ReSAKSS Africa Wide

Regional Strategic Analysis and Knowledge Support System

ReSAKSS Working Paper No. 22

November 2008

Regional Strategic Alternatives for Agriculture-led Growth and Poverty Reduction in West Africa

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About ReSAKSS

The Regional Strategic Analysis and Knowledge Support System (ReSAKSS) is an Africa-wide network of regional nodes supporting the Common Market of Eastern and Southern Africa (COMESA), the Economic Community of West African States (ECOWAS), and the Southern African Development Community (SADC), in collaboration with the International Food Policy Research Institute (IFPRI) and the Africa-based centers of the Consultative Group on International Agricultural Research (CGIAR), to facilitate the implementation of the AU/NEPAD Comprehensive Africa Agriculture Development Program (CAADP) and other regional agricultural development initiatives in Africa.

The ReSAKSS nodes offer high-quality analyses to improve policymaking, track progress, document success, and derive lessons for the implementation of the CAADP agenda. ReSAKSS is jointly funded by the United States Agency for International Development (USAID), the UK Department for International Development (DFID), and the Swedish International Development Cooperation Agency (SIDA). The nodes are implemented by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the International Institute of Tropical Agriculture (IITA), the International Livestock Research Institute (ILRI) and the International Water Management Institute (IWMI), in collaboration with regional and national partners.

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The goal of the ReSAKSS Working Paper series is to provide timely access to preliminary research and data analysis results that relate directly to strengthening ongoing discussions and critical commentaries on the future direction of African agriculture and rural development. The series undergoes a standard peer review process involving at least one reviewer from within the ReSAKSS network of partners and at least one external reviewer. It is expected that most of the working papers eventually will be published in some other form and that their content may be revised further.

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agriculture, GDP, poverty, public investment, MDG

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About the Report

This report is the final output of a project that would not have been possible without the financial support of the West and Central African Council for Agricultural Research and Development (CORAF/WECARD) and the West Africa office of the United States Agency for International Development (USAID). The support and encouragement of the Economic Community of West African States (ECOWAS) to undertake this important study must also be noted.

The study summarizes results from a set of economic and spatial analyses undertaken to explore alternative region-wide development strategy priorities for agriculture in order to generate economic growth and poverty reduction in West Africa. The results of analysis are intended to complement other existing work and in the process enrich the ongoing policy dialogue about alternative agricultural development priorities needed to promote regional growth and poverty reduction in the region.

The report is intended to further promote discussion and dialogue among a broad array of regional and national experts, policy makers, and stakeholders in the West Africa region, on the future strategies for agricultural development, growth and poverty reduction in the region. The report builds on IFPRI's experience with an earlier study conducted in East and Central Africa with the Association for Strengthening Agricultural Research in East and Central Africa (ASARECA). The viewpoints expressed in this report are the sole responsibility of the individual authors and not those of IFPRI or any other institution/organization. Because the report has yet to undergo further peer review to qualify as a research publication in the coming year, it should be regarded as work in progress and for discussion purposes only. We believe, however, that the sets of results coming out of this preliminary work is new and timely for the West Africa region in helping to promote further dialogue for prioritizing investments and policies around the CAADP agenda, and most importantly, enriching the ongoing priority setting exercises of CORAF/WECARD. Comments are welcomed and encouraged.

The study has been led by a team of researchers at the International Food Policy Research Institute (IFPRI), in close collaboration with other researchers in the region (listed below). The team at IFPRI included (in alphabetic order): Regina Birner; Olivia Butler, Jordan Chamberlin; Xinshen Diao; Shenggen Fan; Michael Johnson; Tidiane Ngaido; Alejandro Nin-Pratt; Danielle Resnick; Liang You; and Bingxin Yu. At IITA, Chris Legg, Kai Sonder, and Mbaye Yade contributed research input and feedback of an earlier draft. Many participants who attended a workshop hosted by ECOWAS to present preliminary results of the analysis provide critical feedback. A second workshop organized by CORAF provided further input from a wide range of member countries.

Beneficiaries

The analysis is aimed at informing, in a timely fashion, the ongoing dialogue on regional priorities for accelerating economic growth, poverty reduction and food security in the region, as part of the CAADP implementation efforts in West Africa under the leadership

of ECOWAS. The principle target audiences of the report are key regional stakeholders, including NEPAD, ECOWAS, CORAF, other national and regional organizations, farmer organizations, and the private sector concerned with agricultural R&D, policy reforms, and priority setting in West Africa. Also targeted are African policy makers, development partners, and civil society organizations relevant to the region. Members of the academic community (e.g. local and international universities) interested in agricultural development in West Africa and elsewhere in Africa are likely to find use and value in the findings as well.

Regional Strategic Alternatives for Agriculture-led Growth and Poverty Reduction in West Africa

Executive Summary

Can countries in West African achieve 6 percent target growth rates as part of their commitment to the Comprehensive African Agricultural Development Partnership (CAADP) of the New Partnership for Africa's Development (NEPAD)? Just as importantly, are they on target to meet their other commitment: the first millennium development goal (MDG) of halving poverty by 2015? If not, what needs to be done in terms of resource allocation and investments? What policy reforms are needed? These and many related questions are constantly on the minds of African policy makers and their development partners. Building the consensus around these sets of goals and across multiple governments and donor partners can be considered a major achievement in itself. The challenge now is translating these shared goals into action. What are the critical investment and policy alternatives that need to be considered, especially at the regional level? Are these achievable in terms of available resources and political will? Can these be coordinated well at the regional level to ensure effective implementation and desired outcomes?

While countries in the past have concentrated on problems within their national boundaries at the expense of regional priority setting,, there is a growing recognition among countries sharing common borders and problems that there are potential gains to be had from greater regional cooperation and economic integration. Increasingly, cross-cutting issues such as globalization, political democratization, liberalization of economies, urbanization and migration, health (HIV/AIDS, Malaria and Avian Influenza), natural disasters and climate change, biotechnology, and the changing proprietary nature of agricultural technology, have been at the forefront of policy debates. Because these are problems that extend beyond national boundaries, neighboring countries recognize that cooperating more closely in some of these key areas will lead to greater impacts.

Regional cooperation and integration will also increase negotiating power and leverage with donors and other regional groupings such as the World Trade Organization. In West Africa, this recognition of regional potentialities can be seen through the existence of regional bodies such as: ECOWAS, CORAF and CILSS, for example.The growing commitment to a shared vision for development further supports this perspective, as evident in the New Partnership for Africa's Development (NEPAD) and the Millennium Development Goals (MDGs). Moreover, integration would allow stronger countries to act as regional growth centers and pull neighboring countries along with them as they grow. For example, they might buy imports from their neighbors, attract migrant workers, and be sources of investment capital. These regional trade dynamics can be more powerful if key development policies are synchronized across countries. This report has been motivated by such regional potentialities in West Africa.

