.2 percent in 1995–2003 to 5.1 percent in 2003–2012 (Table D.6). Growth during this period was affected by the severe global food and financial market crises, during which Africa was the only region that managed to maintain a positive growth rate, although it was not able to keep growth at the level of the 6 percent CAADP target. During this period, none of the geographic regions, economic groups or RECs met the CAADP growth target. Moving forward, the Heads of State and Government at their recent summit in Malabo recommitted to the 6 percent growth target for agriculture for the next decade of CAADP implementation, 2015–2025.

The share of *agriculture value-added* in total GDP has declined slightly in the last two decades for Africa as a whole, from 17.9 percent in 1990–1995 to 17.2 percent in 1995–2003 and to 15.1 percent in 2003–2010 (Table D.1). The GDP share of agriculture also decreased in all geographic regions, economic classifications, and RECs in 2003–2012 compared to the two earlier periods. This declining trend is expected as economies transform and other sectors of the economy, such as services and manufacturing, grow faster and overtake agriculture.

Labor productivity (measured as agricultural value added per agricultural worker) and *land productivity* (measured as agricultural value added per hectare of arable land) both increased almost across the board throughout the last two decades (Tables D.2a and D.2b). For Africa as a whole, land productivity increased from an average of $478.9 per hectare (in 2005 US$) in 1990–1995 to $574.1 in 1995–2003 and to 756.2 in 2003–2011. Labor productivity increased from $561.9 per worker in 1990–1995 to $618.2 in 1995–2003 and $782.9 in 2003–2012. Almost all areas saw consistent increases in both land and labor productivity, with the exception of countries with less favorable agricultural conditions; in this group, land and labor productivity both decreased in 1995–2003 from the earlier period, and then increased again, although, in the case of land productivity, not enough to reach the levels of 1990–1995. All geographic regions, economic groupings, and RECs registered increasing land and labor productivity since 2003, with the exception of EAC, which saw slightly negative annual average growth rates for labor productivity in the period 2003–2012. Africa's labor productivity grew at 2.5 percent annually (from 2003 to 2012), while land productivity grew at 3.6 percent annually (from 2003 to 2011).

Cereal yields, measured in kilograms per hectare (kg/ha), represent another measure of agricultural productivity that shows consistent increase across Africa, from 1159 kg/ha during 1990–1995 to 1448 kg/ha during the 2003–2012 period (Table D.3). Cereal yields have increased most in eastern and southern Africa and least in northern Africa. However, it is important to note that northern Africa has the highest absolute cereals yield (annual average 2,735 kg/ha in 2003–12) while central Africa, has lowest cereal yield level of 1,033 kg/ha which is less than half the level of productivity realized

in northern Africa. Among the RECs, the highest cereal yield in the 2003–12 period was reported for COMESA region, with 1,780 kg/ha, followed by EAC, with 1,627 kg/ha; ECCAS had the lowest cereal yield during the period. Cereal yields have shown improvement between 1990–1995 and 2003–2012 for all economic communities. These variations across the continent indicate that there is still great potential to double or even triple cereal yields in most parts of Africa.

Reflecting the increase in agricultural productivity in Africa, the *agricultural production index* has been growing at an annual average rate of 3.2 percent during period 2003–2012. The index measures overall agricultural production, using 2004–2006 as the base period; index values above 100 indicate production levels greater than those of 2004–2006. For the 2003–2012 period, the average level of the index is above 100 for all regions, economic groups, and RECs. The southern Africa region had the highest annual average, with a value of 116.5, followed by the eastern region with a value of 110.6 (Table D.4). Not surprisingly, the group of countries with more favorable agricultural conditions had the highest average annual value (112); among the RECs, the annual average agricultural production index level ranged from a minimum of 102 in ECOWAS to a maximum of 113 in the SADC region. The highest annual average change in the index over the same period occurred in ECCAS region, followed by the SADC region.

Fertilizer use in African agriculture remains low, at an average of 22 kg/ha. Since the mid-1990s, the rate of fertilizer used has not increased significantly, rising from 20.3 kg/ha in 1995–2003 to 22.4 kg/ha in 2003–2012. This is less than half of the target set at the fertilizer summit in Abuja to increase fertilizer use to 50 kg/ha by 2015. The only region that surpasses this target is the northern region, where the average rate of fertilizer use was 103 kg/ha during 2003–2012 (Table D.5); this contributes to the higher cereal yields observed in this region (Table D.3). The trend in fertilizer use is rising in many RECs, except in ECCAS, SADC, and UMA.

Agricultural Trade

The *ratio of total agricultural exports* to total agricultural imports is shown in Table E.1. During the 2003–2011 period, the ratio was 0.6 for Africa as a whole, and in all geographic regions it was less than one, indicating that the value of agricultural imports exceeded the value of exports across the continent. The exceptions were the group of countries with more favorable economic conditions, as well as EAC and IGAD. In every region except northern Africa, the ratio of exports to imports was lower in 2003–2011 than in the earlier periods (1990–1995 and 1995–2003). This is expected as agricultural imports have grown much faster than exports in absolute terms. From 2003 to 2011 the ratio showed a decline, with negative annual average percentage change in all regions, all RECs, and all economic classifications except mineral-rich countries.

The trends behind the declining export ratio are demonstrated in Tables E.2a and E.2b, which show *per capita exports and imports*. As discussed in previous chapters, agricultural imports are increasing throughout the continent, with annual average import levels in 2003–2011 higher than those of 1990–1995 for every region, economic classification, and REC. Imports also continued to grow during the 2003–2011 period, with positive annual growth rates in every area except the group of countries with less favorable agricultural conditions. During this period, the average level of per capita agricultural imports was much higher in northern Africa than in any other region, at $99.5. Import levels were lowest in central and eastern Africa, both at $18.4.

The historical trends are less clearly defined for per capita agricultural exports. Africa as a whole showed small increases between each period, with rising exports in some regions and decreases in others. During the 2003–2011 period, per capita exports were growing in Africa as a whole and in the eastern, northern and southern regions, but decreasing in western and central Africa. The drop in the level of exports was most defined in countries with less favorable agricultural conditions, which saw per capita exports decrease by an annual average of 9.8 percent in 2003–2011. Even where exports were rising, they grew more slowly than imports in all areas except northern Africa.

Reflecting the moderately declining shares of agriculture in GDP shown in Table D.1, the *share of agricultural trade in merchandise trade* is also decreasing (Tables E.3a and E.3b). Between 1990–1995 and 2003–2011, agricultural raw materials (imports and exports) decreased as shares of total merchandise imports and exports in Africa as a whole as well as in all geographic regions. Also, during the 2003–2011 period, Africa's agricultural export share continued to decrease while its import share increased slightly, at an average annual rate of 0.4 percent.

Poverty and Hunger

In Africa as a whole, the *headcount poverty rate*, at the international poverty line of $1.25/day, has dropped moderately but consistently, from 46.7 percent in 1990–1995 to 44.4 percent in 1995–2003 and to 41 percent in 2003–2012 (Table F.1). All regions, economic classifications, and RECs showed the same consistent reduction in poverty. However, poverty levels remain quite high, except in northern Africa. In all areas, 2003–2012 poverty levels remain much greater than 50 percent of the 1990–1995 levels, reflecting insufficient progress toward meeting the MDG target of halving 1990 poverty levels by 2015. However, poverty reduction appears to be accelerating. The average annual percentage reduction in poverty during the 2003–2012 period was greater than the annual average reduction during 1995–2003 for Africa as a whole and for all regions except western Africa. Poverty rates according to national poverty lines show very similar trends (Table F.2), although by this measure, poverty has increased slightly in northern Africa, from 18.4 percent in 1990–1995 to 18.7 percent in 2003–2012.

Measures of hunger and malnutrition show similar trends of regular though disappointingly slow improvement. The prevalence of weight-for-age *child malnutrition* (Table F.3) declined from 24.7 percent in 1990–1995 to 20.9 percent in 2003–2012 for Africa as a whole; all areas saw similar declines, except for the group of countries with less favorable agricultural conditions, where child malnutrition prevalence rose slightly from 30.8 percent in 1990–1995 to 31.3 percent in 2003–2012. The prevalence of *undernourishment* in the entire population declined in all areas between 1990–1995 and 2003–2012. In the latter period, it reached 20.6 percent for Africa as a whole (Table F.4).

Progress in reducing *under-five child mortality* was somewhat stronger (Table F.5). Between 1990–1995 and 2003–2012, the continent as a whole reduced child mortality rates by about one-third, from 149.8 per 1,000 to 100.4. During the 2003–2012 period, the continent's child rate decreased by an average of 4 percent per year, with every area showing annual average reductions of at least 2 percent, and as much as a 5.5 percent reduction in eastern Africa.

These trends are summarized in the *Global Hunger Index* (Table F.6), a measure calculated yearly by IFPRI that combines data on child malnutrition, child mortality, and overall undernourishment (see von Grebmer et al., 2013, for more information). Higher numbers of the Index indicate higher levels of hunger and child mortality. Here again, for the continent as a whole and for all regions, economic categories and RECs, the Index shows consistent improvement throughout the past two decades, with continued declines during 2003–2012.

Progress in the CAADP Implementation Process

Table B.1 provides a summary of progress made in the CAADP implementation process. As of March 2014, 33 countries had signed CAADP compacts, and of these, 25 had developed NAFSIPs to operationalize the commitments in the compacts. Momentum toward signing CAADP compacts did not pick up until 2009, two years after the first compact was signed by Rwanda in 2007. Since 2009, the fast pace of signing CAADP compacts and developing NAFSIPs reflects the commitments of African Heads of State and Government to implementing CAADP as the framework for developing agriculture to improve food and nutrition security, create employment, reduce poverty, and achieve resilience for vulnerable communities and ecosystems. Following the signing of the compact and the development of a NAFSIP, each country holds a business meeting to discuss, among other things, the financing of the plan. The government leads the process by presenting its priorities in the NAFSIP, its own resources to finance the plan, and the financing gap that needs to be filled. Twenty-two countries had held business meetings by March 2014.

In order to support countries to finance the gaps in their NAFSIPs and achieve targeted outcomes, GAFSP was created in 2010, and 15 countries in Africa have been approved for grants totaling over $563 million. In addition to GAFSP, there have been other CAADP-supporting initiatives aimed at improving the pace and quality of implementation at the country level. The New Alliance is one; ten African countries have launched New Alliance cooperation agreements that indicate commitments by various partners, including government, the private sector, and donors. Another is Grow Africa, which arose from the World Economic Forum to attract and support private sector investment in Africa's agriculture; seven countries are participating in that initiative.

Even after countries have signed CAADP compacts and developed NAFSIPs, they still must address questions around implementation. Countries need to track and report implementation progress to their stakeholders. Yet, in several governments, capacity for analysis and M&E is weak. To fill this gap, ReSAKSS has been working to support countries to establish country SAKSS platforms that are aimed at improving policy analysis, review, and dialogue in order to improve the quality of NAFSIP implementation. Already, 6 platforms have been established and an additional 6 will soon be established, taking the total number of country platforms to 12 by the end of 2014.

One of the principles of CAADP is strong partnerships, including mutual accountability. African countries are increasing efforts to strengthen partnerships and promote evidence-based policy planning and implementation, including through review, dialogue, benchmarking and mutual accountability. One key element in efforts to enhance mutual accountability is to strengthen review processes by establishing robust and technically sound agricultural JSRs. JSRs provide an inclusive, evidence-based platform for multiple stakeholders to review progress together, hold each other accountable for commitments, and agree on future plans of action. In early 2014, the African Union Commission (AUC) and the NEPAD Planning and Coordinating Agency (NPCA) initiated a process of assessing the status of JSRs in seven countries. The assessments were completed in July 2014, and the process will be expanded to more countries in the coming years. In supporting the countries, AUC and NPCA were supported by IFPRI and ReSAKSS, as well as the United States Agency for International Development (USAID) Africa Lead II program. This partnership is expected to continue and strengthen for the next set of countries. Recognizing the importance of continued efforts to improve review and dialogue, African Heads of State and Government renewed their commitment to strong review and mutual accountability processes at the June 2014 Malabo summit.

7| Summary and Implications for the CAADP Agenda

The entire agenda of the New Partnership for Africa's Development (NEPAD) reflects the determination of African countries to put an end to decades of economic decline and deteriorating living conditions, through improved economic and policy governance that leads to better economic growth and poverty reduction outcomes. CAADP, in particular, demonstrates the strategic choice of African leaders to focus on agriculture as a major contributor to growth, poverty reduction, and food and nutrition security. When discussing resilience in relation to CAADP, a key indicator of progress is greater availability and accessibility of food among the poor and most vulnerable. Stronger trade performance by African countries in agricultural markets, in and outside Africa, constitutes an important pathway to that goal. Higher competitiveness and increased market shares generate higher incomes, while better market integration reduces the level of volatility in food markets. Combined, both raise the capacity to absorb supply shocks and price shocks, and thus enhance the resilience of domestic food markets.

Findings presented in Chapter 2 and 3 of this report suggest that African countries are making progress toward leveraging the contribution of trade to more resilient local food systems. The encouraging achievements in recent years, reported in Chapter 2, are an indication that more can and needs to be done. At the global level, the realization of increased competitiveness and gains in market share constitute a marked departure from the declining trends in Africa's global trade shares of the 1980s and 1990s. The shares of African countries in global trade still remain, however, rather modest. Furthermore, Africa's agricultural trade deficit is widening very rapidly and will prove to be unsustainable. The current deficit of nearly $40 billion reflects a large unmet demand facing domestic food sectors. The underlying forces—faster economic growth, continued population growth, and rapid urbanization—are long term in nature, suggesting that the surge in demand is likely to persist for a while.

Chapter 3 assesses the causes and effects of food price volatility, as well as market alternatives for reducing the volatility. The chapter also discusses the potential benefits from trade, including stabilizing domestic markets. Benefits from food trade depend on the nature of the interface between global and domestic markets. In addition to fundamentals related to comparative advantage and competitiveness, governments' policy and regulatory actions determine the potential benefits of trade. The chapter identifies policy options to minimize the possible destabilizing effects of food price volatility and to mitigate their impacts among the poor and vulnerable. The findings from Chapters 2 and 3 indicate that there is a need and a real opportunity for domestic markets to respond more fully and expand supply significantly faster than has been the case so far.

Implications for the Future CAADP Agenda:

1. Countries need to vigorously pursue efforts to raise farm level productivity and production, by adopting best practices and opting for the most effective and sustainable options to foster competitiveness and gain further market share, globally as well as domestically. Indeed, there are examples of innovative solutions to problems of access to technology and modern inputs, including in Africa. For instance, successful approaches to developing fertilizer and seed systems and raising adoption rates exist in eastern Africa: Kenya's experience in removing price controls, import quotas, and fertilizer donations and working to develop a private-sector-based input distribution system; and the policy and regulatory reforms undertaken by Uganda, Kenya, and Tanzania, with support from the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), that accelerated variety releases and increased seed supply from both domestic production and imports (Ariga et al., 2006; Waithaka et al., 2011).

2. Faster modernization of food value chains is essential. The emerging and rapidly expanding demand from urban and foreign markets calls for changes in the operation of food value chains, in particular all along the farm-gate-to-retail segments. The issues of processing, packaging, distribution, quality, and norms all deserve greater attention. Fortunately, there are good examples to learn from: for example, since the mid-1990s, Senegal has nearly multiplied tenfold its non-traditional exports to the most restrictive European Union market (Government of Senegal, 2014). Similarly, the rapid development of processed millet and cassava value chains in West Africa serve as good illustrations of what is possible under CAADP.