The most immediate aim of the report is to delineate the context in which organizations such as ECOWAS and CORAF, including their national and regional development partners, might position their own priorities, objectives, strategies, and action plans, especially as part of their own efforts to align with the Comprehensive African Agricultural Development Partnership (CAADP) of the New Partnership for Africa's Development (NEPAD). The report therefore seeks to identify a set of alternative development priorities for agriculture that cut across West Africa, at both the country and regional level.

Analytical Approach

The assessment of alternative region-wide priorities for an agriculture-led growth and poverty reduction strategy in West Africa is accomplished by organizing and integrating several components of economic, spatial, and institutional analyses in order to arrive at a narrower set of alternative development priorities in agriculture, both at the national, economy-wide and sub-sector levels. The adopted analytical approaches are explicitly strategic. First, in recognizing the inherently diverse agricultural landscape and distribution of resources endowments in West Africa, geographic information systems (GIS) methods are initially used to explore and depict spatial similarities and differences in type of livelihood challenges and opportunities that exist in the region. The analysis spans all countries in the region thereby permitting simultaneous focus on both national and regional phenomena. Second, an economy-wide multi-market model for West Africa is developed to consider the potential contributions of both agricultural and non-agricultural sub-sectors in driving future growth rates for reducing poverty and hunger in the region. Third, the multi-market model is subsequently integrated with the Dynamic Research Evaluation for Management (DREAM) model in order to quantify impacts of productivity-enhancing investments in agricultural R&D across major commodities and spatially explicit development domains. Last, an explorative method is applied for conducting a regional wide institutional and governance analysis. The explorative study has provided an overview of major regional organizations and their roles in the processing and implementation of agricultural development strategies in the region.

Together, these analytical frameworks permit examination of a range of issues central to agricultural development. Ultimately, their application sheds light on such questions as the following: What are the implications of continuation of recent growth trends in key agricultural sub-sectors, and in the agricultural sector as a whole? What levels of growth would be required to achieve key development targets? How do different agricultural sub-sectors compare in terms of their potential impacts on agricultural GDP and overall GDP? How do different sub-sectors compare in terms of their impacts on poverty? Which combinations of agricultural and non-agricultural investment yield the greatest impacts on overall growth and poverty? Are there any important sub-national differences in sub-sectoral priorities? How do returns to productivity-enhancing investments compare to those that result from reductions in barriers to trade and marketing? What are the potential benefits from regional cooperation in agricultural development?

Prospects for Achieving the MDG One in West Africa

Despite recent strong signs of rapid economic growth in West Africa, the region is likely to have more poor people in 2015 than it did in 1990. This is because the poverty rate has only declined marginally between 1990 and 2004, from 60 to 54 percent. To achieve MDG One, the region will require a 5.2 percent annual reduction in poverty between now and 2015. Under current agricultural and nonagricultural growth rates, almost none of the countries can achieve such rapid reductions in poverty with the exception of Ghana. For West Africa as a whole, it will only reach this after the year 2020. If West Africa's agriculture grew at 6.8 percent annually, the region would be able to halve the poverty rate by 2015, but not at the individual country level. Achieving this rapid growth will require substantial increased public investments. Public annual agriculture expenditures will need to increase from the current base of $6.6 billion (2004) to $8 billion by 2008 and reach $31.8 billion by 2015, a progression equivalent to an annual growth of 20 percent.

Many West African countries will fail to achieve the MDG One, even at annual agricultural growth rates of 6 percent. Whether the 10 percent budget allocation target for agriculture (based one the Maputo declaration) is sufficient to support the required 6 percent growth rate varies by country. Burkina Faso, Guinea and Chad, for example, may require an additional 200-300 million dollars over the 10 percent budget allocation. Côte d'Ivoire, Gambia and Mali will also need to spend more than the 10 percent recommendation.

These aggregate national-level projections help highlight the importance of increasing agricultural investment and challenges faced by the agricultural sectors and the governments in West Africa. However, increasing government spending in agriculture is not enough. The equally important question is how to effectively leverage multiplier effects through pro-poor growth investments and enable policies at both the national and regional level. This in turn depends on how agriculture is integrated into the economy and how pro-poor growth opportunities are identified and realized in the countries and the region as a whole.

Overview of the Broad Issues Facing West Africa's Agriculture

Formulating and evaluating agricultural growth and development strategies for a region as large and diverse as West Africa is extremely challenging. The region's current population of 290 million is projected to reach 430 million within the next 15 years. This growth has been accompanied by massive urbanization, as 60 percent of West Africans is projected to live in urban areas by 2020 (OECD, 2000), and the number of cities with more than 100,000 inhabitants will grow to more than 300 in 2030. The population expansion and urbanization brings with it greater challenges for maintaining income growth and food security, especially if it is not accompanied by agricultural productivity improvements and structural transformation. But, it also brings forth opportunities through expanded urban-rural linkages, especially along the coast, as farmers capitalize on rapidly expanding urban markets.

A challenge for most of West Africa is that the agriculture sector remains typically characterized by small family farms that still rely heavily on rain-fed production systems, natural methods for soil fertility maintenance, and infrequent year long access to large market centers. Consequently, a majority of rural West African farmers continue to face high production and marketing risks, which in turn increase the variability in production and income growth of the sector. Low modern input use – such as irrigation, fertilizer, improved seeds and machinery – remains very limited This is not to say the millions smallholder farm households do not efficiently use the limited resources at their disposal. Rather, farmers are always looking for better ways to produce and market their harvest but too often are constrained by limited and variable access to markets and purchased inputs due to poor rural infrastructure and services.

The rapid population growth in the region is also contributing to greater biotic stress on crop production systems in areas with already fragile soils and variable climate conditions, especially in the Sahel. Traditional fallow methods are no longer an option for maintaining soil fertility in many of these areas. It is estimated that at least half of West Africa's farmland shows some degree of soil erosion due to intensive "mining" practices in which nutrients are removed from the soil, but not replaced (FAO). While fertilizer can help, its use has remained very limited due to high prices that are out of the reach of a majority of resource poor farmers. This problem is likely to remain so long as poor road infrastructure and high market transaction costs, including poor institutions – e.g. rural financial and extension services – limits the demand for fertilizer (Crawford et al. 2005). Moreover, without adequate water availability or irrigation, fertilizer demand has remained low (Sanders 2002). As a result, crop yields of most staples are still far below their potential (FAO).

The extent to which West African smallholder agriculture can witness rapid productivity and income growth will depend on how well the many constraints facing the sector – such as poor rural infrastructure and extension services, high market and trade transaction costs, weak producer and market institutions, and for some countries unstable political environments – can be thoroughly addressed through public investments and policies, especially where there are insufficient incentives for private sector input. So long as food imports have been expanding rapidly with population growth and urbanization, there is great potential for commercialization of food production systems all the way from production of basic staples to processed food industries. Past strategies that have focused entirely on export markets outside the region have neglected the many opportunities offered by growing West Africa regional markets. This has been detrimental to growth in intra-regional trade. Yet the potential is great and is also less subject to the low and variable prices in world markets. Within the Economic Community of West African States (ECOWAS), for example, intra-regional trade has already been approaching 12 percent of total exports. Clearly, West Africa has yet to vigorously pursue greater integration among the sub-region's economies. Many countries also stand to gain given that their populations are just too small to be viable markets on their own.

Socioeconomic and Biophysical Underpinnings of West Africa's Agriculture

Agricultural performance both derives from and conditions deeper socioeconomic and biophysical realities. Analysis of spatial distributions of human population, associated access to cultivable land, agricultural potential captured by agroecological conditions, and access to markets reveals high degrees of heterogeneity in options for agricultural development within West African countries. Agricultural development strategies must recognize such heterogeneity when devising interventions and investments. Areas exhibiting different combinations of these characteristics are often associated with different management practices and livelihood strategies, and thus overall agricultural performance. 27 "Agricultural development domains" representing particular realizations of population density, agricultural potential, and access to markets are identified and various agricultural development options associated with the domains are proposed in this report. Patterns of agricultural opportunities and constraints captured in agricultural development domains are shown to invariably straddle administrative and political boundaries within and across West African countries.

The spatial analysis of this study shows that the largest individual domain in the region is the one with low population density, low agricultural potential, and low market access, accounting for 37 percent of West Africa land area (domain LLL). The domain with high population density, but low agricultural potential and low market access (domain HLL) is also large, accounting for 22 percent of land area. Areas with high agricultural potential and high market access account for only 2 percent of the land area but include more than 8 percent of cropland and almost 20 percent of the rural population. Most countries contain at least 6 of the domain types. Linking each of the development domains to specific development strategies is an important next step (e.g. crop-mix systems and/or crop-livestock systems).

Agricultural Performance and Contribution to the West African Economy

The socioeconomic and biophysical diversity of West Africa agriculture can also be traced to the circumstances and policies that have dictated the degree to which the sector has performed and contributed to the national and regional economy. The agricultural sector's performance has been a primary determinant of overall economic growth in West Africa. Of the 3.9 percent annual GDP growth between 2000 and 2004, 1.2 percent was attributed to agriculture sector growth. Unfortunately, so long as sector performs poorly, it cannot support significant poverty reduction in the region. Growth in total factor productivity has been low within the last 20 years. The coastal countries have shown higher dynamism than Sahelian countries, growing at about 2.1 percent per year in agricultural productivity, compared to -0.29 percent per year in Sahelian countries as a whole. At the country level, the best performers in agricultural productivity growth are Benin, Nigeria and Ghana. Given these solemn trends in agricultural productivity in West Africa, it is not surprising that average yields for West Africa's major crops currently fall well below global levels.

The overall picture of low agricultural productivity growth in West Africa has major implications for production, consumption, and trade patterns within the region. The majority of countries in West Africa are net importers of most agricultural

commodities. Cotton and cocoa, two traditional export crops, dominate the region's agricultural exports, with nontraditional exports, including fruits and vegetables, rapidly increasing over the years. While most countries in West Africa are net food importers, the potential for regional trade does exist for livestock, pulses, oilseeds, and even maize.

The domestic demand for food staples (including farmers' own consumption levels) generated almost 20 billion $US. This is more than three times West Africa's international exports and 50 times the level of intra-regional trade within the region captured by official statistics. These figures highlight the enormous potential gains from strengthening regional linkages and increasing intra-regional commodity exchanges as productivity increases. Because of the important role domestic-demand plays in the region's agricultural growth, it is necessary to further examine the dynamics at the micro level.

Based on household demand analyses for three West African countries (Mali, Ghana and Senegal), poor households were found to spend more on coarse grains (like maize, millet and sorghum) and root crops. Households also tend to spend proportionately less on coarse grain consumption as incomes rise. In contrast, demand for livestock products rises as income rises, although at slower levels among the richest quintile group. This is a reasonable conclusion considering richer households already spend much more on livestock products, and thus will not dramatically increase their livestock consumption as their incomes grow. For rice and wheat consumption, results seem to imply that households will spend a similar portion of their income on rice and wheat consumption as their incomes increase (falling somewhere between the patterns for coarse grains and livestock products).

The demand-side analysis in the three countries suggest that domestic demand for staples in many West African countries will have to increase rapidly if growth is to be pro-poor. Rapid growth is needed given the huge consumption gaps of staple foods between the rich and poor. If growth favors the rich, market opportunities for many staple foods will be limited. Wealthier consumers generally prefer to spend more on high value and processed agricultural commodities and even more on nonagricultural commodities like industrial goods and services. This analysis helps to illustrate that market opportunities for agriculture, especially for staple foods and livestock sectors, depends critically on broad-based agricultural growth. This can directly increase the incomes of the majority of farmers and thus increase their consumption levels. When broad-based agriculture growth is rooted in increased agriculture productivity, food prices can decrease without lowering farmers' incomes. Poor urban consumers will also benefit from cheaper prices and further increase consumption levels.

Alternative Futures for West Africa's Agriculture

Having reviewed the socio-economic and biophysical underpinning of West Africa's agriculture, its past performance, and demand opportunities for some of the most basic outputs of the sector in the region, the next step is to analyze the future alternatives for agricultural growth. But even more importantly, are the subsequent implications for overall economic growth and poverty reduction. The aim is to identify strategic priorities

for agricultural development in the region that can assist national and regional stakeholders define and position their own priorities and objectives.

Based on methodologies that integrate spatial analysis with economic models (multi-market model and DREAM model) of West Africa, maintaining the current trends in the performance of agriculture—termed "business-as-usual"— shows that current growth rates in the region are inadequate to meet the MDG One. However, there exists a huge potential in the region to stimulate agricultural growth further. Since the potential varies widely across the region, given the wide differences in agro-ecological, physical and social-economic conditions, questions of which agricultural sub-sectors are more important for overall agriculture growth are better answered at the national level.

Results show that if countries can maximize their agricultural potential, nine out of twenty West African countries can achieve the 6 percent annual agricultural growth target and another seven will attain more than 5 percent growth in the next 10 years. Among the major commodities, rice shows the highest potential for growth and could subsequently generate the largest producer benefits among many countries and for the region as a whole. Joint investments in rice research and development at the regional level will provide even higher returns given its potential for transferability across borders.

Livestock also proves to be an important and strategic option for generating growth, especially for the Sahelian zone. The analysis shows that if the livestock sector grows at the same rate as that projected for the crop sector, it turns out to contribute the most to total agricultural growth in the Sahel. This is primarily because of the sheer size of this sector in the economies of most Sahelian countries.

In the Coastal and Central sub-regions, sub-sectoral contributions to total growth turn out to be much more diverse than that in most of the Sahelian countries. Within such diverse growth patterns, the contribution from growth in root crops seems to be relatively important in many countries. For example, root crops contribute to more than one-third of agricultural growth in Ghana, Benin, Togo and Nigeria and 11–15 percent of growth in Sierra Leone and Côte d'Ivoire.