3. It is encouraging that the document on sustaining the momentum of CAADP and its related Results Framework (RF) are focusing on the right priorities. The first three of the five priority areas deal with productivity issues, markets for modern inputs and crops, and trade performance and competitiveness. This emphasis provides the needed focus for an increased level of action and effectiveness. Going forward, the emphasis should be on raising the pace, quality, and intensity (in terms of resources) of implementation, at the country and regional levels.

Chapters 4 and 5 deal with the regional dimension of trade and its links to the volatility and resilience of local food markets. They look at the link in both directions: the scope for trade to mitigate food market volatility, and, conversely, the potential for biophysical or ecosystem risks to undermine trade. Findings show that existing patterns of country specialization in production and trade would allow for much higher levels of intraregional trade than are reflected by current flows. They also show that expanding trans-border trade would reduce the volatility of local food markets in many countries, to the benefit of many of the poor and vulnerable. Recent trends that have been observed within the three main RECs show that countries are becoming more competitive in regional markets, and that these are in turn playing increasingly important roles in trade by individual countries. Intra-regional trade is projected to expand under current trends; measures such as removing cross-border barriers, reducing the overall cost of trading, or raising yields would further expand

regional trade beyond the projected trends. Chapter 5 highlights the two-dimensional nature of the relationship between trade and resilience. On the one hand, trade can help countries better navigate shocks to the food system, including biophysical shocks. Such shocks, on the other hand, can undermine the production base, which lowers the capacity to trade or amplifies the magnitude of shocks. This in turn reduces the effectiveness of trade as a stabilizing force.

The CAADP Pillar II framework document (Framework for Improving Rural Infrastructure and Trade Related Capacities for Market Access (FIMA)) puts emphasis on the importance of regional trade as a major source of future income growth for smallholder farmers. Projections cited in the document indicate that demand for local staples in regional markets is expected to grow by about $100 billion between 2005 and 2030. The pervasive nature of various types of barriers to cross-border trade is well documented across all major regions. The costs are not just missed opportunities to stabilize local markets, as shown in the 2011 crisis in the Sahel region, but also lost opportunities to raise incomes and create wealth among rural and smallholder communities. If climate change were to erode the production base and scuttle the capacity to expand trade, these losses would be compounded.

Implications for the Future CAADP Agenda:

1. RECs and their member states have for decades tried to boost regional trade and integrate regional markets. In order to speed up progress, they need to more forcefully track and enforce their existing policies and adopt new ones as required to deepen market integration. Member states need to make more efforts in three broad areas: align and harmonize national policies; invest in modernizing staples value chains from farm gate to retail; and build the required infrastructure to lower the cost of moving goods in local and cross-border markets. While these are not new ideas, it should be possible to focus more effectively on these issues under the CAADP Results Framework (RF). In particular, priority areas 2 and 3 target, respectively, better functioning regional and domestic markets, and increased investment in agribusiness value chains. CAADP accountability processes can help to encourage and enforce compliance and realize faster progress.

2. Climate change adaptation and mitigation are already being addressed under CAADP RF priority area 5 (improved management of natural resources for sustainable production) and priority area 1 (increased agricultural production, productivity, and value addition). Technology innovation systems that are capable of effectively controlling and mitigating biophysical risks, including pests and disease, must be a major piece of the agenda. Such systems would have the double benefit of reducing the likelihood or severity of future shocks while boosting or preserving the capacity to use trade to stabilize domestic food markets when shocks do occur.

In addition to providing an in-depth analysis of the feature topic of agricultural trade and resilience, chapter 6 of the 2013 ATOR assesses trends and progress on CAADP core indicators as well as the CAADP implementation process. The chapter shows that Africa's overall economic

and agricultural growth rates have been impressive in recent years. Growth in the level of public agricultural expenditures was also remarkable, particularly during 2003-2008 when expenditures grew an annual average rate of 7.7 percent for Africa as a whole. However, in the aftermath of the global food and financial market crises, the pace of PAE growth declined markedly at -1.3 percent a year in 2008-2013, reflecting the decline in the rate of economic growth and the sharp fall in fiscal revenue and development assistance. Thus, for Africa as a whole and across all major regions, the growth in expenditures has not been enough to achieve the CAADP targets of a 10 percent budget share. The annual average rate of agricultural growth of more than 5 percent for Africa as a whole moved closer to the 6 percent target. Poverty and hunger levels also have consistently made moderate declines for Africa as a whole and across all major regions. The chapter also reports on the various initiatives that are supporting the CAADP implementation process by financing gaps in NAFSIPs or seeking to improve the quality of sector polices and agricultural dialogue and review processes. These include GAFSP, the New Alliance, the establishment of country SAKSS, and strengthening of comprehensive agriculture JSRs. The recent recommitment to CAADP by African leaders in Malabo is expected to enhance the need for increased agricultural investments and progress toward desired results and targets.

Annexes:
Core CAADP M&E and Supplementary Indicators

The is section presents data and trends in the core CAADP M&E core indicators (see Benin et al. 2010). It also contains supplementary data and trends specific to the feature topic of the 2013 ATOR. The trend data are organized as follows:

- Annex A – Enabling Environment: gives the context within which the CAADP process and related policies, investments, and outcomes have been taking place.
- Annex B – CAADP Implementation Process: assesses progress in implementing the CAADP roundtable agenda.
- Annex C – Agricultural Financing: assesses trends in public agriculture expenditures.
- Annex D – Agricultural Output, Productivity, and Growth: assess trends in overall agricultural growth and agricultural productivity growth.
- Annex E – Agricultural Trade: assesses trends in agricultural exports and imports.
- Annex F – Poverty and Hunger: assesses trends in poverty and hunger outcomes.
- Annex G- Supplementary Data Tables.

Technical Notes to Annex Tables

1. To control for year-to-year fluctuations, one-point estimates are avoided. Therefore, the values under the column "2003" are averages over the years 2002 to 2004.

2. Annual average level and annual average change for 2003–2012 include data from 2003 up to the most recent year that is measured and available.

3. Annual average level is simple average over the years shown, inclusive of the years shown.

4. Annual average change for indicators that can be negative (such as growth rates and inflation), or for indicators that are greater than 100 percent (such as government gross debt or revenue as % of GDP), is shown as annual average percentage point change, which is a simple average of the difference in two consecutive years over the years specified in the range. Annual average change for all other indicators is annual average percent change, the beginning to the end years shown by fitting an exponential growth function to the data points (the "LOGEST" function in Excel).

5. For indicators in which there are only a few measured data points over the years specified in the range (such as poverty, which is measured once every three to five years or so), a straight-line method was used

to obtain missing values for the individual years between any two measured data points. Otherwise, estimated annual average change based on the measured values is used to obtain missing values either preceding or following the measured data point. In cases where the missing values could not be interpolated, the data is reported as missing and excluded from the calculations for that time period. Any weights used for these indicators are adjusted to account for the missing data in the series of the indicator.

6. Values for the following groupings are calculated by weighted summation: Africa; the regional aggregations (SSA and central, eastern, northern, southern and western); economic aggregations (Less favorable agriculture conditions, More favorable agriculture conditions, Mineral-rich countries, and Middle income countries); and Regional Economic Communities (CEN-SAD, COMESA, EAC, ECCAS, ECOWAS, IGAD, SADC, and UMA). The weights vary by indicator; weights are based on each country's proportion in the total value of the indicator used for the weighing measured at the respective aggregate level. Each country *i*'s weight in region *j* (wij) is then multiplied by the country's data point (xi) and then summed up for the relevant countries in the region to obtain the regional value (yj) according to: $yj = \Sigma i\ wijxi.$

7. Africa, south of the Sahara (SSA), excludes the northern Africa region and its constituent countries.

Annex A: Enabling Environment

TABLE A.1—TOTAL ODA PER CAPITA, GROSS DISBURSEMENTS (constant 2005 US$)

Region	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	32.87	39.23	–2.49
Central	55.96	52.14	–4.82
Eastern	30.88	42.17	–1.87
Northern	19.61	22.17	1.48
Southern	45.63	45.17	–3.21
Western	27.63	38.51	–2.16
Less favorable agriculture conditions	52.03	56.78	–4.06
More favorable agriculture conditions	35.76	47.18	–0.46
Mineral–rich countries	66.41	59.44	–4.03
Middle–income countries	22.63	28.37	–2.89
CEN–SAD	25.48	34.48	–0.40
COMESA	34.64	38.17	–3.93
EAC	33.10	48.79	2.66
ECCAS	55.31	49.57	–5.90
ECOWAS	27.63	38.51	–2.16
IGAD	26.10	35.78	–0.88
SADC	48.35	48.51	–3.98
UMA	19.83	28.47	6.18

Source: ReSAKSS based on Creditor Reporting System (OECD 2014) and World Development Indicators (World Bank 2014).

TABLE A.2—SHARE OF AGRICULTURAL ODA IN TOTAL ODA (%)

	SHARE IN TOTAL ODA			SHARE IN TOTAL SECTOR ALLOCABLE ODA		
Region	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	3.91	4.19	6.31	7.62	7.35	0.73
Central	2.22	2.26	7.69	6.24	6.02	0.49
Eastern	4.51	4.78	4.76	7.96	8.02	–0.74
Northern	4.31	4.17	2.92	6.66	5.11	–0.44
Southern	3.02	4.18	7.32	5.40	6.29	1.25
Western	5.53	5.01	6.51	10.14	9.20	2.69
Less favorable agriculture conditions	6.34	6.33	4.55	11.27	11.18	1.13
More favorable agriculture conditions	4.92	5.58	3.84	8.20	8.77	–0.47
Mineral–rich countries	1.42	1.98	8.65	4.52	4.99	1.94
Middle–income countries	3.69	3.39	8.16	6.73	5.50	2.09
CEN–SAD	5.06	4.52	5.21	8.94	7.77	1.54
COMESA	3.29	4.08	7.90	6.98	7.48	0.95
EAC	4.36	5.07	3.60	6.76	7.45	–0.62
ECCAS	2.08	2.65	11.64	5.78	6.31	3.45
ECOWAS	5.53	5.01	6.51	10.14	9.20	2.69
IGAD	4.17	4.40	5.63	7.57	7.63	0.39
SADC	2.79	3.79	6.31	6.21	6.69	–0.64
UMA	5.61	4.42	1.23	8.53	5.29	–1.69

Source: ReSAKSS based on Creditor Reporting System (OECD 2014).

Notes: Both agriculture ODA and total sector allocable ODA are based on gross disbursements. Total sector allocable ODA is total ODA minus total unallocable ODA, which includes commodity aid and general program assistance, debt programs, humanitarian aid, administrative costs, funds to NGOs, refugee programs, and other unallocable aid.

TABLE A.3—SHARE OF EMERGENCY FOOD AID IN TOTAL ODA (%)

Region	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	4.04	4.37	–1.23
Central	1.68	3.53	12.17
Eastern	9.76	9.82	–4.69
Northern	0.74	0.86	5.20
Southern	3.37	2.34	–6.37
Western	1.00	1.11	6.30
Less favorable agriculture conditions	4.21	7.15	7.20
More favorable agriculture conditions	5.04	5.13	–3.60
Mineral–rich countries	1.86	2.17	0.20
Middle–income countries	4.66	3.98	–5.47
CEN–SAD	3.45	4.97	3.02
COMESA	6.49	7.74	–2.25
EAC	4.64	4.64	–6.93
ECCAS	3.55	3.44	3.14
ECOWAS	1.00	1.11	6.30
IGAD	14.96	14.54	–6.25
SADC	2.21	2.02	–1.71
UMA	0.90	1.05	2.60

Source: ReSAKSS based on Creditor Reporting System (OECD 2014).
Notes: Both emergency food aid and total ODA are based on gross disbursements.

TABLE A.4—GDP GROWTH RATE (%)

Region	Annual avg. level (1990–1995)	Annual avg. percentage point change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage point change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage point change (2003–2012)
Africa	1.63	0.09	3.87	0.27	5.85	5.22	–0.13
Central	–1.47	1.17	4.14	0.29	7.48	5.39	0.00
Eastern	2.83	0.66	4.79	–0.11	4.95	5.74	–0.28
Northern	2.41	–0.31	4.08	0.55	4.69	4.47	–0.37
Southern	0.80	0.63	3.27	–0.08	4.05	4.38	0.06
Western	2.33	–1.08	3.98	0.65	11.21	7.65	–0.07
Less favorable agriculture conditions	1.41	1.45	5.13	0.10	7.89	6.37	–0.03
More favorable agriculture conditions	2.71	0.06	3.89	–0.28	3.52	5.81	0.37
Mineral–rich countries	–3.67	0.78	1.80	0.42	5.05	5.70	0.47
Middle–income countries	1.71	0.02	3.89	0.33	6.05	5.10	–0.20
CEN–SAD	2.90	–0.68	4.08	0.57	7.13	5.95	–0.26
COMESA	2.74	0.23	3.89	0.05	3.74	5.02	–0.29
EAC	3.52	–0.21	4.42	–0.02	4.48	4.80	–0.06
ECCAS	–1.84	1.54	5.22	–0.05	8.23	7.49	0.09
ECOWAS	2.33	–1.08	3.98	0.65	11.21	7.65	–0.07
IGAD	3.03	0.98	4.74	–0.19	4.91	5.72	–0.40
SADC	0.65	0.60	3.25	–0.03	4.13	4.52	0.06
UMA	1.92	–0.35	3.95	0.82	5.25	4.39	–0.45

Source: ReSAKSS based on World Development Indicators (World Bank 2014).

TABLE A.5—GDP PER CAPITA (constant 2005 US$)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	895	–1.70	941	1.83	1,021	1,150	1.87
Central	518	–5.15	481	0.87	516	572	1.67
Eastern	327	–0.81	348	1.44	371	433	3.02
Northern	1,446	–0.14	1,721	4.34	1,989	2,218	1.29
Southern	2,195	–1.81	2,228	0.68	2,320	2,630	2.26
Western	518	–1.50	528	1.07	588	722	3.69
Less favorable agriculture conditions	312	–2.15	311	1.04	336	384	2.24
More favorable agriculture conditions	283	–1.14	297	0.64	303	346	3.11
Mineral–rich countries	289	–7.47	230	–1.11	229	257	2.95
Middle–income countries	1,402	–1.27	1,509	2.24	1,666	1,901	2.04
CEN–SAD	701	–0.51	792	3.21	898	1,030	1.90
COMESA	461	–0.94	540	4.06	600	648	0.35
EAC	585	0.37	629	1.19	661	736	1.96
ECCAS	586	–6.02	559	1.45	614	770	4.16
ECOWAS	518	–1.50	528	1.07	588	722	3.69
IGAD	312	–0.61	337	1.41	358	422	3.13
SADC	1,345	–2.49	1,335	0.55	1,380	1,543	2.00
UMA	1,939	–1.05	2,274	4.73	2,675	2,947	0.62

Source: ReSAKSS based on World Development Indicators (World Bank 2014).