Growth in both staple crops and the livestock sector depends not only on technology to generate high productivity growth, but also on regional integration in both commodity and input markets. The analysis shows that improvement in market conditions and trade policies are important sources of agricultural growth as market investments and reforms will expand regional and domestic demand. West Africa as a whole is a net importer of both rice and livestock products. Increased supply in rice and livestock products, through productivity growth, can easily find market in the region if market and trade conditions are improved.

Traditional export crops, such as cocoa in Côte d'Ivoire and Ghana and cotton in Benin and Mali, continue to play important role in West Africa's agricultural growth. However, diversification in these commodities' markets is critical as current OECD market demand elasticity is low. Exploring other market opportunities, including markets

in some Asian countries like China and India and emerging East European markets, are the necessary conditions for continuous growth in these commodities' exports and production.

West African countries also need to diversify their total agricultural exports and the analysis of this report shows that with better market and trade conditions, together with increased productivity, (intraregional?) trade in nontraditional agriculture, including many staple food commodities are in the region, significantly increases. Such trade diversification and creation not only help agricultural growth in general, but also help to reduce price risk from concentrated exports of a very few traditional agricultural commodities.

Challenges for Regional Cooperation and Integration

One of the major problems in West Africa does not seem to be convincing countries about the benefits of regionalism but ensuring that these benefits are not undermined by duplicate activities. The traditional challenges of multiple memberships in different economic organizations and poor donor coordination appears to underlie the emergence of duplicate agricultural policies and bio-safety frameworks from ECOWAS and UEMOA. The Agricultural Policy of the Economic Community of West African States (ECOWAP) was adopted by ECOWAS in 2005, which constitutes the West African version of CAADP. UEMOA adopted a joint agricultural policy (*Politique Agricole d'UEMOA* PAU) in 2001. Both organizations have deemed the harmonization of agricultural policy a priority and this seems to be a realistic goal given that the PAU is not fully implemented and ECOWAS has decided to adopt UEMOA's Common External Tariff (CET).

Acceptance of NEPAD's CAADP and adoption of a PRSP are some of the factors influencing the priority accorded to agriculture within a number of West African countries. The result has been the development of an agricultural framework law (LOASP) in Senegal and a Rural Development Strategy (SDR) in Burkina Faso, both of which were finalized after a two-year period of consultations. Yet, the common complaint in both countries is that these approaches do not constitute a coherent, strategic vision for the agricultural sector with clearly defined objectives. Given this fact, perhaps it is not surprising that sub-regional agricultural strategies and policies, such as the PAU and the ECOWAP, are only partially built on existing national policies. Instead, sub-regional organizations tend to conduct new studies and new workshops to identify agricultural priorities. CORAF's priority-setting approach, which started with national and zonal workshops before moving onto sub-regional meetings, seems to be a sensible means by which to determine those issues that continue to remain salient as the level of analysis moves from the micro to the macro levels. Attention to where funding opportunities seem most promising was also a criterion for determining priorities.

The participation and input from broader stakeholder groups in agriculture, such as the Regional Network of Peasant and Agricultural Producer Organizations (ROPPA), remains unclear at the regional level. This is in contrast to the national level where peasant and agricultural producer organizations have increasingly proved to be a major

lobbying force. Although producer groups and civil society organizations such as ROPPA are diverse entities themselves with a wide array of opinions and interests that cannot always be taken into account by decision-making authorities, it is important that the input of these stakeholder groups are not dismissed at the sub-regional levels. In the past, the lack of organizational strength, especially on the part of rural producers without the capacity for collective action, was deemed a major reason why agriculture did not receive the degree of state attention commensurate with its importance to African economies. Yet, with the growing organizational strength of producers and civil society within West Africa over the last decade, their voice within debates over agricultural policies can no longer be ignored. Future research on West African agriculture should therefore examine why governments have decided to accept some of the recommendations of these stakeholders while ignoring others.

Existing gaps in linking the results of stakeholder consultations to public policy and action are aggravated by the challenges of actually implementing the policies that are the outcome of participatory processes. As West Africa continues to pursue a thirty-year quest for regional integration, success with improving agricultural growth may require identifying a narrow set of issues that affect the most amount of countries, which are informed by researchers as well as producer groups and NGOs and which are supported by coordinated donor interventions and implemented by only one regional economic organization. This may help to realize the benefits of regional collaboration envisioned by ECOWAS and UEMOA.

Conclusions and Policy Recommendations

The analysis of this report suggests that while there are daunting challenges to improving the performance of the agricultural sector in West Africa in order to meet MDG One, it is not an impossible task. The region will require a growth rate of 6.8 percent per year on average. This varies widely across countries, however. Some countries, e.g. Ghana, are already on track to meet the MDG at current growth rates. Stimulating the required agricultural growth rates is possible, especially if the full potential of productivity improvements can be realized. A majority of countries could witness agricultural growth rates of above 5 percent and almost half (9 countries) could achieve growth rates above 6 percent. To accomplish these goals, West African governments must invest in combinations of measures that:

1. ***Spur productivity growth, focusing on sub-sectors with high demand within West Africa.***

- The importance of agricultural sub-sectors in relation to overall growth varies across countries and major zones (e.g., coastal versus Sahelian), given different agro-ecological and demand conditions. The model analysis details such variations. This emphasizes the importance of priority-setting at the country level.
- Keeping such variations in mind, rice seems to have the highest potential for growth and subsequently could generate the greatest producer benefits for many countries. Rice could be thought of as a region-wide strategic commodity. To take advantage of its potential, joint investments in rice

research and development at the regional level can provide even higher returns given its potential for transferability across borders.

- Livestock also turns out to be an important and strategic option for generating growth, especially for the Sahelian zone. The analysis shows that if the livestock sector grows at the same rate as that projected for the crop sector, it would contribute the most to total agricultural growth in the Sahel. This is primarily because of the sheer size of this sector in the economies of most Sahelian countries.
- In the Coastal and Central sub-regions, sub-sectoral contributions to total growth are much more diverse while the contribution from growth in root crops seems to be relatively important in many countries. Root crops contribute to more than one-third of agricultural growth in Ghana, Benin, Togo and Nigeria and 11–15 percent of growth in Sierra Leone and Côte d'Ivoire. Finding foreign markets for these crops, e.g. Asian markets, will be important for future growth.

- Traditional export crops, such as cocoa in Côte d'Ivoire and Ghana and cotton in Benin and Mali, continue to play important role in West Africa's agricultural growth. However, diversification in these commodities' markets is critical as current OECD market demand elasticity is low. Exploring other market opportunities, including markets in some Asian countries like China and India and emerging East European markets, will be a necessary condition for continuous growth in these commodities' exports and production.

2. *Strengthen regional agricultural markets, trade and economic integration*

- To enhance the integration of the regional economy, both joint public investment (such as in R&D and infrastructure) and improvements in market conditions and trade policies are important. The analysis shows that growth in staple crops and livestock sector depends not only on technology to generate high productivity growth, but also on regional integration in both commodity and input markets. Improvements in market conditions and trade policies have shown to be important source of agricultural growth as market investments and reforms will expand regional and domestic demand. West Africa as a whole is a net importer of rice and livestock products. Increased supplies in rice and livestock products, through productivity growth, can easily find market in the region if market and trade conditions are improved.
- West African countries also need to diversify their total agricultural exports. Analysis shows that better market and trade conditions, together with increased productivity, significantly increase trade in nontraditional agriculture, including the many commodities that are staple food in the region. The creation of such trade, and its diversification helps agricultural growth and also reduces the risk from concentrating in very small numbers of agricultural export commodities.

3. *Enhance linkages between agricultural and non-agricultural sectors*.

- In areas where transport costs and other structural factors prevent local economies from reaching outside sources of effective demand for local products, the strongest links between agricultural and non-agricultural sectors spring from production and consumption of non-tradable commodities.
- Determining (?) links to agro-industries is also important (e.g. for processed foods, feed, and intermediate products). Three related sets of measures would be needed over time: first, the growth of agro-processing, distribution, and farm-input provisions off-farm; second, institutional and organizational adjustments in relations among agro-industrial firms and farms—such as greater vertical integration and, third, concomitant changes in product composition, technology, and sectoral and market structures.

4. Exploit opportunities for greater regional cooperation and harmonization

- Growth needs to be supported by public investment. To make agriculture grow more rapidly to meet the MDG One, huge investment in agriculture are needed. Expenditures will need to increase from the current base of $6.6 billion (2004) to $8 billion by 2008 and reach $31.8 billion by 2015, amounts equivalent to an annual growth of 20 percent over a 15-year period.
- Effective institutions at both country and regional levels are important preconditions for promoting agriculture growth and regional integration can also be an outcome of greater cooperation and harmonization of policies and strategies.
- As West Africa continues to pursue a thirty-year quest for regional integration, successfully improving agricultural growth may require identifying a narrow set of issues that affect the greatest number of countries. These issues should be informed by researchers as well as producer groups and NGOs, supported by coordinated donor interventions and implemented by either one regional economic organization or several organizations closely coordinated with clear divisions of responsibilities. This may help to realize the benefits of regional collaboration envisioned by ECOWAS and UEMOA.

Regional Strategic Alternatives for Agriculture-led Growth and Poverty Reduction in West Africa

1. Introduction

Can countries in West Africa achieve 6 percent target growth rates as part of their commitment to the Comprehensive African Agricultural Development Partnership (CAADP) of the New Partnership for Africa's Development (NEPAD)? Just as importantly, are they on target to meet their other commitment: the first millennium development goal (MDG) of halving poverty by 2015? If not, what needs to be done in terms of resource allocation and investments? What policy reforms are needed? These and many related questions are constantly on the minds of African policy makers and their development partners. Building consensus around these sets of goals and across multiple governments and donor partners can be considered a major achievement in itself. The challenge then becomes transforming these shared goals into actions. What are the critical investment and policy alternatives that need to be considered, especially at the regional level? Are these achievable in terms of available resources and political will? Can these be coordinated well at the regional level to ensure effective implementation and desired outcomes? These and many other questions are considered in this report.

One great challenge to poverty reduction is that most countries have not achieved or sustained the estimated 6 percent GDP growth rates required to achieve the first MDG (from hereon referred to as MDG One). Between 2000 and 2004, only three countries experienced growth rates of 6 percent or more: Burkina Faso, Chad, and Mali (Table 2.1.1). However, some of this growth can be attributed to rapidly rising world prices favoring oil and mineral-rich countries (i.e. Chad and Mauritania). While these growth rates are a positive sign and part of a larger pattern of steady growth over the past decade, they nonetheless conceal the low per capita incomes and high poverty rates that have persisted (Table 1.1).

The question, therefore, is whether West African countries can still grow and achieve the MDG of halving poverty by 2015. Even more importantly, can regional priorities be identified to stimulate such growth? Agricultural development strategies are typically national plans that define investment and policy action priorities of individual countries based on local assessments of needs. Seldom are regional priorities for agricultural development considered since they cut across national boundaries of interest. However, there is a growing recognition among countries that share common borders and problems that there are potential gains to be had from greater regional cooperation and economic integration. In West Africa, this can be seen through the existence of several regional bodies such as: ECOWAS, CORAF, and CILSS. The growing commitment to a shared vision for development across individual countries also further supports this perspective, as evident in the New Partnership for Africa's Development (NEPAD) and the Millennium Development Goals (MDGs).

Increasingly, cross-cutting issues such as: globalization, political democratization, liberalization of economies, urbanization and migration, health (HIV/AIDS, Malaria and Avian Influenza), natural disasters and climate change, biotechnology, and the changing proprietary nature of agricultural technology, have been at the forefront of policy debates. Because these are problems that extend beyond national boundaries, neighboring countries recognize that cooperating more closely in some of these key areas will lead to greater impacts. Regional cooperation and integration will also increase negotiating power and leverage with donors, global organizations like the World Trade Organization and other regional groupings. Moreover, integration would allow stronger countries to act as regional growth centers and pull neighboring countries along with them as they grow. For example, they might buy imports from their neighbors, attract migrant workers, and be sources of investment capital. These regional trade dynamics can be more powerful if key development policies are synchronized across countries.

Finally, some national investments might generate externality benefits for a country's neighbors, leading to potential efficiency gains from regional rather than national investment strategies. For instance, agricultural research and development (R&D) in one country might lead to spillover benefits for neighboring countries that have similar agroecological conditions. It might be inefficient for each country to undertake wholly independent R&D; significant gains might be achieved from regionally conceived and implemented R&D programs. This report has been motivated by such regional potentialities in West Africa.

The most immediate aim of the report is to delineate the context in which organizations such as ECOWAS and CORAF, including their national and regional partners, might position their own priorities, objectives, strategies, and action plans, especially as part of their own efforts to align with the Comprehensive African Agricultural Development Partnership (CAADP) of NEPAD. The report therefore seeks to identify a set of alternative development priorities for agriculture that cut across West Africa, at both the country and regional level.

1.1 Overview of the Broad Issues Facing West Africa's Agriculture

Formulating and evaluating agricultural growth and development strategies for a region as large and diverse as West Africa is extremely challenging. The region's current population of 290 million is projected to reach 430 million within the next 15 years. This growth has been accompanied by massive urbanization, as 60 percent of West Africans is projected to live in urban areas by 2020 (OECD, 2000), and the number of cities with more than 100,000 inhabitants will grow to more than 300 in 2030. The population expansion and urbanization brings with it greater challenges for maintaining income growth and food security, especially if it is not accompanied by agricultural productivity improvements and structural transformation. But, it also brings forth opportunities through expanded urban-rural linkages, especially along the coast, as farmers capitalize on rapidly expanding urban markets.