TABLE A.6—INFLATION, GDP DEFLATOR (%)

Region	Annual avg. level (1990–1995)	Annual avg. percentage point change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage point change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage point change (2003–2012)
Africa	113.39	10.44	34.47	–7.71	10.54	9.84	–0.07
Central	1239.54	12.96	54.60	–12.02	4.78	7.88	0.21
Eastern	37.94	2.52	13.47	–3.67	7.70	11.07	1.38
Northern	16.77	–0.52	7.66	–1.29	8.49	8.35	0.20
Southern	67.28	20.39	67.06	–13.37	13.90	8.50	–0.71
Western	31.24	12.53	19.96	–7.76	12.07	14.54	–0.40
Less favorable agriculture conditions	9.38	1.73	6.56	–1.03	6.47	6.85	–0.09
More favorable agriculture conditions	16.58	1.34	9.08	–1.56	6.24	9.04	0.92
Mineral–rich countries	2603.28	25.24	133.31	–25.16	14.62	14.17	–1.05
Middle–income countries	42.25	11.37	35.24	–8.01	11.00	9.89	–0.16
CEN–SAD	23.60	5.39	12.79	–4.14	9.82	10.75	0.23
COMESA	365.71	3.27	22.51	–4.95	12.15	11.58	0.86
EAC	11.69	–0.34	6.85	–0.55	4.11	6.32	0.58
ECCAS	1139.01	105.86	300.13	–66.00	30.35	13.25	–2.61
ECOWAS	31.24	12.53	19.96	–7.76	12.07	14.54	–0.40
IGAD	46.33	2.63	14.34	–4.29	7.58	12.36	1.96
SADC	245.48	20.34	68.77	–13.87	13.52	8.62	–0.64
UMA	18.17	–0.11	8.58	–1.61	9.00	7.57	0.03

Source: ReSAKSS based on World Development Indicators (World Bank 2014).

TABLE A.7—GENERAL GOVERNMENT GROSS DEBT AS A SHARE OF GDP (%)

Region	Annual avg. level (1990–1995)	Annual avg. percentage point change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage point change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage point change (2003–2012)
Africa	95.55	4.47	80.80	–5.49	62.47	43.42	–2.73
Central	126.04	6.02	117.29	–6.54	93.31	47.82	–7.90
Eastern	198.99	14.27	120.70	–10.57	96.39	62.99	–4.73
Northern	81.59	2.65	74.47	–4.00	62.73	49.88	–1.84
Southern	30.75	0.89	37.29	2.32	42.73	34.93	–0.60
Western	64.39	9.13	90.55	–2.59	71.10	36.12	–5.37
Less favorable agriculture conditions	99.57		95.51	–1.17	89.49	51.34	–6.09
More favorable agriculture conditions	131.78	5.73	93.07	–8.48	76.86	50.92	–4.29
Mineral–rich countries	95.35	–1.41	153.93	12.22	192.45	97.63	–17.27
Middle–income countries	93.92	4.48	77.91	–5.91	57.17	41.08	–2.14
CEN–SAD	98.13	4.18	85.84	–2.95	73.94	52.94	–3.13
COMESA	125.96	8.88	97.46	–4.01	88.92	69.04	–3.00
EAC	67.04		68.52	0.15	68.84	49.45	–3.19
ECCAS	125.71	5.64	113.62	–7.21	85.02	44.41	–6.75
ECOWAS	64.39	9.13	90.55	–2.59	71.10	36.12	–5.37
IGAD	262.93		126.78	–10.81	104.99	66.83	–5.41
SADC	85.88	–6.23	57.10	–2.34	48.10	38.12	–1.06
UMA	81.59	2.65	69.62	–5.79	49.27	34.41	–2.02

Source: ReSAKSS based on World Economic Outlook Database (IMF 2014) and World Development Indicators (World Bank 2014).

TABLE A.8—GENERAL GOVERNMENT REVENUE AS A SHARE OF GDP (%)

Region	Annual avg. level (1990–1995)	Annual avg. percentage point change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage point change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage point change (2003–2012)
Africa	24.66	–0.11	25.54	0.29	27.17	29.60	0.26
Central	23.24	0.10	20.55	–0.34	20.79	26.56	0.71
Eastern	16.32	–0.06	16.46	0.31	18.88	20.22	0.00
Northern	28.26	–0.14	29.94	0.44	31.79	35.39	0.36
Southern	28.36	0.51	26.92	–0.28	25.92	29.39	0.48
Western	13.80	0.43	21.69	1.28	27.17	25.81	–0.14
Less favorable agriculture conditions	21.53	–1.20	19.02	0.52	21.43	25.31	0.42
More favorable agriculture conditions	15.65	0.27	17.64	0.03	18.27	20.27	0.40
Mineral–rich countries	15.92	–1.01	12.23	0.24	16.59	20.99	0.79
Middle–income countries	26.80	–0.08	27.50	0.20	28.52	30.92	0.24
CEN–SAD	23.25	–0.18	24.84	0.49	27.46	29.18	0.22
COMESA	21.91	–0.13	23.32	0.51	26.74	30.12	0.35
EAC	21.96	1.29	23.88	–0.22	23.98	25.11	0.35
ECCAS	22.79	0.04	23.29	0.30	25.50	32.95	1.01
ECOWAS	13.80	0.43	21.69	1.28	27.17	25.81	–0.14
IGAD	16.08	0.12	16.44	0.36	19.41	20.16	–0.19
SADC	22.44	–0.57	21.58	0.43	25.00	28.51	0.50
UMA	28.26	–0.14	30.89	0.72	34.11	39.19	0.70

Source: ReSAKSS based on World Economic Outlook Database (IMF 2014) and World Development Indicators (World Bank 2014).

Annex B: CAADP Implementation Process

TABLE B.1—PROGRESS IN CAADP IMPLEMENTATION PROCESS AS OF MARCH 2014

Country/Region	Roundtable held and compact signed	Investment plan drafted, reviewed and validated	Business meeting held	Country SAKSS established	GAFSP funding approved	Grow Africa first wave	JSR Assessment conducted	New Alliance Cooperation Framework launched
AFRICA*	**33**	**25**	**22**	**6**	**15**	**7**	**7**	**10**
Central Africa*	***4***	***1***	***1***	***1***	***1***			
Burundi	25-Aug-09	31-Aug-11	15-Mar-12		Burundi (30m)			
Cameroon								
Central Af. Republic	15-Apr-11							
Chad								
Congo Dem. Rep.	18-Mar-11			yes				
Congo , Rep.								
Equatorial Guinea								
Gabon								
Sao Tome and Principe	15-Oct-13, scheduled							
Eastern Africa*	***8***	***5***	***5***	***2***	***4***	***4***	***2***	***2***
Comoros								
Djibouti	19-Apr-12							
Eritrea								
Ethiopia	28-Sept-09	Sept -10	7-Dec-10		Ethiopia (52m)	Ethiopia	yes	yes
Kenya	24-Jul-10	14-Sep-10	27-Sep-10			Kenya		
Madagascar								
Mauritius								
Rwanda	31-Mar-07	Dec-09	9-Dec-09	yes	Rwanda (50m)	Rwanda		
Seychelles	16-Sep-11							
Somalia								
Sudan	29-Jul-13							
Tanzania	8-Jul-10	31-May-11	10-Nov-11	yes	Tanzania (23m)	Tanzania	yes	yes
Uganda	31-Mar-10	16-Sep-10	17-Sep-10		Uganda (28m)			

TABLE B.1—PROGRESS IN CAADP IMPLEMENTATION PROCESS AS OF MARCH 2014 *continued*

Country/Region	Roundtable held and compact signed	Investment plan drafted, reviewed and validated	Business meeting held	Country SAKSS established	GAFSP funding approved	Grow Africa first wave	JSR Assessment conducted	New Alliance Cooperation Framework launched
Northern Africa*	***1***	***1***						
Algeria								
Egypt								
Libya								
Mauritania	28-Jul-11	16-Feb-12						
Morocco								
Tunisia								
Southern Africa*	***5***	***3***	***3***	***1***	***2***	***1***	***2***	***2***
Angola								
Botswana								
Lesotho	5-Sep-13							
Malawi	19-Apr-10	10-Oct-10	29-Sep-11		Malawi (39m)		yes	yes
Mozambique	12-Dec-11	yes	yes	yes		Mozambique	yes	yes
Namibia								
South Africa								
Swaziland	3-Mar-10							
Zambia	18-Jan-11	yes	29-May-13		Zambia (31m)			
Zimbabwe								
Western Africa*	***15***	***15***	***13***	***2***	***8***	***2***	***3***	***6***
Benin	16-Oct-09	25-Sep-10	7-Jun-11					yes
Burkina Faso	22-Jul-10	17-Sep-10	12-Mar		Burkina Faso (37)	Burkina Faso	yes	yes
Cape Verde	11-Dec-09	25-Sep-10	17-Nov-10					
Cote d'Ivoire	27-Jul-10	1-Apr-12						yes
Gambia, The	28-Oct-09	25-Sep-10	5-Nov-09		Gambia (28m)			
Ghana	28-Oct-09	9-Jun-10	17-Jun-09	yes		Ghana	yes	yes
Guinea	7-Apr-10	25-Sep-10	4-Jun-13					
Guinea-Bissau	18-Jan-11	3-Jun-11						

Annex B: CAADP Implementation Process *continued*

TABLE B.1—PROGRESS IN CAADP IMPLEMENTATION PROCESS AS OF MARCH 2014 *continued*

Country/Region	Roundtable held and compact signed	Investment plan drafted, reviewed and validated	Business meeting held	Country SAKSS established	GAFSP funding approved	Grow Africa first wave	JSR Assessment conducted	New Alliance Cooperation Framework launched
Western Africa* *cont'd*	***15***	***15***	***13***	***2***	***8***	***2***	***3***	***6***
Liberia	6-Oct-09	9-Jun-10	17-Jun-09		Liberia (46m)			
Mali	13-Oct-09	25-Sep-10	5-Nov-10		Mali (37.2m)			
Niger	30-Sep-09	25-Sep-10	15-Dec-10		Niger (33m)			
Nigeria	13-Oct-09	9-Jun-10	17-Jun-10					yes
Senegal	10-Feb-10	9-Jun-10	17-Jun-09		Senegal (40m)		yes	yes
Sierra Leone	18-Sep-09	9-Jun-10	17-Jun-09		Sierra Leone (50m)			
Togo	30-Jul-09	9-Jun-10	17-Jun-09	yes	Togo (39m)			
RECS	***2***	***1***	***1***					
CEN-SAD								
COMESA	In progress							
EAC								
ECCAS								
ECOWAS	11-Nov-09	9-Jun-10	17-Jun-10					
IGAD	21-Oct-13							
SADC								
UMA								

Sources: Authors' compilation based on African Union Commission, March 2014

Notes. * The items in this row are the number of countries in Africa or subregion that have achieved the milestone

** The items in this row are the number of RECs that have achieved the milestone

SAKSS: Strategic Analysis and Knowledge Support System; GAFSP: Global Agriculture and Food Security Program; JSR: Joint Sector Review; New Alliance: New Alliance for Food Security and Nutrition.

For the RECs, this refers to ReSAKSS regional nodes and the following country assignments:

ReSAKSS-ECA

Burundi (COMESA, EAC, ECCAS)
Central Afr. Rep. (Cen-SAD, ECCAS)
Comoros (CEN-SAD, COMESA)
Congo, D.R (COMESA, ECCAS, SADC)
Congo, R (ECCAS)
Djbouti (CEN-SAD, COMESA, IGAD)
Egypt (CEN-SAD, COMESA)
Eritrea (COMESA, IGAD)
Ethiopia (COMESA, IGAD)
Gabon (ECCAS)
Kenya (Cen-SAD, COMESA, EAC, IGAD)
Libya (CEN-SAD, COMESA, UMA)
Rwanda (COMESA, EAC, ECCAS)
Seychelles (COMESA, SADC)
South Sudan ()
Sudan (CEN-SAD, COMESA, IGAD)
Tanzania (SADC)
Uganda (COMESA, EAC, IGAD)

ReSAKSS-SA

Angola (ECCAS, SADC)
Botswana (SADC)
Lesotho (SADC)
Madagascar (COMESA, SADC)
Malawi (COMESA, SADC)
Mauritius (COMESA, SADC)
Mozambique (SADC)
Namibia (SADC)
Swaziland (COMESA, SADC)
Zambia (COMESA, SADC)
Zimbabwe (COMESA, SADC)

ReSAKSS-WA

Benin (CEN-SAD, ECOWAS
Burkina Faso (CEN-SAD, ECOWAS)
Cameroon (ECCAS)
Cape Verde (ECOWAS)
Chad (CEN-SAD, ECCAS)
Cote d'Ivoire (CEN-SAD, ECOWAS)
Gambia (CEN-SAD, ECOWAS)
Ghana(CEN-SAD, ECOWAS)
Guinea (CEN-SAD, ECOWAS)
Guinea-Bissau (CEN-SAD, ECOWAS)
Liberia (CEN-SAD, ECOWAS)
Mali (CEN-SAD, ECOWAS)
Mauritania (CEN-SAD, UMA)
Niger (CEN-SAD, ECOWAS)
Nigeria (CEN-SAD, ECOWAS)
Senegal (CEN-SAD, ECOWAS)
Sierra Leone (CEN-SAD, ECOWAS)
Togo (CEN-SAD, ECOWAS)

TABLE C.1—PUBLIC AGRICULTURE EXPENDITURE, ANNUAL GROWTH RATE (%)

Region	Annual avg. rate (1995–2003)	Annual avg. percentage point change (1995–2003)	2003	Annual avg. rate (2003–2008)	Annual avg. percentage point change (2003–2008)	Annual avg. rate (2008–2013)	Annual avg. percentage point change (2008–2013)
Africa	6.63	0.28	5.90	7.67	2.20	–1.34	–2.33
Africa excluding Nigeria and Angola	6.30	0.64	5.13	5.51	1.45	0.03	–2.46
Central	–3.25	–2.36	14.44	12.57	–3.97	16.76	–3.64
Eastern	9.94	4.22	22.79	6.52	–3.73	–3.44	1.20
Northern	5.67	–0.69	–2.66	0.63	10.12	–1.33	–8.99
Southern	11.15	0.65	7.36	13.81	–3.68	0.01	0.92
Western	3.21	–1.16	11.50	16.35	5.29	–5.29	–1.33
Less favorable agriculture conditions	4.29	2.27	17.01	2.28	–5.0	–2.21	3.0
More favorable agriculture conditions	2.17	4.55	15.06	9.47	0.0	–1.13	–2.4
Mineral-rich countries	–0.04	3.47	19.89	24.83	–4.8	–0.82	–12.1
Middle-income countries	7.97	–0.82	3.63	7.08	2.9	–1.40	–2.1
CEN-SAD	3.62	–0.55	1.46	3.83	0.9	–4.82	0.7
COMESA	5.37	–0.09	5.62	4.50	–1.3	–4.88	–0.7
EAC	5.18	1.95	–7.00	–1.99	0.8	3.28	0.7
ECCAS	–1.88	3.37	23.45	28.22	–9.5	10.09	0.9
ECOWAS	3.21	–1.16	11.50	16.35	5.3	–5.29	–1.3
IGAD	13.21	3.34	20.56	7.11	–5.7	–2.28	3.9
SADC	8.40	1.55	10.57	12.63	–2.9	–0.18	–1.1
UMA	6.61	–0.20	–0.04	3.08	15.2	0.25	–14.2

Source: ReSAKSS based on SPEED Database (IFPRI 2013), AUC 2008, World Development Indicators (World Bank 2014), and national sources.
Notes: Values for 2003 are 2002-2004 averages. Annual average percentage point changes represent the averaged differences of the growth rates of the first and last years of the period.