A challenge for most of West Africa is that the agriculture sector remains typically characterized by small family farms that still rely heavily on rain-fed production

systems, natural methods for soil fertility maintenance, and infrequent year long access to large market centers. Consequently, a majority of rural West African farmers continue to face high production and marketing risks, which in turn increase the variability in production and income growth of the sector. Low modern input use – such as irrigation, fertilizer, improved seeds and machinery – remains very limited This is not to say the millions smallholder farm households do not efficiently use the limited resources at their disposal. Rather, farmers are always looking for better ways to produce and market their harvest but too often are constrained by limited and variable access to markets and purchased inputs due to poor rural infrastructure and services.

The rapid population growth in the region is also contributing to greater biotic stress on crop production systems in areas with already fragile soils and variable climate conditions, especially in the Sahel. Traditional fallow methods are no longer an option for maintaining soil fertility in many of these areas. It is estimated that at least half of West Africa's farmland shows some degree of soil erosion due to intensive "mining" practices in which nutrients are removed from the soil, but not replaced (FAO). While fertilizer can help, its use has remained very limited due to high prices that are out of the reach of a majority of resource poor farmers. This problem is likely to remain so long as poor road infrastructure and high market transaction costs, including poor institutions – e.g. rural financial and extension services – limits the demand for fertilizer (Crawford et al. 2005). Moreover, without adequate water availability or irrigation, fertilizer demand has remained low (Sanders 2002). As a result, crop yields of most staples are still far below their potential (FAO).

The extent to which West African smallholder agriculture can witness rapid productivity and income growth will depend on how well the many constraints facing the sector – such as poor rural infrastructure and extension services, high market and trade transaction costs, weak producer and market institutions, and for some countries unstable political environments – can be thoroughly addressed through public investments and policies, especially where there are insufficient incentives for private sector input. So long as food imports have been expanding rapidly with population growth and urbanization, there is great potential for commercialization of food production systems all the way from production of basic staples to processed food industries. Past strategies that have focused entirely on export markets outside the region have neglected the many opportunities offered by growing West Africa regional markets. This has been detrimental to growth in intra-regional trade. Yet the potential is great and is also less subject to the low and variable prices in world markets. Within the Economic Community of West African States (ECOWAS), for example, intra-regional trade has already been approaching 12 percent of total exports. Clearly, West Africa has yet to vigorously pursue greater integration among the sub-region's economies. Many countries also stand to gain given that their populations are just too small to be viable markets on their own.

1.2 Analytical approach

The assessment of alternative region-wide priorities for an agricultural-led growth and poverty reduction strategy in West Africa is accomplished by organizing and integrating several components of economic and spatial analysis in order to arrive at a narrower set of alternative development priorities in agriculture, both at the national and economy-wide level and sub-sector levels (e.g. targeting of agricultural R&D investments). Specific objectives of each of the analytical components are designed to: Disaggregate the region spatially (in terms of geographic and socio-economic factors) to determine the distributional patterns of production and consumption of key crop and livestock commodities; In order to get the full picture, the entire basket of major commodities is taken into account, e.g. horticulture, tree crops, non-traditional, etc; Assessing the patterns of domestic, regional, and global, demand for key agricultural commodities in order to determine future market growth potential to absorb supply; Identifying future policy and investment alternatives needed to meet targeted growth rates for poverty and hunger reduction, such as the CAADP 6 percent growth and MDG poverty targets; determining whether such targets are achievable given feasible improvements in agricultural productivity and market access; assessing the distribution of potential gains by commodity and country, as well as scope for leveraging regional growth dynamics from agricultural R&D expanded domestic and intra-regional markets and trade opportunities; and finally, improving our understanding about how governance structures and institutions, at both the national and regional levels, matter in affecting the efficiency and effectiveness of regional cooperation and synergies across countries in public investments and trade policy reforms, and thus, the achievement of key development goals.

Given these multiple goals, the adopted analytical approaches are explicitly strategic by addressing a set of strategic questions in a logical and sequential fashion in order to narrow the set of alternative priorities for consideration. First, in recognizing the inherently diverse agricultural landscape and distribution of resources endowments in West Africa, geographic information systems (GIS) methods are initially used to explore and depict spatial similarities and differences in type of livelihood challenges and opportunities that exist in the region. The analysis spans all countries in the region thereby permitting simultaneous focus on both national and regional phenomena. Second, an economy-wide multi-market model for West Africa is developed to consider the potential contributions of both agricultural and non-agricultural sub-sectors in driving future targeted growth rates for reducing poverty and hunger in the region. Third, the multi-market model is subsequently integrated with the Dynamic Research Evaluation for Management (DREAM) model in order to quantify impacts of productivity-enhancing investments in agricultural R&D across major commodities and spatially explicit development domains.

To the extent possible, these analytical approaches were integrated in a consistent fashion, which is an improvement over the earlier ASARECA/IFPRI study. Altogether, the study is: *dynamic* – forward looking over the next ten years; *spatial* – in specifically accounting for the heterogeneity of production conditions across space; *economy-wide* – by incorporating both agriculture and non-agriculture sector production, consumption,

prices, and trade (domestic, regional and international markets); and *integrated* – certain spatial data and parameters serve as key input into the economic models while both the economy-wide and DREAM models use the same baseline and growth scenarios.

Finally, an explorative method is applied for conducting regional wide institutional and governance analysis. The explorative study has provided an overview of major regional organizations and their roles during the process of designing and implementing agricultural development strategies in the region.

Together, these analytical frameworks permit examination of a range of issues central to agricultural development. Ultimately, their application sheds light on such questions as the following: What are the implications of the continuation of recent growth trends in key agricultural sub-sectors, and in the agricultural sector as a whole? What levels of growth would be required to achieve key development targets? How do different agricultural sub-sectors compare in terms of their potential impacts on agricultural GDP and overall GDP? How do different sub-sectors compare in terms of their impacts on poverty? Which combinations of agricultural and non-agricultural investment yield the greatest impacts on overall growth and poverty? Are there any important sub-national differences in sub-sectoral priorities? How do returns to productivity-enhancing investments compare to those that result from reductions in barriers to trade and marketing? What are the potential benefits from regional cooperation in agricultural development?

1.3 Outline of the report

The question at issue in this report is the nature of agricultural development strategies that might lead West African countries toward development paths that feature sustainable increases agricultural productivity, food and nutrition security, and poverty reduction. In addressing these issues, the remainder of the report is organized as follows. Chapter 2 highlights a projection for poverty reduction trends in the region, the required agriculture growth for achieving MDG One, the effects of 10 percent of government budget allocation on agricultural growth, and the required sufficient public investment to achieve MDG One. The projection is done at the aggregated national economy level for individual West African countries. Chapter 3 provides an overview of recent economic development trends and current conditions affecting agricultural productivity and the performance of West African agriculture. Past growth trends are analyzed through agriculture's contribution to the national and regional GDP, agricultural productivity, agricultural production, consumption, and trade, and agricultural market opportunities. Differences across countries based on underlying factors of geography, agricultural potential, conflict and the structural composition of growth, are stressed.

A more descriptive and spatial analysis of the socioeconomic and biophysical underpinnings of agriculture within and across countries follows in Chapter 4. This chapter in intended to focus more attention on the spatial distribution of key socioeconomic and agroecological factors, such as population density, agricultural potential, and access to markets, that can affect research priority options in the region. "Agricultural development domains" are applied to represent such identification, which

help analyze various strategic livelihood options associated with such conditions. Chapter 5 explores the implications for future economic growth and poverty reduction in West Africa of alternative policy and investment strategies in agriculture. Using a specially developed regional multi-market model of agriculture in West Africa, outcomes from continuation of recent trends (i.e., continued "business-as-usual") are contrasted with those associated with alternative growth-enhancing, poverty-reducing investment strategies. To weight the gains from sub-sector specific investments, the DREAM model is integrated into the analysis of agricultural R&D priorities. Chapter 6 concentrates on region-wide institutional issues and contains the study's recommendations and policy implications. Broad conclusions round out the report in Chapter 7.

2. Prospects for Achieving MDG One in West Africa

While sub-Saharan Africa's economic performance has been overall disappointing, many West African countries have begun to demonstrate steady growth rates in recent years. The entire region grew at an almost 4 percent annual average between 2000 and 2004 (see Table 3.1.1). Growth was slower in the Central African region, averaging about 3 percent per year, partially due to the poor performance record of the Central African Republic and the Democratic Republic of the Congo. But at the national level, countries such as Nigeria, Mauritania and Guinea-Bissau experienced growth rates of 5 percent and over while Burkina Faso, Chad, and Mali, experienced growth rates as high as 6 percent or more. Despite the fact that West Africa has recently shown strong signs of economic growth, the region is likely to have more poor people in 2015 than it did in 1990. This is because the poverty rate declined only marginally in the past decade, from 60 to 54 percent. To achieve the first MDG- halve the 1990's poverty rate by 2015-the region will require an average 5.2 percent annual reduction in poverty between now and 2015.

How important is the role of agriculture in contributing to overall growth and poverty reduction in West Africa? High and sustained rates of economic growth, driven in large part by the agricultural sector, will be necessary if West African countries are to accelerate poverty reduction. Although there is a burgeoning industrial sector in some West African countries rich in minerals or oil, agriculture still provides the dominant livelihood for 70 percent or more of the population. It comprises an average 30–40 percent of the region's GDP and contributes a considerable share to agricultural processing industries and the service sector (Chapter 3 will consider agriculture's linkage to West African economies in greater detail).

Much of the continent's poverty remains concentrated in rural areas among smallholder farmers. Generating higher agricultural growth, particularly in the smallholder sector, would increase rural incomes and food supplies. It would also stimulate broad-based economic growth through linkages with the nonagricultural sector. By contrast, growth in the nonagricultural sector alone, especially in the mineral-based industrial sector, would not have a broad impact on poverty reduction (Fan, Chan-Kang, and Mukherjee, 2005).

2.1 Business as usual will not work

The growth rates required for poverty reduction will vary across countries in the region (Table 2.1). For example, Ghana's 35 percent reduction in poverty between 1990 and 2004 (and current agricultural growth rate) will allow the country to meet MDG One. Unfortunately, many other West African countries would not meet the goal at the national level. Côte d'Ivoire, Guinea, Nigeria, Chad, Guinea-Bissau, and Niger, for example, could need 5-20 years to reach the MDG One target. Because of a lack of progressive growth in the 1990s, Guinea-Bissau and Niger will likely need rapid economic growth in the coming years to support a 7-10 percent annual poverty reduction and meet MDG One; as it stands they would need decades to meet the goal following business as usual.

The Comprehensive African Agricultural Development Program (CAADP) of NEPAD has set a 6 percent annual growth rate target for agriculture. If countries achieved this growth rate, West Africa would be able to halve poverty by 2015 at the regional level. Unfortunately, agriculture in the region has been growing at an average of only 3.7 percent in recent years, only one percentage point higher than the region's average population growth rate. Under current agriculture and non-agriculture growth rates, almost none of the countries in the region can reach MDG One (see Table 2.1). According to these projections, West Africa will reach the target of MDG One after 2020, many years later than the targeted 2015, while the continent as a whole will require even more time to reach the goal.

As Table 2.2 shows, regional agriculture would need to maintain an annual growth rate of 6.8 percent between 2004 and 2015 to achieve MDG One for West Africa as a whole. Although China's growth experience between 1978 and 1984 shows it is possible to maintain such a high growth rate for more than ten years, this is a very ambitious goal with daunting challenges for West Africa. Such challenges vary across countries. For example, due to steady growth over the past 20 years and significant poverty reduction between 1990 and 2004, Ghana does not need a 6 percent agricultural growth rate to achieve MDG One and it should be able to meet this poverty reduction target before 2015 even following its current growth path. On the other hand, Guinea-Bissau, Nigeria and Niger, which have experienced low agricultural growth rates or rising poverty, would need to accelerate their annual agricultural growth rates to more than 9 percent in order to meet MDG One.

2.2. Leveraging and achieving the growth required

What are the resources needed to reach the 6 percent agriculture growth rate target set by CAADP or the even more ambitious MDG One? The political commitment by West African leaders to allocate up to 10 percent of their fiscal budgets to agriculture by 2008 (based on the 2003 Maputo Declaration) is a step in the right direction. Achieving rapid growth in agriculture requires substantially increased public investments, together with increased private investments resulting from economic growth and improvements in policy environments. Assuming other things to be as usual, public annual agriculture expenditure in West Africa needs to increase from the current base of $6.6 billion (2004) to $8 billion by 2008 and reach $31.8 billion by 2015, in order to support the agricultural growth needed for meeting MDG One at the regional level (Figure 2.1). These amounts are equivalent to a 20 percent annual growth rate over a 15-year period.

If all West African countries reach the 10 percent target of the Maputo Declaration, government spending in the agricultural sector would rise to almost $9.1 billion by 2008 for the region as a whole. This assumes that total government expenditures (including expenditures in other sectors outside agriculture) remain the same as 2004 levels (Table 2.2). Currently, only a few West African countries, such as Chad, Guinea, and Burkina Faso, have reached the 10 percent budget allocation target (Table 2.3). Many countries are far below the 10 percent goal; Niger and Guinea-Bissau spent less than 1 percent of the governments' total budget on agriculture in 2004. Nigeria, the largest country in Africa, spent only 3.2 percent of the government's budget on

agriculture, though the country is rich in oil and government revenue has been boosted by the recent surge in oil prices. In West Africa, the current average of agricultural spending as a percentage of agricultural GDP is 3.8 percent, but in Asia and Latin America such spending was 8-10 percent of the regions' agricultural GDP.