TABLE C.2—SHARE OF AGRICULTURE EXPENDITURE IN TOTAL PUBLIC EXPENDITURE (%)

Region	Annual avg. share (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. share (2003–2008)	Annual avg. percentage change (2003–2008)	Annual avg. share (2008–2013)	Annual avg. percentage point change (2008–2013)
Africa	3.15	8.64	3.71	3.66	–0.98	3.11	–5.58
Central	2.20	33.96	2.19	2.70	7.82	4.75	12.62
Eastern	5.94	–0.02	6.49	6.45	–2.93	5.16	–7.78
Northern	4.44	1.72	4.38	3.72	–6.80	2.71	–7.46
Southern	1.66	9.76	2.23	2.47	2.88	2.44	–3.89
Western	4.99	–2.96	4.25	5.20	10.39	4.96	–3.53
Less favorable agriculture conditions	9.68	–1.88	10.21	11.05	–1.20	7.93	–5.78
More favorable agriculture conditions	7.20	–3.60	7.01	7.25	0.35	6.75	–8.31
Mineral-rich countries	3.89	48.26	3.18	4.07	13.23	5.05	–7.02
Middle-income countries	3.04	4.53	3.34	3.23	–1.53	2.68	–5.32
CEN-SAD	5.40	–0.92	4.81	4.31	–3.95	2.92	–8.18
COMESA	4.64	19.44	5.49	4.97	–4.79	3.32	–10.06
EAC	6.84	1.07	6.63	5.38	–7.53	4.39	–3.35
ECCAS	1.37	21.02	1.38	2.09	14.04	4.21	4.59
ECOWAS	4.99	–2.96	4.25	5.20	10.39	4.96	–3.53
IGAD	6.27	0.44	6.99	7.09	–2.41	5.01	–6.12
SADC	1.71	17.54	2.41	2.59	1.75	2.65	–4.29
UMA	3.81	2.19	4.10	3.77	–3.52	3.25	–5.94

Source: ReSAKSS based on SPEED Database (IFPRI 2013), AUC 2008, World Development Indicators (World Bank 2014), and national sources.
Notes: Values for 2003 are 2002-2004 averages.

TABLE C.3—PUBLIC AGRICULTURE EXPENDITURE AS A SHARE OF AGRICULTURE GDP AND GDP (%)

3a—PUBLIC AGRICULTURE EXPENDITURE AS A SHARE OF AGRICULTURE GDP (%)

Region	Annual avg. share (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. share (2003–2008)	Annual avg. percentage change (2003–2008)	Annual avg. share (2008–2012)	Annual avg. percentage point change (2008–2012)
Africa	5.84	1.85	5.91	6.30	3.32	6.14	–6.06
Central	2.37	–9.16	1.70	2.21	9.54	4.07	17.84
Eastern	3.33	6.16	4.92	5.58	2.43	5.23	–7.06
Northern	10.92	1.98	10.84	9.64	–1.64	8.54	–7.70
Southern	11.47	7.41	14.44	18.49	9.32	20.65	–4.05
Western	3.02	–3.57	2.15	2.64	10.10	2.36	–11.14
Less favorable agriculture conditions	6.83	0.69	8.37	8.86	–4.22	5.72	–5.40
More favorable agriculture conditions	4.48	–1.32	4.97	5.63	4.30	6.49	–3.39
Mineral-rich countries	2.48	–6.31	1.70	2.82	20.66	4.54	–1.48
Middle-income countries	6.46	2.55	6.35	6.60	2.96	6.18	–6.91
CEN-SAD	5.18	–1.67	4.29	4.14	–0.30	3.18	–9.55
COMESA	5.53	2.15	5.85	6.06	1.08	5.25	–7.88
EAC	8.36	1.83	8.70	7.32	–3.83	7.86	2.37
ECCAS	2.89	–7.29	2.14	3.82	21.64	8.37	7.35
ECOWAS	3.02	–3.57	2.15	2.64	10.10	2.36	–11.14
IGAD	3.00	9.05	4.95	5.76	2.90	4.68	–6.18
SADC	7.91	5.38	9.48	11.91	8.53	14.36	–3.25
UMA	11.15	2.75	12.07	11.28	1.38	11.04	–7.47

Source: ReSAKSS based on SPEED Database (IFPRI 2013), AUC 2008, World Development Indicators (World Bank 2014), and national sources.
Notes: Values for 2003 are 2002-2004 averages.

TABLE C.3—PUBLIC AGRICULTURE EXPENDITURE AS A SHARE OF AGRICULTURE GDP AND GDP (%) continued

3b—PUBLIC AGRICULTURE EXPENDITURE AS A SHARE OF GDP (%)

Region	Annual avg. share (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. share (2003–2008)	Annual avg. percentage change (2003–2008)	Annual avg. share (2008–2012)	Annual avg. percentage point change (2008–2012)
Africa	0.86	2.61	0.90	0.93	1.46	0.90	–5.40
Central	0.66	–10.26	0.44	0.55	8.07	0.96	16.57
Eastern	1.04	4.91	1.42	1.50	–0.77	1.27	–6.00
Northern	1.25	1.41	1.24	1.08	–3.94	0.96	–6.02
Southern	0.46	7.83	0.57	0.69	6.99	0.82	–2.32
Western	0.89	–0.80	0.72	0.83	8.01	0.71	–12.92
Less favorable agriculture conditions	2.59	–1.18	2.69	2.91	–2.15	2.01	–5.84
More favorable agriculture conditions	1.44	–1.81	1.55	1.67	2.36	1.75	–5.46
Mineral-rich countries	1.13	–7.69	0.69	1.05	17.57	1.58	–3.27
Middle-income countries	0.77	4.11	0.82	0.82	0.96	0.77	–5.82
CEN-SAD	1.16	–0.53	1.03	0.94	–2.56	0.69	–9.80
COMESA	1.31	0.76	1.30	1.26	–1.89	1.00	–7.03
EAC	1.52	1.10	1.52	1.20	–7.35	1.10	1.03
ECCAS	0.57	–8.71	0.39	0.62	15.71	1.29	9.01
ECOWAS	0.89	–0.80	0.72	0.83	8.01	0.71	–12.92
IGAD	1.02	7.82	1.56	1.67	–0.65	1.21	–4.49
SADC	0.53	4.46	0.61	0.72	5.89	0.87	–2.13
UMA	1.10	2.45	1.22	1.13	–1.05	1.17	–4.70

Source: ReSAKSS based on SPEED Database (IFPRI 2013), AUC 2008, World Development Indicators (World Bank 2014), and national sources.
Notes: Values for 2003 are 2002-2004 averages.

TABLE D.1—AGRICULTURE, VALUE ADDED AS A SHARE OF GDP (%)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	17.89	–0.74	17.22	–0.65	16.67	15.09	–1.47
Central	27.29	2.27	24.38	–2.24	21.28	21.65	0.27
Eastern	37.92	–0.34	35.55	–2.69	31.29	29.04	–0.85
Northern	15.09	–2.46	14.05	–2.06	12.35	10.84	–1.49
Southern	6.64	–4.63	5.90	–1.04	5.69	5.22	–0.16
Western	32.65	0.83	33.93	2.00	37.13	30.52	–4.03
Less favorable agriculture conditions	39.60	1.47	39.49	–1.69	34.41	38.35	1.19
More favorable agriculture conditions	36.72	0.16	34.03	–2.68	30.89	31.35	0.35
Mineral–rich countries	36.60	5.18	37.50	1.56	38.21	36.50	–1.02
Middle–income countries	14.59	–1.48	14.17	0.03	14.18	12.19	–2.46
CEN–SAD	25.92	–0.69	25.58	–0.34	24.55	21.31	–2.65
COMESA	27.05	–0.31	25.27	–3.06	20.56	18.79	–1.01
EAC	26.97	–1.57	22.73	–3.76	19.41	18.68	–0.49
ECCAS	23.86	–0.81	20.32	–2.17	18.18	17.25	–0.70
ECOWAS	32.65	0.83	33.93	2.00	37.13	30.52	–4.03
IGAD	40.24	–0.24	38.67	–2.30	33.60	31.08	–0.63
SADC	9.74	–2.32	8.40	–1.80	7.97	7.43	–0.29
UMA	14.14	–2.71	12.81	–2.73	10.95	9.42	–1.89

Source: ReSAKSS based on World Development Indicators (World Bank 2014).

TABLE D.2—LAND AND LABOR PRODUCTIVITY

2a—LAND PRODUCTIVITY (agriculture value added per hectare of arable land, constant 2005 US$)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2011)	Annual avg. percentage change (2003–2011)
Africa	478.92	–0.05	574.09	3.65	671.89	756.17	3.57
Central	412.98	2.11	477.04	1.18	500.75	605.14	3.85
Eastern	368.13	1.02	453.79	2.68	480.13	492.47	1.37
Northern	985.23	–1.60	1148.74	3.62	1371.62	1662.44	4.74
Southern	348.84	–2.84	391.01	2.49	422.18	478.05	3.55
Western	456.87	1.23	579.93	5.78	767.64	877.26	4.61
Less favorable agriculture conditions	644.71	–6.28	490.42	–1.85	470.62	546.55	5.61
More favorable agriculture conditions	335.82	2.03	403.33	1.84	422.10	443.15	1.42
Mineral–rich countries	407.67	2.16	473.98	0.58	473.32	510.59	3.05
Middle–income countries	553.84	–0.86	683.18	4.97	850.62	1012.40	4.77
CEN–SAD	570.32	–0.56	685.57	4.40	831.70	926.19	3.72
COMESA	526.87	0.92	616.65	1.67	636.77	657.27	1.50
EAC	527.02	–1.03	621.72	2.61	667.26	701.95	0.53
ECCAS	414.25	–1.10	479.02	2.35	527.90	676.79	5.70
ECOWAS	456.87	1.23	579.93	5.78	767.64	877.26	4.61
IGAD	371.78	0.94	459.30	2.31	476.26	489.24	1.69
SADC	366.46	–0.75	412.41	1.79	436.79	479.08	2.56
UMA	688.45	–2.96	792.01	3.67	968.16	1195.12	5.27

Source: ReSAKSS based on World Development Indicators (World Bank 2014) and FAOSTAT (FAO 2014).

TABLE D.2—LAND AND LABOR PRODUCTIVITY *continued*

2b—LABOR PRODUCTIVITY (agriculture value added per agricultural worker, constant 2005 US$)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	561.87	–1.09	618.20	2.43	698.39	782.90	2.53
Central	388.95	0.03	406.77	–0.15	402.05	446.79	0.57
Eastern	294.19	–0.27	317.65	0.47	316.27	330.76	1.42
Northern	1699.78	–1.14	1911.15	2.69	2183.13	2597.72	3.82
Southern	495.87	–4.27	520.30	1.65	543.89	595.36	2.50
Western	750.89	0.97	937.28	6.00	1269.64	1517.15	4.21
Less favorable agriculture conditions	398.89	–1.15	371.75	–1.99	348.70	479.41	4.39
More favorable agriculture conditions	234.93	–0.70	249.75	0.69	252.23	267.84	1.39
Mineral–rich countries	351.86	–0.80	353.82	–0.97	339.87	361.31	2.18
Middle–income countries	1166.26	–0.42	1402.76	4.51	1738.53	2148.96	5.08
CEN–SAD	869.12	–0.35	1014.95	3.99	1231.75	1409.74	3.31
COMESA	397.11	0.16	426.43	0.18	419.50	433.11	1.06
EAC	365.38	–2.59	365.42	0.73	372.19	367.45	–0.79
ECCAS	356.40	–2.51	367.41	0.53	379.05	453.95	2.75
ECOWAS	750.89	0.97	937.28	6.00	1269.64	1517.15	4.21
IGAD	316.03	–0.23	345.31	0.31	337.84	353.29	1.52
SADC	379.35	–2.75	385.76	0.43	389.29	416.18	1.88
UMA	2036.05	–4.14	2115.13	2.32	2443.32	2956.53	4.07

Source: ReSAKSS based on World Development Indicators (World Bank 2014) and FAOSTAT (FAO 2014).

TABLE D.3—CEREAL YIELDS (kilograms per ha)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	1159.09	–0.72	1261.26	1.40	1341.25	1448.40	1.99
Central	834.32	–0.80	893.96	1.39	942.40	1032.53	2.40
Eastern	1055.67	–3.92	1060.07	1.09	1128.56	1262.54	3.93
Northern	2018.59	1.98	2365.97	2.82	2690.26	2735.37	0.82
Southern	1296.58	0.12	1533.55	2.31	1551.79	1743.32	3.66
Western	924.30	1.48	1005.05	0.81	1051.16	1160.99	1.15
Less favorable agriculture conditions	501.79	–1.24	562.18	2.52	583.72	708.55	3.97
More favorable agriculture conditions	1175.51	–0.23	1232.79	0.35	1228.11	1392.37	3.66
Mineral–rich countries	1090.55	0.02	1115.34	0.12	1135.20	1310.98	3.40
Middle–income countries	1330.37	–0.82	1482.64	2.31	1663.00	1754.23	1.37
CEN–SAD	1123.61	–0.59	1207.56	1.41	1316.82	1376.32	0.79
COMESA	1501.52	–2.78	1554.11	1.37	1642.15	1780.33	2.65
EAC	1497.93	1.45	1443.70	1.26	1527.85	1626.90	1.83
ECCAS	765.58	–0.79	854.74	1.24	882.72	977.15	3.09
ECOWAS	924.30	1.48	1005.05	0.81	1051.16	1160.99	1.15
IGAD	934.68	–4.98	933.65	1.70	1008.23	1161.88	4.14
SADC	1296.23	0.45	1477.38	1.23	1471.79	1604.10	3.15
UMA	990.84	–6.75	997.06	3.18	1295.55	1338.13	1.32

Source: ReSAKSS based on FAOSTAT (FAO 2014).

TABLE D.4—AGRICULTURE PRODUCTION INDEX (API) (2004–2006 = 100)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	68.16	1.63	81.13	2.90	91.77	107.08	3.16
Central	97.80	0.10	92.58	–0.09	93.24	107.32	3.08
Eastern	64.07	1.24	77.72	4.00	91.99	110.59	4.32
Northern	65.10	0.44	79.15	3.06	91.33	108.84	3.53
Southern	74.07	0.71	86.97	2.76	94.61	116.53	5.25
Western	62.32	4.84	79.86	3.19	90.70	101.77	1.78
Less favorable agriculture conditions	74.83	–1.34	83.33	3.23	94.82	110.57	3.67
More favorable agriculture conditions	67.19	0.23	80.81	3.44	92.54	111.94	4.56
Mineral–rich countries	97.91	0.01	91.13	0.10	94.15	108.38	3.33
Middle–income countries	64.75	2.48	80.03	3.12	91.21	105.45	2.70
CEN–SAD	63.48	2.77	79.87	3.36	91.47	104.06	2.20
COMESA	72.19	0.83	83.16	2.88	92.96	109.26	3.46
EAC	73.04	–1.38	81.64	3.20	92.75	109.27	3.27
ECCAS	88.95	1.46	87.95	0.80	92.52	113.14	4.73
ECOWAS	62.32	4.84	79.86	3.19	90.70	101.77	1.78
IGAD	60.61	2.73	77.25	4.38	91.92	110.38	4.14
SADC	83.03	0.47	88.31	1.60	94.47	112.86	4.51
UMA	67.57	–1.43	77.88	2.86	90.81	109.39	3.99

Source: ReSAKSS based on FAOSTAT (FAO 2014) and World Development Indicators (World Bank 2014).

TABLE D.5—FERTILIZER CONSUMPTION (kilograms per ha)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2011)	Annual avg. percentage change (2003–2011)
Africa	19.21	–1.88	20.33	2.60	23.36	22.38	–0.46
Central	2.27	6.47	4.09	7.73	5.70	4.01	–1.07
Eastern	7.19	–0.59	8.51	–0.70	8.13	9.87	7.67
Northern	64.54	–1.29	77.80	5.46	99.61	102.55	–0.04
Southern	37.64	–1.31	35.26	–0.46	35.31	33.19	–0.63
Western	8.18	–6.45	6.20	–0.12	6.84	7.21	–1.55
Less favorable agriculture conditions	2.07	6.30	2.40	–14.57	4.52	5.66	11.72
More favorable agriculture conditions	10.59	1.07	12.48	–1.23	11.41	12.62	3.18
Mineral–rich countries	5.41	1.70	5.49	4.04	9.33	8.27	6.52
Middle–income countries	29.03	–2.69	29.83	2.83	33.83	32.62	–0.68
CEN–SAD	20.31	–3.03	21.97	4.30	27.01	26.24	–1.08
COMESA	27.98	–0.30	32.89	2.41	37.35	35.89	0.55
EAC	13.77	–1.97	16.53	2.42	16.33	18.19	–0.30
ECCAS	2.34	5.15	3.54	6.30	4.79	3.88	–0.79
ECOWAS	8.18	–6.45	6.20	–0.12	6.84	7.21	–1.55
IGAD	7.45	0.05	9.47	–0.34	8.84	11.01	9.14
SADC	24.66	–1.25	24.27	–0.16	24.97	22.24	–0.75
UMA	27.61	–3.72	29.20	6.09	37.21	36.56	–0.57

Source: ReSAKSS based on FAOSTAT (FAO 2014).

TABLE D.6—AGRICULTURE, VALUE ADDED GROWTH RATE (%)

Region	Annual avg. level (1990–1995)	Annual avg. percentage point change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage point change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage point change (2003–2012)
Africa	2.81	0.28	6.17	0.50	8.73	5.13	0.09
Central	2.51	1.36	2.27	–0.79	2.11	2.83	0.54
Eastern	1.86	1.74	4.22	–0.78	1.63	4.82	2.24
Northern	3.46	–1.10	5.86	2.27	6.68	5.16	–1.60
Southern	0.96	0.68	4.23	0.20	3.09	4.84	0.31
Western	3.14	–0.15	8.50	0.33	17.21	5.49	–0.28
Less favorable agriculture conditions	1.50	2.19	4.16	–0.38	2.50	3.91	0.29
More favorable agriculture conditions	2.99	0.36	3.90	–0.70	1.83	4.26	0.67
Mineral–rich countries	5.08	1.31	2.48	–1.61	3.01	3.71	0.45
Middle–income countries	2.51	–0.06	7.19	1.13	11.38	5.55	–0.11
CEN–SAD	3.11	–0.38	7.21	0.95	11.32	5.08	0.08
COMESA	2.80	1.35	3.58	–0.79	1.30	4.02	1.53
EAC	2.09	–1.62	4.27	0.44	3.45	2.62	–0.33
ECCAS	1.21	1.98	4.08	–0.94	4.17	5.29	0.37
ECOWAS	3.14	–0.15	8.50	0.33	17.21	5.49	–0.28
IGAD	1.92	1.80	4.15	–0.81	0.93	5.04	2.77
SADC	1.91	0.99	3.32	–0.22	2.83	4.28	0.26
UMA	3.44	–2.02	6.85	3.76	8.68	5.99	–2.71

Source: ReSAKSS based on World Development Indicators (World Bank 2014).

Annex E: Agricultural Trade

TABLE E.1—RATIO OF TOTAL AGRICULTURAL EXPORTS TO TOTAL AGRICULTURAL IMPORTS

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2011)	Annual avg. percentage change (2003–2011)
Africa	0.70	–1.40	0.72	–1.28	0.71	0.62	–3.71
Central	1.01	–1.15	0.90	–8.45	0.63	0.49	–5.40
Eastern	1.72	–1.62	1.45	–7.40	1.15	0.97	–4.07
Northern	0.19	–0.91	0.20	2.13	0.25	0.26	–1.19
Southern	1.18	–4.34	1.19	–0.17	1.03	0.87	–3.72
Western	1.08	–1.09	1.17	–1.98	1.11	0.89	–2.84
Less favorable agriculture conditions	1.15	–3.09	0.90	–7.46	0.66	0.49	–7.57
More favorable agriculture conditions	1.83	–0.91	1.87	–4.89	1.48	1.29	–2.80
Mineral–rich countries	0.36	–4.54	0.37	–0.58	0.40	0.41	1.01
Middle–income countries	0.55	–2.17	0.58	0.12	0.61	0.52	–4.27
CEN–SAD	0.65	–0.05	0.68	0.07	0.75	0.63	–4.66
COMESA	0.74	2.08	0.72	–2.54	0.71	0.61	–4.61
EAC	1.48	–3.18	1.25	–3.47	1.12	1.19	–2.53
ECCAS	0.62	–1.29	0.55	–7.91	0.38	0.30	–5.87
ECOWAS	1.08	–1.09	1.17	–1.98	1.11	0.89	–2.84
IGAD	1.75	1.19	1.60	–9.01	1.21	1.03	–3.99
SADC	1.21	–3.97	1.15	–1.23	0.99	0.82	–3.99
UMA	0.20	–3.14	0.21	–0.88	0.21	0.23	–2.90

Source: ReSAKSS based on FAOSTAT (FAO 2014).

TABLE E.2—PER CAPITA AGRICULTURAL TRADE (2005 US$)

2a—PER CAPITA AGRICULTURAL EXPORTS (constant 2005 US$)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2011)	Annual avg. percentage change (2003–2011)
Africa	23.49	3.08	25.39	–1.34	24.90	25.27	1.90
Central	13.18	1.47	13.42	–6.24	10.61	9.27	–0.64
Eastern	21.91	7.11	18.89	–6.18	16.10	18.46	3.25
Northern	16.34	–0.94	15.49	–0.42	18.71	25.85	6.92
Southern	46.84	–0.12	53.75	0.38	51.60	51.16	1.89
Western	21.54	5.88	27.81	0.74	28.94	24.91	–0.87
Less favorable agriculture conditions	18.76	2.71	17.63	–5.29	13.84	9.80	–9.83
More favorable agriculture conditions	22.22	10.16	21.90	–4.60	18.60	22.11	4.30
Mineral–rich countries	4.20	–2.53	4.82	0.51	6.03	6.01	0.82
Middle–income countries	28.09	0.60	32.00	0.22	33.38	32.83	1.68
CEN–SAD	24.28	4.61	26.49	–0.76	27.27	27.01	1.14
COMESA	20.10	4.57	18.85	–4.00	17.20	18.81	2.88
EAC	36.92	10.33	29.91	–5.81	26.73	35.73	4.81
ECCAS	11.19	0.98	11.12	–6.35	8.74	7.92	–0.09
ECOWAS	21.54	5.88	27.81	0.74	28.94	24.91	–0.87
IGAD	20.43	10.32	18.75	–5.95	16.27	19.19	4.01
SADC	33.02	–0.12	34.63	–1.08	32.10	31.69	1.48
UMA	22.91	–1.27	21.74	–2.32	22.18	30.29	5.23

Source: ReSAKSS based on FAOSTAT (FAO 2014) and World Development Indicators (World Bank 2014).

TABLE E.2—PER CAPITA AGRICULTURAL TRADE (2005 US$) *continued*

2b—PER CAPITA AGRICULTURAL IMPORTS (constant 2005 US$)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2011)	Annual avg. percentage change (2003–2011)
Africa	36.12	3.89	35.19	–1.21	35.48	40.55	4.47
Central	14.15	3.85	15.84	1.32	17.34	18.35	3.01
Eastern	11.64	8.79	13.07	1.63	13.77	18.40	6.92
Northern	92.79	1.69	84.69	–2.38	83.68	99.48	6.75
Southern	46.68	6.39	49.68	–1.22	50.83	58.29	4.66
Western	22.89	8.05	24.28	1.29	25.89	27.55	0.26
Less favorable agriculture conditions	14.65	3.66	18.80	2.70	20.71	18.57	–2.27
More favorable agriculture conditions	11.82	11.94	11.60	0.22	12.64	17.75	7.36
Mineral–rich countries	11.96	–0.49	12.27	–0.61	13.14	14.78	2.38
Middle–income countries	55.91	3.44	54.50	–1.35	54.58	61.84	4.64
CEN–SAD	38.55	0.81	35.79	–0.99	35.86	42.70	5.16
COMESA	28.85	–3.55	24.15	–1.73	24.28	30.75	6.84
EAC	23.25	11.14	23.50	–1.87	23.50	31.01	8.12
ECCAS	24.29	5.73	24.34	–1.08	24.84	25.17	2.08
ECOWAS	22.89	8.05	24.28	1.29	25.89	27.55	0.26
IGAD	10.31	9.45	11.90	3.40	13.12	17.63	7.36
SADC	30.62	5.66	32.37	–1.34	32.88	38.44	4.69
UMA	125.81	3.93	117.94	–1.96	117.11	128.55	5.31

Source: ReSAKSS based on FAOSTAT (FAO 2014) and World Development Indicators (World Bank 2014).

TABLE E.3—AGRICULTURAL TRADE AS A SHARE IN MERCHANDISE TRADE (%)

3a—AGRICULTURAL RAW MATERIALS EXPORTS AS A SHARE OF TOTAL MERCHANDISE EXPORTS (%)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2011)	Annual avg. percentage change (2003–2011)
Africa	12.11	4.98	11.82	–5.35	9.63	7.41	–2.55
Central	12.23	2.11	9.99	–11.43	5.99	3.73	–6.16
Eastern	56.79	–0.16	45.99	–7.59	32.86	28.78	–2.14
Northern	4.98	8.77	4.66	–6.02	3.97	3.80	3.96
Southern	10.27	0.79	10.10	–3.34	8.38	6.46	–4.08
Western	16.35	5.39	17.46	–2.79	16.41	11.13	–6.43
Less favorable agriculture conditions	43.51	–2.86	37.85	–3.37	28.13	13.82	–13.45
More favorable agriculture conditions	56.52	0.79	53.53	–2.72	45.10	42.48	–1.45
Mineral–rich countries	8.24	7.57	10.25	–1.59	10.59	8.39	–7.10
Middle–income countries	8.72	4.28	8.53	–4.85	7.30	5.50	–2.62
CEN–SAD	14.45	6.03	14.42	–4.27	12.57	9.40	–2.98
COMESA	20.60	7.33	19.79	–6.44	14.67	11.56	0.36
EAC	27.28	1.27	22.94	–6.20	18.15	20.78	1.85
ECCAS	8.43	0.69	6.31	–12.70	3.53	1.99	–9.33
ECOWAS	16.35	5.39	17.46	–2.79	16.41	11.13	–6.43
IGAD	69.28	0.20	55.43	–8.90	37.22	31.73	–2.17
SADC	12.07	1.20	11.49	–4.14	9.23	7.05	–4.37
UMA	4.07	9.76	3.78	–8.44	2.81	2.52	0.20

Source: ReSAKSS based on FAOSTAT (FAO 2014).

TABLE E.3—AGRICULTURAL TRADE AS A SHARE IN MERCHANDISE TRADE (%) *continued*

3b—AGRICULTURAL RAW MATERIALS IMPORTS AS A SHARE OF TOTAL MERCHANDISE IMPORTS (%)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2011)	Annual avg. percentage change (2003–2011)
Africa	17.41	1.39	15.91	–2.04	14.55	13.18	0.38
Central	19.78	7.61	18.50	–4.10	15.93	13.66	–3.49
Eastern	16.99	4.44	17.22	0.54	17.10	15.61	–0.11
Northern	23.07	1.13	20.20	–3.46	17.43	16.02	1.50
Southern	10.33	1.76	8.88	–3.14	8.17	7.62	1.15
Western	17.60	0.56	18.35	1.24	19.19	16.68	–2.98
Less favorable agriculture conditions	23.24	–0.93	24.21	–0.17	23.47	20.17	–6.44
More favorable agriculture conditions	16.80	4.86	16.05	0.84	17.01	16.19	–0.65
Mineral–rich countries	25.33	9.30	24.52	–3.70	21.28	17.88	–3.28
Middle–income countries	17.06	0.80	15.40	–2.47	13.77	12.45	0.96
CEN–SAD	19.71	0.48	18.26	–1.76	16.79	15.54	0.84
COMESA	22.09	–0.80	19.28	–0.91	18.40	17.21	2.15
EAC	11.72	7.08	11.71	–2.97	10.93	10.99	1.96
ECCAS	23.19	3.89	19.39	–5.65	16.61	13.66	–2.99
ECOWAS	17.60	0.56	18.35	1.24	19.19	16.68	–2.98
IGAD	19.92	1.73	17.62	1.05	18.01	16.69	0.83
SADC	11.02	2.42	9.97	–2.86	9.10	8.45	0.82
UMA	20.84	3.40	19.20	–3.19	16.53	14.88	–0.07

Source: ReSAKSS based on FAOSTAT (FAO 2014).

TABLE F.1—HEADCOUNT POVERTY RATE (% of population below international poverty line, $1.25/day)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	46.72	–0.76	44.40	–0.88	42.53	40.96	–1.13
Central	50.33	–2.26	43.15	–2.28	39.94	37.83	–4.81
Eastern	60.47	–0.65	56.80	–0.96	53.92	50.38	–1.41
Northern	5.62	–1.60	4.56	–3.36	3.90	3.13	–5.39
Southern	53.36	–1.82	47.95	–1.43	44.68	41.04	–1.94
Western	60.09	–0.62	58.11	–0.95	55.74	54.66	–0.48
Less favorable agriculture conditions	76.20	–1.03	68.32	–1.80	63.53	58.41	–2.11
More favorable agriculture conditions	65.39	–1.09	59.68	–1.45	55.70	51.21	–1.79
Mineral–rich countries	69.42	–1.87	63.44	–1.35	59.81	58.75	–1.80
Middle–income countries	32.23	–0.35	31.96	–0.47	31.15	31.13	–0.03
CEN–SAD	40.75	–0.34	40.06	–0.35	39.35	38.93	–0.33
COMESA	44.00	–0.69	41.21	–0.84	39.52	38.05	–1.64
EAC	46.89	–0.99	45.07	0.32	45.35	44.56	–0.59
ECCAS	56.75	–1.90	50.81	–1.58	47.68	45.37	–3.00
ECOWAS	60.09	–0.62	58.11	–0.95	55.74	54.66	–0.48
IGAD	53.36	–0.84	48.00	–1.61	44.55	40.17	–2.38
SADC	60.71	–1.14	57.15	–0.85	54.43	52.53	–1.26
UMA	7.40	0.21	6.45	–2.78	5.61	4.69	–3.96

Source: ReSAKSS based on World Development Indicators (World Bank 2014).

TABLE F.2—HEADCOUNT POVERTY RATE (% of population below national poverty line)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	46.04	–1.28	42.63	–1.18	40.48	38.46	–1.59
Central	58.51	–1.81	51.48	–2.34	47.41	45.10	–3.50
Eastern	54.85	–2.16	48.24	–1.86	44.69	39.56	–3.06
Northern	18.35	0.13	18.49	0.13	18.54	18.71	0.41
Southern	51.05	–2.50	45.25	–1.95	40.67	37.63	–1.33
Western	52.93	–0.83	49.72	–0.96	47.80	45.79	–1.03
Less favorable agriculture conditions	69.22	–1.58	61.60	–2.16	55.82	49.57	–3.14
More favorable agriculture conditions	56.53	–1.87	50.31	–1.83	46.71	42.48	–2.24
Mineral–rich countries	67.33	–0.49	61.65	–1.66	57.57	57.24	–1.61
Middle–income countries	38.68	–0.96	36.74	–0.75	35.43	34.13	–0.78
CEN–SAD	41.44	–0.52	39.77	–0.63	38.73	37.89	–0.67
COMESA	39.81	–1.01	37.85	–0.64	36.73	35.90	–1.53
EAC	55.93	–3.20	45.00	–3.30	39.07	31.18	–6.60
ECCAS	63.30	–1.78	56.16	–2.29	51.24	46.69	–3.81
ECOWAS	52.93	–0.83	49.72	–0.96	47.80	45.79	–1.03
IGAD	50.43	–2.72	42.25	–2.60	38.05	32.74	–3.99
SADC	53.66	–1.84	49.41	–1.29	46.05	44.42	–1.79
UMA	30.17	–3.59	23.03	–4.64	18.64	13.76	–7.64

Source: ReSAKSS based on World Development Indicators (World Bank 2014).

TABLE F.3—PREVALENCE OF CHILD MALNUTRITION, WEIGHT FOR AGE (% of children under five years of age)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	24.67	–0.82	23.12	–1.05	22.11	20.88	–1.31
Central	29.04	–1.44	27.58	–0.52	26.36	25.13	–1.25
Eastern	30.79	–0.38	29.67	–0.79	28.40	27.48	–0.86
Northern	9.82	–0.93	8.30	–2.92	7.82	6.01	–4.46
Southern	18.76	–1.64	16.89	–1.96	15.50	13.66	–3.02
Western	30.33	–1.13	27.69	–1.34	26.34	24.81	–1.38
Less favorable agriculture conditions	30.79	0.50	31.42	–0.24	31.27	31.30	0.03
More favorable agriculture conditions	29.64	–1.20	27.25	–1.53	25.21	23.30	–2.00
Mineral–rich countries	29.57	–1.82	27.83	–0.52	26.47	24.60	–1.70
Middle–income countries	20.32	–0.61	18.83	–1.16	18.20	17.17	–1.20
CEN–SAD	23.46	–0.42	22.37	–0.70	21.97	21.32	–0.73
COMESA	25.98	–0.55	24.94	–0.75	24.06	22.97	–1.12
EAC	20.11	–0.88	18.21	–1.61	17.08	16.14	–1.60
ECCAS	30.64	–1.94	27.57	–1.57	25.34	22.96	–2.47
ECOWAS	30.33	–1.13	27.69	–1.34	26.34	24.81	–1.38
IGAD	31.83	–0.13	31.04	–0.57	30.15	29.32	–0.73
SADC	24.25	–1.59	22.37	–1.30	20.71	19.13	–1.92
UMA	9.67	–0.67	8.19	–1.55	7.93	5.95	–4.16

Source: ReSAKSS based on World Development Indicators (World Bank 2014).
Notes: Child malnutrition prevalence includes children whose weight-for-age is over two standard deviations below the median.

TABLE F.4—PREVALENCE OF UNDERNOURISHMENT (% of population)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	27.48	–1.53	24.64	–1.53	22.98	20.61	–2.20
Central	45.65	–0.17	40.71	–3.04	36.17	33.39	–2.31
Eastern	48.08	–0.76	44.25	–1.74	41.03	36.85	–2.30
Northern	5.80	0.25	5.63	–1.21	5.27	5.13	–0.27
Southern	31.88	–0.94	27.80	–1.58	26.07	24.25	–1.76
Western	20.55	–4.88	16.61	–1.60	15.20	12.23	–3.64
Less favorable agriculture conditions	45.40	–0.62	41.25	–2.57	37.25	33.39	–3.40
More favorable agriculture conditions	45.23	–0.87	40.64	–1.65	37.85	34.03	–2.21
Mineral–rich countries	33.58	–0.60	35.11	1.05	35.70	33.44	–1.87
Middle–income countries	14.63	–3.56	12.13	–2.16	10.91	9.25	–2.49
CEN–SAD	18.38	–3.47	15.71	–0.95	14.93	12.58	–2.99
COMESA	36.60	–0.69	33.78	–1.46	31.90	29.45	–1.89
EAC	32.89	–0.42	32.66	–0.64	32.04	30.97	–0.87
ECCAS	50.85	–0.97	44.74	–3.38	38.78	33.94	–3.53
ECOWAS	20.55	–4.88	16.61	–1.60	15.20	12.23	–3.64
IGAD	54.44	–1.49	46.77	–2.48	42.48	38.03	–2.45
SADC	31.80	0.14	30.43	–0.58	29.40	27.19	–1.58
UMA	6.49	0.38	6.17	–2.04	5.50	5.25	–0.49

Source: ReSAKSS based on World Development Indicators (World Bank 2014).

TABLE F.5—MORTALITY RATE, CHILDREN UNDER FIVE YEARS OF AGE (per 1000)

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	149.75	–1.05	133.81	–2.44	119.26	100.43	–4.00
Central	164.27	0.23	163.63	–0.47	159.25	146.87	–2.30
Eastern	159.77	–1.24	136.16	–3.53	114.72	89.74	–5.50
Northern	65.56	–4.75	46.45	–5.58	36.51	29.17	–4.73
Southern	132.66	–0.65	126.35	–1.13	119.07	101.65	–4.28
Western	199.96	–0.88	179.16	–2.57	158.63	133.76	–3.84
Less favorable agriculture conditions	208.67	0.31	186.74	–2.86	162.74	134.59	–4.25
More favorable agriculture conditions	167.53	–1.58	142.52	–3.47	120.62	94.27	–5.63
Mineral–rich countries	187.26	–0.68	175.77	–1.24	166.29	151.17	–2.57
Middle–income countries	126.16	–1.09	114.47	–2.08	103.84	89.58	–3.47
CEN–SAD	152.50	–1.26	135.30	–2.51	120.50	103.03	–3.54
COMESA	141.49	–1.37	123.10	–2.79	107.93	89.42	–4.29
EAC	130.01	1.44	123.56	–2.49	107.67	85.55	–5.18
ECCAS	172.19	1.12	170.68	–0.93	162.48	147.18	–2.59
ECOWAS	199.96	–0.88	179.16	–2.57	158.63	133.76	–3.84
IGAD	160.05	–1.94	136.65	–2.98	118.46	94.68	–5.10
SADC	146.07	–0.59	136.28	–1.69	125.78	108.62	–3.81
UMA	57.57	–3.79	44.15	–4.29	36.77	30.81	–3.84

Source: ReSAKSS based on World Development Indicators (World Bank 2014).

TABLE F.6—GLOBAL HUNGER INDEX

Region	Annual avg. level (1990–1995)	Annual avg. percentage change (1990–1995)	Annual avg. level (1995–2003)	Annual avg. percentage change (1995–2003)	2003	Annual avg. level (2003–2012)	Annual avg. percentage change (2003–2012)
Africa	23.10	–0.81	20.96	–1.76	19.56	18.00	–1.77
Central	50.33	–2.26	43.15	–2.28	39.94	37.83	–4.81
Eastern	30.78	0.09	28.39	–1.73	26.49	24.54	–1.56
Northern	6.80	–1.29	5.65	–3.56	4.86	4.02	–4.52
Southern	20.55	–0.98	18.69	–1.68	17.43	16.12	–1.82
Western	23.48	–1.94	20.54	–2.16	18.90	16.91	–2.37
Less favorable agriculture conditions	33.39	–0.43	30.37	–1.84	28.23	26.06	–1.86
More favorable agriculture conditions	29.43	–0.36	27.05	–1.66	25.27	23.39	–1.63
Mineral–rich countries	25.10	–0.52	24.11	–0.57	23.29	22.53	–0.77
Middle–income countries	17.01	–1.57	14.88	–2.31	13.65	12.16	–2.42
CEN–SAD	20.97	–1.72	18.69	–1.82	17.43	15.89	–2.03
COMESA	29.96	–0.11	27.71	–1.59	26.03	24.29	–1.50
EAC	21.56	0.26	20.69	–0.85	20.07	19.49	–0.65
ECCAS	31.61	–0.25	28.19	–2.32	25.81	23.30	–2.11
ECOWAS	23.48	–1.94	20.54	–2.16	18.90	16.91	–2.37
IGAD	33.07	–0.30	30.03	–1.93	27.84	25.53	–1.86
SADC	21.80	–0.27	20.36	–1.34	19.23	18.12	–1.21
UMA	6.80	–1.29	5.65	–3.56	4.86	4.02	–4.52

Source: ReSAKSS based on von Grebmer et al. 2013 and World Development Indicators (World Bank 2014).

TABLE S.2.1—GOODS TRADE FLOWS, EXPORTS AND IMPORTS (US$, billions)

Reporter/Partner	Trade flow	Annual average level (1996–2003)	Annual average percentage change (1996–2003)	2003	Annual average level (2003–2013)	Annual average percentage change (2003–2013)
Africa to ROW	Export Import	63.09 59.85	30.79 27.16	111.95 112.66	253.93 262.63	11.20 13.08
Africa to Africa	Export Import	8.65 8.07	42.05 48.38	15.94 17.65	43.49 39.35	16.00 11.05
SSA to ROW	Export Import	43.21 44.15	49.34 34.71	74.13 78.22	152.77 156.36	10.77 9.78
SSA to SSA	Export Import	7.97 7.49	44.79 49.28	14.17 15.76	35.05 33.04	14.40 10.30
ECOWAS to ECOWAS	Export Import	1.43 1.28	68.38 41.13	3.16 3.25	6.80 4.81	7.13 –1.65
ECOWAS to COMESA	Export Import	0.01 0.06	58.92 38.96	0.04 0.12	0.16 0.25	8.45 3.68
ECOWAS to SADC	Export Import	0.37 0.24	167.39 84.02	0.77 0.70	4.82 1.31	29.11 12.19
COMESA to COMESA	Export Import	0.90 0.70	22.28 22.93	1.46 1.25	3.87 3.61	14.69 16.98
COMESA to ECOWAS	Export Import	0.08 0.02	74.77 26.73	0.03 0.02	0.24 0.05	33.47 20.18
COMESA to SADC	Export Import	1.17 2.39	36.83 48.49	1.86 3.82	5.03 8.70	11.61 10.50
SADC to SADC	Export Import	4.13 4.45	49.64 76.29	6.63 9.28	16.62 19.98	14.75 11.84
SADC to ECOWAS	Export Import	0.41 0.23	89.01 101.53	0.72 0.46	1.42 2.17	9.68 23.14
SADC to COMESA	Export Import	2.57 0.78	43.41 59.82	3.49 1.34	8.41 3.51	13.51 14.52
ECOWAS to Africa	Export Import	2.05 1.70	71.07 42.23	4.65 4.27	13.93 7.26	14.78 2.08
COMESA to Africa	Export Import	1.92 2.78	32.19 36.40	3.00 4.52	8.87 11.15	14.43 12.26
SADC to Africa	Export Import	4.98 4.85	51.33 75.63	8.01 10.05	19.94 22.89	14.33 12.75

Source: Authors' calculations based on United Nations Statistics Division 2014.

TABLE S.2.2—AGRICULTURAL TRADE FLOWS, EXPORTS AND IMPORTS (US$, billions)

Reporter/Partner	Trade flow	Annual average level (1996–2003)	Annual average percentage change (1996–2003)	2003	Annual average level (2003–2013)	Annual average percentage change (2003–2013)
Africa to ROW	Export	6.04	31.55	12.81	23.00	9.16
	Import	8.47	19.66	14.88	36.36	15.49
Africa to Africa	Export	1.85	38.45	3.52	7.25	13.81
	Import	1.40	41.26	2.77	5.50	10.68
SSA to ROW	Export	5.87	28.23	11.29	18.46	7.59
	Import	5.25	31.76	9.90	19.33	10.15
SSA to SSA	Export	1.61	36.34	2.91	5.69	13.05
	Import	1.28	50.24	2.52	4.49	9.22
ECOWAS to ECOWAS	Export	0.21	98.93	0.58	0.96	5.90
	Import	0.16	50.91	0.37	0.51	5.41
ECOWAS to COMESA	Export	0.00	65.29	0.00	0.02	11.99
	Import	0.02	44.88	0.03	0.04	–0.35
ECOWAS to SADC	Export	0.01	110.50	0.02	0.06	5.23
	Import	0.05	66.50	0.13	0.17	8.08
COMESA to COMESA	Export	0.34	20.20	0.51	1.41	16.46
	Import	0.16	23.95	0.28	0.93	18.31
COMESA to ECOWAS	Export	0.01	41.49	0.01	0.04	24.65
	Import	0.00	51.76	0.00	0.01	28.43
COMESA to SADC	Export	0.34	31.93	0.46	1.13	15.47
	Import	0.44	51.59	0.71	1.41	9.51
SADC to SADC	Export	0.92	47.14	1.54	3.14	15.09
	Import	0.78	86.13	1.57	2.83	9.80
SADC to ECOWAS	Export	0.06	62.97	0.11	0.17	10.44
	Import	0.02	0.77*	0.02	0.03	2.68
SADC to COMESA	Export	0.50	33.44	0.72	1.61	14.27
	Import	0.20	54.89	0.29	0.70	14.25
ECOWAS to Africa	Export	0.26	86.36	0.70	1.21	5.78
	Import	0.27	55.05	0.60	1.03	7.95
COMESA to Africa	Export	0.65	25.03	0.99	2.52	16.18
	Import	0.50	36.59	0.83	2.03	12.86
SADC to Africa	Export	1.11	43.80	1.86	3.68	14.40
	Import	0.82	84.53	1.63	2.99	10.14

Source: Authors' calculations based on United Nations Statistics Division 2014.

* Annual average percentage change is computed for the year 1997-2003

TABLE S.2.3—AGRICULTURAL TRADE FLOWS, EXPORTS AND IMPORTS (kilocalories, trillions)

Reporter/Partner	Trade flow	Annual average level (1996–2003)	Annual average percentage change (1996–2003)	2003	Annual average level (2003–2013)	Annual average percentage change (2003–2013)
Africa to ROW	Export Import	15.19 99.03	52.90 26.74	23.30 172.94	42.42 260.38	11.06 8.73
Africa to Africa	Export Import	27.01 9.80	24.31 43.96	23.25 15.82	32.58 24.52	10.57 3.31
SSA to ROW	Export Import	16.44 55.20	43.59 36.40	24.05 106.74	37.29 117.63	8.79 –0.76
SSA to SSA	Export Import	26.14 9.14	21.58 44.74	20.88 13.87	27.69 21.21	9.26 3.72
ECOWAS to ECOWAS	Export Import	1.06 1.13	84.73 52.96	3.09 2.20	8.84 2.44	23.20 –0.16
ECOWAS to COMESA	Export Import	0.00 0.06	115.42 71.91	0.01 0.09	0.04 0.15	–0.11 –11.32
ECOWAS to SADC	Export Import	0.04 0.15	123.82 83.48	0.10 0.35	0.11 0.28	–11.60 –0.81
COMESA to COMESA	Export Import	6.46 1.40	12.36 16.70	2.15 2.79	5.47 3.82	11.52 7.93
COMESA to ECOWAS	Export Import	0.02 0.02	67.55 44.96	0.01 0.01	0.06 0.02	38.59 25.64
COMESA to SADC	Export Import	18.79 4.11	11.44 51.96	7.70 6.37	5.12 8.44	–0.20 0.95
SADC to SADC	Export Import	22.23 5.55	16.97 88.74	10.95 8.92	12.53 14.30	4.06 4.34
SADC to ECOWAS	Export Import	0.25 0.11	95.47 13.37*	0.35 0.13	0.32 0.09	–3.64 –8.10
SADC to COMESA	Export Import	8.59 1.18	51.68 51.18	6.32 2.34	8.72 3.20	2.27 10.22
ECOWAS to Africa	Export Import	1.31 1.73	70.06 58.46	3.62 2.98	9.36 3.83	21.44 0.39
COMESA to Africa	Export Import	20.09 4.61	8.83 36.09	9.42 7.35	8.87 10.46	4.66 1.26
SADC to Africa	Export Import	23.41 5.74	20.13 92.18	12.93 9.23	15.38 14.64	3.44 3.94

Source: Authors' calculations based on United Nations Statistics Division 2014.

* Annual average percentage change is computed for the year 1997-2003

TABLE S.4.1—REGIONAL AND COUNTRY PRODUCTION VOLATILITY, 1980–2010

COMESA		ECOWAS		SADC	
Country	**Normalized Coef. of Var.**	Country	**Normalized Coef. of Var.**	Country	**Normalized Coef. of Var.**
Burundi	1.63	Benin	1.58	Angola	1.32
COMESA	**1**	Burkina Faso	1.8	Bostowana	3.12
Comoros	1.1	Cote d'Ivoire	0.88	DRC	0.54
DRC	1.88	**ECOWAS**	**1**	Lesotho	1.97
Egypt	1.56	Gambia	3.82	Malawi	1.5
Kenya	2.59	Ghana	1.97	Mauritius	5.26
Madagascar	2.74	Guinea	1.39	Mozambique	1.54
Malawi	5.23	Guinea-Bissau	1.84	Namibia	1.37
Rwanda	6.93	Liberia	5.77	**SADC**	**1**
Sudan	5.65	Mali	3.52	South Africa	1.28
Swaziland	6.63	Niger	2.57	Swaziland	1.9
Uganda	1.58	Nigeria	1.98	Zambia	1.96
Zambia	6.87	Senegal	3.4	Zimbabwe	2.04
Zimbabwe	7.13	Togo	1.04		

Source: Authors' calculations based on FAOSTAT (FAO 2014).

TABLE S.4.2—CORRELATION OF COUNTRY PRODUCTION FLUCTUATIONS, 1980–2010, ECOWAS

	Benin	Burkina Faso	Côte d'Ivoire	Gambia	Ghana	Guinea	Guinea-Bissau	Liberia	Mali	Niger	Nigeria	Senegal	Togo
Benin	1	0.906	0.828	0.902	0.926	0.956	0.655	−0.12	0.909	0.845	0.758	0.682	0.964
Burkina Faso	0.906	1	0.859	0.853	0.916	0.926	0.709	−0.22	0.885	0.94	0.819	0.677	0.913
Côte d'Ivoire	0.828	0.859	1	0.698	0.898	0.8	0.732	−0.453	0.729	0.711	0.877	0.558	0.881
Gambia	0.902	0.853	0.698	1	0.818	0.874	0.693	0.075	0.917	0.835	0.529	0.786	0.843
Ghana	0.926	0.916	0.898	0.818	1	0.883	0.681	−0.291	0.866	0.804	0.776	0.653	0.937
Guinea	0.956	0.926	0.8	0.874	0.883	1	0.702	−0.106	0.899	0.907	0.813	0.615	0.951
Guinea-Bissau	0.655	0.709	0.732	0.693	0.681	0.702	1	−0.121	0.753	0.647	0.603	0.626	0.657
Liberia	−0.12	−0.22	−0.453	0.075	−0.291	−0.106	−0.121	1	0.068	−0.057	−0.448	0.122	−0.219
Mali	0.909	0.885	0.729	0.917	0.866	0.899	0.753	0.068	1	0.877	0.624	0.77	0.872
Niger	0.845	0.94	0.711	0.835	0.804	0.907	0.647	−0.057	0.877	1	0.705	0.617	0.834
Nigeria	0.758	0.819	0.877	0.529	0.776	0.813	0.603	−0.448	0.624	0.705	1	0.379	0.827
Senegal	0.682	0.677	0.558	0.786	0.653	0.615	0.626	0.122	0.77	0.617	0.379	1	0.599
Togo	0.964	0.913	0.881	0.843	0.937	0.951	0.657	−0.219	0.872	0.834	0.827	0.599	1

Source: Authors' calculations based on FAOSTAT (FAO 2014).

TABLE S.4.3—CORRELATION OF COUNTRY PRODUCTION FLUCTUATIONS, 1980–2010, COMESA

	Burundi	Comoros	D. R. Congo	Egypt	Kenya	Madagascar	Malawi	Mauritius	Rwanda	Sudan	Swaziland	Uganda	Zambia	Zimbabwe
Burundi	1	0.429	0.646	0.522	0.456	0.551	0.365	−0.081	0.373	0.334	−0.148	0.534	0.496	−0.241
Comoros	0.429	1	0.66	0.911	0.485	0.809	0.679	−0.704	0.441	0.514	−0.485	0.926	0.342	−0.45
D. R. Congo	0.646	0.66	1	0.801	0.478	0.479	0.417	−0.443	−0.014	0.48	−0.119	0.741	0.24	−0.194
Egypt	0.522	0.911	0.801	1	0.461	0.764	0.66	−0.66	0.306	0.603	−0.38	0.937	0.22	−0.454
Kenya	0.456	0.485	0.478	0.461	1	0.525	0.316	−0.1	0.336	0.502	−0.375	0.592	0.421	−0.139
Madagascar	0.551	0.809	0.479	0.764	0.525	1	0.814	−0.411	0.793	0.462	−0.473	0.858	0.631	−0.474
Malawi	0.365	0.679	0.417	0.66	0.316	0.814	1	−0.394	0.611	0.312	−0.369	0.745	0.622	−0.295
Mauritius	−0.081	−0.704	−0.443	−0.66	−0.1	−0.411	−0.394	1	−0.07	−0.302	0.362	−0.636	−0.004	0.396
Rwanda	0.373	0.441	−0.014	0.306	0.336	0.793	0.611	−0.07	1	0.162	−0.436	0.477	0.66	−0.35
Sudan	0.334	0.514	0.48	0.603	0.502	0.462	0.312	−0.302	0.162	1	−0.281	0.569	0.11	−0.158
Swaziland	−0.148	−0.485	−0.119	−0.38	−0.375	−0.473	−0.369	0.362	−0.436	−0.281	1	−0.484	−0.176	0.446
Uganda	0.534	0.926	0.741	0.937	0.592	0.858	0.745	−0.636	0.477	0.569	−0.484	1	0.397	−0.524
Zambia	0.496	0.342	0.24	0.22	0.421	0.631	0.622	−0.004	0.66	0.11	−0.176	0.397	1	0.117
Zimbabwe	−0.241	−0.45	−0.194	−0.454	−0.139	−0.474	−0.295	0.396	−0.35	−0.158	0.446	−0.524	0.117	1

Source: Authors' calculations based on FAOSTAT (FAO 2014).

TABLE S.4.4—CORRELATION OF COUNTRY PRODUCTION FLUCTUATIONS, 1980–2010, SADC

	Angola	Botswana	D. R. Congo	Lesotho	Malawi	Mauritius	Mozambique	Namibia	South Africa	Swaziland	Zambia	Zimbabwe
Angola	1	−0.084	0.43	−0.303	0.733	−0.499	0.835	0.382	0.203	−0.475	0.472	−0.501
Botswana	−0.084	1	0.158	0.409	0.076	−0.063	−0.003	0.126	0.398	0.163	0.551	0.35
D. R. Congo	0.43	0.158	1	0.018	0.417	−0.443	0.534	0.377	0.065	−0.119	0.24	−0.194
Lesotho	−0.303	0.409	0.018	1	−0.29	0.038	−0.096	0.048	0.301	0.422	0.084	0.624
Malawi	0.733	0.076	0.417	−0.29	1	−0.394	0.844	0.385	0.168	−0.369	0.622	−0.295
Mauritius	−0.499	−0.063	−0.443	0.038	−0.394	1	−0.545	−0.357	−0.137	0.362	−0.004	0.396
Mozambique	0.835	−0.003	0.534	−0.096	0.844	−0.545	1	0.494	0.222	−0.212	0.461	−0.277
Namibia	0.382	0.126	0.377	0.048	0.385	−0.357	0.494	1	0.368	−0.257	0.314	0.085
South Africa	0.203	0.398	0.065	0.301	0.168	−0.137	0.222	0.368	1	−0.085	0.404	0.407
Swaziland	−0.475	0.163	−0.119	0.422	−0.369	0.362	−0.212	−0.257	−0.085	1	−0.176	0.446
Zambia	0.472	0.551	0.24	0.084	0.622	−0.004	0.461	0.314	0.404	−0.176	1	0.117
Zimbabwe	−0.501	0.35	−0.194	0.624	−0.295	0.396	−0.277	0.085	0.407	0.446	0.117	1

Source: Authors' calculations based on FAOSTAT (FAO 2014).

TABLE S.4.5—DISTRIBUTION OF EXPORT SIMILARITY AND PRODUCTION SIMILARITY INDICATOR VALUES, 2007–2011

Number of Country Pairs				Number of Country Pairs			
Production Similarity Index	COMESA	ECOWAS	SADC	Export Similarity index	COMESA	ECOWAS	SADC
0–10	295	77	119	0–10	688	320	326
10–20	208	97	123	10–20	123	63	75
20–30	151	114	51	20–30	42	33	24
30–40	121	79	74	30–40	34	12	28
40–50	95	62	69	40–50	21	12	19
50–60	27	42	34	50–60	21	9	11
60–70	13	18	24	60–70	15	19	9
70–80	11	21	16	70–80	1	9	1
80–90	0	0	0	80–90	0	5	0
90–100	5	0	5	90–100	0	0	0

Source: Authors' calculation based on FAOSTAT (FAO 2014).

TABLE S.4.6—COMESA, PRODUCT RCA RANKING (2007-2011)

			N=167	
Rank	**Commodity**	**Country**	**Average RCA**	**Normalized RCA**
1	Cloves	Comoros	42768.12	0.999953
2	Vanilla	Comoros	14760.77	0.999865
3	Vanilla	Madagascar	4099.372	0.999512
4	Coffee husks and skins	Uganda	3191.999	0.999374
5	Cloves	Madagascar	3128.918	0.999361
6	Oil essential nes	Comoros	2043.79	0.999022
7	Coffee husks and skins	Burundi	2036.627	0.999018
8	Sesame seed	Ethiopia	1396.377	0.998569
9	Skins dry slt sheep	Ethiopia	1201.678	0.998337
10	Coffee subst. cont. coffee	Rwanda	1183.447	0.998311
11	Coffee husks and skins	Kenya	976.855	0.997955
12	Goat meat	Ethiopia	956.288	0.997911
13	Cotton carded, combed	Uganda	930.223	0.997852
14	Sesame seed	Eriteria	899.749	0.99778
15	Tobacco, unmanufactured	Malawi	820.937	0.997567
16	Oilseeds, nes	Ethiopia	799.899	0.997503
17	Broad beans, horse beans, dry	Ethiopia	746.751	0.997325
18	Cotton carded, combed	Burundi	706.864	0.997175
19	Skinsdry sltsheep	Rwanda	641.877	0.996889
20	Tea	Rwanda	628.084	0.996821

Source: Authors' calculation based on FAOSTAT (FAO 2014).
Note: RCA: revealed comparative advantage.

TABLE S.4.7—ECOWAS, PRODUCT RCA RANKING (2007-2011)

No. of Products: 144

Rank	Commodity	Country	Average RCA	Normalized RCA
1	Cashew nuts, with shell	Guinea-Bissau	19774.41	0.999899
2	Cake of groundnuts	Gambia	9209.213	0.999783
3	Groundnut oil	Gambia	6036.704	0.999669
4	Cashew nuts, with shell	Benin	3085.309	0.999352
5	Groundnuts shelled	Gambia	1853.686	0.998922
6	Cashew nuts, with shell	Gambia	1310.564	0.998475
7	Groundnut oil	Senegal	1164.21	0.998284
8	Copra	Gambia	995.7903	0.997994
9	Cake of groundnuts	Senegal	936.6455	0.997867
10	Cake of cottonseed	Benin	759.8702	0.997371
11	Rubber nat dry	Liberia	714.6075	0.997205
12	Cottonseed oil	Togo	676.269	0.997047
13	Cottonseed oil	Benin	588.9315	0.99661
14	Sugar beet	Gambia	510.0391	0.996086
15	Cashew nuts, with shell	Cote D 'I voire	474.4819	0.995794
16	Cotton linter	Benin	456.4093	0.995628
17	Cocoa beans	Cote D 'I voire	442.1866	0.995487
18	Cake of groundnuts	Togo	437.6885	0.995441
19	Cocoa paste	Cote D 'I voire	405.7295	0.995083
20	Cocoa beans	Ghana	385.5244	0.994826

Source: Authors' calculation based on FAOSTAT (FAO 2014).

TABLE S.4.8—SADC, PRODUCT RCA RANKING (2007-2011)

			No. of Products: 147	
Rank	**Commodity**	**Country**	**Average RCA**	**Normalized RCA**
1	Vanilla	Madagascar	4099.372	0.99951224
2	Cloves	Madagascar	3128.918	0.99936101
3	Coffee husks and skins	Tanzania	936.2679	0.99786614
4	Tobacco, unmanufactured	Malawi	820.9368	0.99756672
5	Cotton carded, combed	Malawi	627.3118	0.99681687
6	Cashew nuts, with shell	Tanzania	451.7599	0.99558265
7	Cake of cottonseed	Zimbabwe	414.7542	0.99518947
8	Cake of cottonseed	Tanzania	414.5012	0.99518654
9	Cotton carded,combed	Tanzania	365.5119	0.99454315
10	Cloves	Tanzania	360.1245	0.99446174
11	Coffee subst. cont. coffee	Malawi	295.4896	0.9932544
12	Sesame oil	Tanzania	244.0405	0.99183808
13	Cashew nuts, with shell	Mozambique	232.0887	0.99141958
14	Hides nes	Zimbabwe	229.8947	0.99133804
15	Cotton linter	Zimbabwe	227.8551	0.99126085
16	Tobacco, unmanufactured	Zimbabwe	191.1372	0.98959077
17	Cotton linter	Malawi	183.0267	0.98913201
18	Tea	Malawi	174.142	0.98858069
19	Cotton waste	Malawi	168.5023	0.98820075
20	Peas, green	Zimbabwe	167.3134	0.9881174

Source: Authors' calculation based on FAOSTAT (FAO 2014).
Note: RCA: revealed comparative advantage.

TABLE S.4.9—COMESA AGRICULTURAL TRADE EXPANSION INDEX RANKS AND RELATED RCA VALUES (2007–2011)

		Trade Expansion Index (N=324)					N=167
Rank	**Commodity**	**2007**	**2008**	**2009**	**2010**	**2011**	**Average RCA**
1	Beans, dry	0.79	0.93	0.83	0.9	0.67	129.12
2	Sugar confectionery	0.8	0.73	0.81	0.78	0.98	16.3
3	Vegetables, preserved	0.83	0.92	0.63	0.85	0.87	20.93
4	Juice, fruit	0.85	0.84	0.76	0.78	0.86	18.17
5	Cigarettes	0.84	0.79	0.96	0.78	0.54	14.96
6	Spices,	0.54	0.63	0.97	0.82	0.61	65.04
7	Sugar raw centrifugal	0.68	0.65	0.95	0.73	0.57	141.58
8	Fruit, prepared	0.77	0.56	0.87	0.66	0.65	14.61
9	Groundnuts, shelled	0.48	0.8	0.8	0.83	0.59	114.75
10	Cake, cottonseed	0.63	0.66	0.91	0.56	0.64	414.75
11	Pineapples	0.48	0.78	0.38	0.93	0.82	7.98
12	Cereal preparations	0.68	0.88	0.57	0.78	0.42	93.1
13	Anise, badian, fennel, coriander	0.52	0.99	0.59	0.3	0.88	47.46
14	Waters, ice etc	0.84	0.45	0.65	0.44	0.89	16.1
15	Cheese, whole cow milk	0.62	0.65	0.52	0.6	0.63	3.62
16	Bananas	0.74	0.83	0.4	0.39	0.61	0.83
17	Bran, wheat	0.33	0.81	0.64	0.87	0.28	49.36
18	Tobacco products	0.85	0.36	0.3	0.76	0.66	29.8
19	Pepper (piper spp.)	0.5	0.53	0.4	0.82	0.64	45.11
20	Orange juice, single strength	0.43	0.69	0.27	0.48	0.96	2.99

Source: Authors' calculation based on FAOSTAT (FAO 2014).
Note: RCA: revealed comparative advantage.

TABLE S.4.10—ECOWAS AGRICULTURAL TRADE EXPANSION INDEX RANKS AND RELATED RCA VALUES (2007–2011)

		Trade Expansion Index (N=296)					N=144
Rank	**Commodity**	**2007**	**2008**	**2009**	**2010**	**2011**	**Average RCA**
1	Tobacco products	0.93	0.91	0.94	0.94	0.91	53
2	Fatty acids	0.88	0.73	0.63	0.88	0.71	5.36
3	Groundnuts, shelled	0.76	0.83	0.68	0.93	0.51	1853.69
4	Hides, cattle, wet salted	0.02	0.74	0.75	0.94	0.97	7.04
5	Coffee, extracts	0.54	0.41	0.55	0.88	1	19.98
6	Fruit, fresh	0.79	0.76	0.01	0.55	0.99	0.82
7	Fruit, tropical fresh	1	0.97	0.38	0.6	0.01	104.67
8	Cigarettes	0.28	0.45	0.64	0.79	0.69	14.38
9	Tea, mate extracts	0.51	0.23	0.01	0.93	1	55.32
10	Oilseeds	0.2	0.7	0.55	0.48	0.69	180.02
11	Onions, dry	0.61	0.48	0.44	0.82	0.22	132.49
12	Oil, cottonseed	0.66	0.91	0.34	0.39	0.26	676.27
13	Pepper (piper spp.)	0.29	0.32	0.83	0.48	0.48	59.16
14	Margarine short	0.39	0.48	0.39	0.61	0.41	10.43
15	Roots and tubers	0.75	0.54	0.63	0.33	0.02	114.32
16	Cereal preparations	0.28	0.2	0.81	0.23	0.68	14.71
17	Chickpeas	0.44	0.34	0.64	0.35	0.3	15.26
18	Vegetables fresh or dried products	0.58	0.41	0.42	0.22	0.43	97.75
19	Fruit, prepared	0.23	0.16	0.31	0.6	0.77	0.98
20	Pineapple, canned	0.24	0.22	0.88	0.53	0.15	9.53

Source: Authors' calculation based on FAOSTAT (FAO 2014).
Note: RCA: revealed comparative advantage.

TABLE S.4.11—SADC AGRICULTURAL TRADE EXPANSION INDEX RANKS AND RELATED RCA VALUES (2007–2011)

		Trade Expansion Index (N=315)					N=147
Rank	**Commodity**	**2007**	**2008**	**2009**	**2010**	**2011**	**Average RCA**
1	Pepper (piper spp.)	0.83	0.98	0.91	0.92	0.96	45.11
2	Cake, cottonseed	0.71	0.93	0.87	0.88	0.89	414.75
3	Cottonseed	0.68	0.88	0.85	0.92	0.9	148.22
4	Cigarettes	0.79	0.8	0.82	0.95	0.72	11.01
5	Hair, fine	0.77	0.91	0.95	0.83	0.59	18.9
6	Bran, wheat	0.55	0.67	0.89	0.91	0.96	47.82
7	Waters, ice etc	0.93	0.74	0.88	0.71	0.66	1.55
8	Bran, maize	0.82	0.83	0.92	0.78	0.56	63.58
9	Fruit, dried	0.83	0.87	0.85	0.87	0.46	8.97
10	Sugar	0.78	0.93	0.73	0.79	0.64	97.34
11	Cider etc	0.46	0.83	0.74	0.88	0.9	5.91
12	Molasses	0.66	0.45	0.98	0.84	0.86	80.11
13	Juice, fruit	0.94	0.7	0.48	0.77	0.84	1
14	Onions, dry	0.86	0.81	0.46	0.92	0.68	2.69
15	Flour, cereals	0.61	0.6	0.87	0.68	0.89	6.76
16	Chocolate products	0.79	0.61	0.71	0.98	0.52	0.84
17	Meat, pig, preparations	0.72	0.8	0.8	0.66	0.6	1.23
18	Cauliflowers and broccoli	0.73	0.82	0.52	0.78	0.71	1.23
19	Coconut(copra) oil	0.89	0.78	0.95	0.4	0.5	16. 96
20	Vegetables frozen	0.9	0.88	0.86	0.6	0.25	9.88

Source: Authors' calculation based on FAOSTAT (FAO 2014).
Note: RCA: revealed comparative advantage.

TABLE S.4.12—NORMALIZED AGRICULTURAL TRADE OVERLAP INDICES OF COUNTRIES IN COMESA (2007–2011)

					N=324
Country	**2007**	**2008**	**2009**	**2010**	**2011**
Burundi	0.15	0.23	0.22	0.38	0.27
Comoros	0	0	0	0	0
Democratic Republic of the Congo	0.11	0.28	0.25	0.24	0.29
Djibouti	0.14	0.34	0.58	1.48	0.69
Egypt	0.18	0.26	0.3	0.25	0.27
Eritrea	0	0	0	0	0
Ethiopia	0.22	0.29	0.18	0.28	0.11
Kenya	0.83	0.84	0.47	0.71	0.71
Libya	0.02	0.01	0.01	0.02	0.01
Madagascar	0.38	0.51	0.91	0.73	0.6
Malawi	0.46	0.74	0.53	0.94	0.37
Mauritius	0.21	0.29	0.31	0.53	0.74
Rwanda	0.29	0.59	0.43	0.33	0.39
Seychelles	0.2	0.25	0.3	0.24	0.19
Sudan (former)	0.51	0.58	0.13	0.11	0.17
Swaziland	0.3	0.53	0.66	0.56	0.54
Uganda	1.31	1.39	1.23	1.25	0.92
Zambia	0.29	0.37	1	0.42	0.27
Zimbabwe	0.6	0.39	0.24	1.92	0.36

Source: Authors' calculation based on FAOSTAT (FAO 2014).

TABLE S.4.13—NORMALIZED AGRICULTURAL TRADE OVERLAP INDICES OF COUNTRIES IN ECOWAS (2007–2011)

					N=296
Country	**2007**	**2008**	**2009**	**2010**	**2011**
Benin	3.41	2.7	2.83	2.75	3.25
Burkina Faso	0.61	0.39	0.3	0.15	0.22
Burundi	0.24	0.35	0.25	0.43	0.43
Cabo Verde	0.02	0.01	0.51	0.03	0.33
Cote D'Ivoire	0.56	0.36	0.39	0.55	0.43
Gambia	2.45	2.16	1.84	1.13	1.38
Guinea	0.13	0.26	0.59	0.33	0.35
Guinea-Bissau	2.77	0.05	0.05	2.01	2.83
Liberia	0.21	0.14	0.15	0.12	0.34
Mali	0.41	0.34	0.19	0.13	0.28
Niger	0.65	1.14	1.06	1.29	1.21
Nigeria	0.09	0.1	0.06	0.06	0.07
Senegal	0.52	0.56	0.56	0.57	0.58
Sierra Leone	0.04	0.03	0.05	0.07	0.03
Togo	0.33	1.25	1.46	1.22	0.67

Source: Authors' calculation based on FAOSTAT (FAO 2014).

TABLE S.4.14—NORMALIZED AGRICULTURAL TRADE OVERLAP INDICES OF COUNTRIES IN SADC (2007–2011)

					N=315
Country	**2007**	**2008**	**2009**	**2010**	**2011**
Angola	0.06	0.07	0.05	0.05	0.05
Botswana	0.24	0.21	0.36	0.32	0.41
Democratic Republic of the Congo	0.07	0.15	0.11	0.12	0.21
Lesotho	0.03	0.01	0.01	0.01	0.01
Madagascar	0.26	0.27	0.41	0.37	0.43
Malawi	0.32	0.4	0.24	0.48	0.26
Mauritania	0.02	0.02	0.07	0	0
Mozambique	0.46	0.42	0.27	0.47	0.5
Namibia	0.24	0.24	0.16	0.15	0.22
Seychelles	0.14	0.14	0.13	0.12	0.13
South Africa	0.34	0.4	0.29	0.32	0.39
Swaziland	0.21	0.28	0.3	0.29	0.39
United Republic of Tanzania	0.57	0.38	0.27	0.38	0.32
Zambia	0.2	0.2	0.45	0.21	0.19
Zimbabwe	0.41	0.21	0.11	0.97	0.26

Source: Authors' calculation based on FAOSTAT (FAO 2014).

TABLE S.4.15—GDP AND AGRICULTURAL GROWTH RATES UNDER BASELINE AND RECENT TRENDS

	agrGDP		GDP			agrGDP		GDP	
	Baseline	Trends	Baseline	Trends		Baseline	Trends	Baseline	Trends
Benin	5.23	4.85	4.84	5.13	Burundi	2.50	2.51	6.12	6.70
Burkina Faso	5.36	5.48	5.67	5.50	Comoros	2.75	2.75	3.26	2.60
Cape Verde	2.37	2.03	6.89	7.50	D. R. Congo	1.25	1.25	2.43	2.20
Chad	1.83	1.33	5.61	8.00	Djibouti	2.31	3.24	9.04	3.00
Cote d'Ivoire	2.74	2.21	3.95	3.69	Egypt	3.33	3.39	6.25	5.20
Gambia	4.53	3.96	7.00	7.19	Eritrea	5.26	5.36	5.60	2.90
Ghana	3.56	3.48	6.44	7.06	Ethiopia	6.51	6.52	9.08	8.20
Guinea	5.17	5.00	4.25	4.33	Kenya	2.42	2.17	2.03	3.40
Guinea-Bissau	4.02	3.97	3.86	4.30	Libya	1.39	1.43	3.05	2.20
Liberia	2.55	2.00	4.02	5.09	Madagascar	1.99	1.98	3.18	3.90
Mali	3.70	3.26	5.24	6.26	Malawi	1.57	1.57	1.90	2.70
Mauritania	2.54	2.46	4.49	3.22	Mauritius	3.31	3.31	4.58	5.00
Niger	3.25	3.19	2.61	2.84	Rwanda	5.28	5.30	9.39	7.60
Nigeria	5.04	5.00	5.62	4.79	Seychelles	1.48	1.47	-1.89	2.30
Senegal	2.75	2.30	3.52	3.44	Sudan	2.50	2.45	6.40	7.20
Sierra Leone	4.94	4.83	6.08	5.67	Swaziland	1.03	1.11	2.85	2.60
Togo	2.31	1.63	4.54	6.66	Tanzania	4.64	4.65	7.60	6.00
					Uganda	3.01	3.01	6.51	8.10
					Zambia	1.06	0.95	3.49	6.30
					Zimbabwe	-0.51	-0.68	-0.85	1.00

Source: Authors' calculation based on FAOSTAT (FAO 2014).

TABLE S.5.1—CORRELATES OF MAIZE NET EXPORTS USING VARIOUS ECONOMETRIC METHODS

OLS, PANEL LINEAR AND IV FIXED-EFFECT, RANDOM-EFFECTS, BETWEEN-EFFECTS AND ERROR-CORRECTION ON VALUE OF MAIZE NET EXPORTS

	OLS_maize		Random-effects		Fixed-effects		IV Panel fixed-effects		IV Panel error-correction	
	coef	se	coef	se	coef	se	coef	se	coef	se
Rainfall	−0.000	0.000	0.000	0.000	0.000	0.000				
Temperature	−0.254***	0.044	−0.284***	0.062	−0.336***	0.067				
Temperature (squared)	0.006***	0.001	0.006***	0.001	0.006***	0.001				
NDVI maize	−0.009	0.088	−0.016	0.091	−0.062	0.085				
Soil quality maize	0.002***	0.000	0.002***	0.001						
Tree coverage (%) maize	−0.001	0.001	−0.002	0.003						
Crop disease prevalence	−0.096	0.069	−0.007	0.138						
Weeds prevalence	−0.269***	0.062	−0.432***	0.103						
Pest prevalence	1.220***	0.242	1.064**	0.414						
Total population (million)	0.001	0.001	0.002**	0.001	0.004***	0.001	0.006***	0.001	0.003***	0.001
GDP per capita, PPP (constant 2011 international $)	−0.000***	0.000	−0.000***	0.000	−0.000***	0.000	−0.000***	0.000	−0.000***	0.000
Latitude of largest city	−0.003***	0.001	−0.004***	0.001					−0.003**	0.002
Longitude of largest city	0.001**	0.000	0.001	0.001					−0.003***	0.001
Population of largest city (million)	−0.007	0.011	0.009	0.019					0.050***	0.015
Total crop land area	0.000	0.000	−0.000	0.000					−0.000*	0.000
Log of gross production value of maize in constant							−0.015	0.022	−0.033***	0.010
Constant	1.874***	0.453	2.604***	0.679	4.520***	0.826	0.199**	0.089	0.290***	0.049
Number of observations	378		378		396		288		288	
Adjusted R2	0.770				0.284					

Source: Authors' calculation.

Notes: Analysis of individual commodities (maize), the effect of the different factors on value of net exports of maize and wheat are similar in direction to those associated with total agricultural production, although the magnitude of the parameters varies. Both regressions show fairly high explanatory power, in particular for wheat. OLS: ordinary least squares; IV: Instrumental Variables; se: standard errors; coef: coefficient.

TABLE S.5.2—CORRELATES OF WHEAT NET EXPORTS USING VARIOUS ECONOMETRIC METHODS

OLS, PANEL FIXED AND RANDOM EFFECTS ON VALUE OF WHEAT NET EXPORTS						
	OLS_wheat		Random-effects		Fixed-effects	
	coef	se	coef	se	coef	se
Rainfall	0.000	0.000	0.000	0.000	0.000	0.000
Temperature	−0.266	0.203	−0.266	0.203	−0.351**	0.157
Temperature (squared)	0.005	0.004	0.005	0.004	0.007**	0.003
NDVI wheat	−0.406	0.285	−0.406	0.285	−0.229	0.204
Soil quality wheat	0.013***	0.003	0.013***	0.003		
Tree coverage (%) wheat	−0.010	0.007	−0.010	0.007		
Crop disease prevalence	−1.604***	0.366	−1.604***	0.366		
Weeds prevalence	−0.549	0.379	−0.549	0.379		
Pest prevalence	0.043	2.800	0.043	2.800		
Total population (million)	−0.002	0.002	−0.002	0.002	−0.001	0.002
GDP per capita, PPP (constant 2011 international $)	−0.000***	0.000	−0.000***	0.000	−0.000***	0.000
Latitude of largest city	−0.013***	0.002	−0.013***	0.002		
Longitude of largest city	−0.019***	0.005	−0.019***	0.005		
Population of largest city (million)	0.292***	0.059	0.292***	0.059		
Total crop land area	−0.000***	0.000	−0.000***	0.000		
Constant	5.016***	1.689	5.016***	1.689	5.116***	1.877
Number of observations	198		198		234	
Adjusted R2	0.875				0.636	
Adjusted R2	0.770				0.284	

Source: Authors' calculation.

Notes: Analysis of individual commodities (wheat), the effect of the different factors on value of net exports of maize and wheat are similar in direction to those associated with total agricultural production, although the magnitude of the parameters varies. Both regressions show fairly high explanatory power, in particular for wheat. OLS: ordinary least squares; se: standard errors; coef: coefficient.

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