While meeting the Maputo Declaration's 10 percent budget allocation target can significantly help agricultural growth in the region, it may be insufficient for some countries. For example, Burkina Faso, Guinea and Chad may need 200-300 million dollars more public investment in agriculture to meet the MDG One in addition to the 10 percent budget allocation. Côte d'Ivoire, Gambia and Mali may also need supplemental spending in agriculture on top of the 10 percent budget allocation.

Projections summarized in this chapter indicate a difficult task lies ahead for West African governments aiming to half poverty and hunger by 2015. Increasing investments in agriculture will be an integral part of any MDG strategy. But even with more investments in agriculture committed by governments and the international donor community, countries in the region must also have the capacity to absorb and manage a rapid increase in resources. In other words, increasing government spending in agriculture is not enough. An equally important strategy will be effectively leveraging multiplier effects through pro-poor growth investments at both national and regional levels. The extent of such multiplier effects and their ability to be leveraged depends on agriculture's integration into the economy and how pro-poor growth opportunities are identified and realized nationally and regionally. Understanding these underlying challenges and identifying such growth opportunities is the focus of this report.

3. An Overview of the Performance of West African Agriculture

Despite showing signs of positive economic growth in recent years, West Africa's poverty rates remain high, as the analysis in Chapter 2 reinforced. Economic growth can only lead to greater poverty reduction if the leading growth sector affects the majority of the poor's incomes. Since agriculture is the dominant livelihood of 70 percent or more of West Africa's population, even when considering the more nascent industrial sectors in countries rich in minerals or oil, drawing linkages between agricultural performance and economic growth is an important starting point for developing strategies that target poverty and hunger within the region.

A common characteristic shared by most West African countries is that their agricultural sectors have not performed at the levels required to make meaningful contributions to growth, poverty reduction, and food security. Per capita food and agricultural production grew minimally for countries in the Economic Community of West African States (ECOWAS), although slightly better than the rest of sub-Saharan Africa (SSA). Countries in the Economic Community of Central African States (ECOCAS), on the other hand, have seen deteriorating levels of per capita production (see Figure 3.0).

In this chapter, agriculture's contribution to GDP growth is analyzed using a growth decomposition model (at regional, subregional and country levels) that measures the share of the sector in the economy and the growth performance of the sector. Then, with the understanding economic indicators alone can not provide a full picture of West African agriculture, additional factors such as proximity to the coast, agroecological conditions, and the political enabling environment (specifically, incidence of conflict) are considered.

Performance of West Africa's agriculture sector is further examined broad trends in total factor productivity (TFP) across countries and the major sub-regions (identified by CORAF): Sahelian, Coastal, and Central. TFP growth is then decomposed into partial productivity measures of land and labor. The factors that influence the observed patterns of productivity are discussed at some length, both from a supply and demand perspective.

3.1 Agriculture's contribution to growth

How important is agriculture to West Africa's growth and development? Although the agriculture sector is undoubtedly critical to development, its importance will vary across countries. To determine the degree to which agriculture contributes to economic growth within each country, a growth decomposition method is employed. Two important factors that influence this measurement are: the share of the sector in the economy and the growth performance of the sector. If agriculture has a dominant share in the economy and demonstrates high growth performance, the sector can become a key engine of growth. Conversely, a less dominant, poorly performing sector will contribute little to overall growth. Table 3.1.1 demonstrates that the agriculture sector has the potential to play a prominent role in determining overall economic growth throughout the majority of the region.

In most West African countries, agriculture comprises large shares of national economies. In 2000, agriculture accounted for 30 percent of the region's total GDP averaging 28.5–34 percent shares in the three sub-regional zones identified by CORAF: the Sahel, Coastal, and Central (Table 3.1.1). If Gabon, a middle-income economy with rich oil resources, is excluded, the share of agriculture in the Central sub-region's GDP rises significantly to 42 percent. Sub-regional averages mask huge variances across countries. For example, agriculture accounts for more than 60 percent of the national GDP in Guinea-Bissau and Democratic Republic of the Congo, but less than 10 percent in oil-rich countries like Gabon and Congo Republic. Gabon and Congo Republic are among only three countries (the third being Senegal) in West Africa for which agriculture accounts for less than 20 percent of the total GDP. For the rest of West Africa, agriculture shows strong potential to serve as a driver of growth and poverty reduction.

At the regional level, the average agricultural GDP growth rate mirrored the overall GDP rate between 2000 and 2004 (Table 3.1.1, Figure 3.1.1) Coastal and Central regions demonstrated significantly higher agricultural growth than the Sahel. The highest agricultural growth occurred in the Coastal region, averaging over 4 percent per year and practically doubling the Sahelian region's disappointing 2.3 percent growth rate. Again, regional averages mask large variances across countries. Ghana, Nigeria, Gabon and Republic of Congo experienced relatively high agGDP growth rates (4.5 percent and over), while Chad, Gambia, Mauritania and Senegal experienced much lower growth rates close to zero. Only two countries registered agricultural growth rates close to the 6 percent target of the CAADP initiative: Benin and Cameroon. Countries like Benin and Cameroon that demonstrated high agricultural performance had a high contribution of agriculture to the overall economy.

Between 2000 and 2004, agriculture contributed to about 30.5 percent of West Africa's overall GDP growth, slightly higher than its share in the economy in 2000 (Table 3.1.1). In other words, of the 3.9 percent annual GDP growth between 2000 and 2004, 1.2 percent can be attributed to growth in the agriculture sector alone. Industry and services combined accounted for the remaining 2.7 percent (Table 3.1.2). If Gabon is excluded, agriculture contributed to nearly half the Central sub-region's GDP growth at 47.8 percent. This is larger than the agricultural sector's 41.9 percent share in the Central region's economy. Similarly, in the Coastal sub-region, agriculture contributed to 32.1 percent of overall economic growth which was also larger than the sector's 28.5 percent share in the region's overall economy. These indicators demonstrate that within the Central and Coastal sub-regions, agriculture performed better than the nonagricultural sectors. The Sahelian sub-region shows a contrasting picture. While agriculture accounted for one-third of the Sahelian region's overall economy, it contributed to only 15 percent of overall economic growth in 2000-04, indicating a poorly performing sector on the whole. Agriculture grew far more slowly than the overall economy due to rapid growth in other sectors such as the oil sector, for example.

These figures have important implications for poverty reduction since the majority of rural poor are employed in agriculture. If West African countries could maintain high and sustained rates of agricultural growth, broad based reductions in

poverty could occur given agriculture's strong linkages with the rest of the economy. Understanding the decomposition of growth within a sector helps to identify which sub-sectors have been principal drivers behind any observed growth patterns. This analysis of growth then allows for greater priority-setting within the sectors.

Tables 3.1.2 to 3.1.5 summarize growth patterns for the agricultural and non-agricultural sectors. For instance, many of the countries in the Coastal region experiencing high agricultural growth rates (e.g. Burkina Faso, Benin, Cameroon and Nigeria) saw much of this growth come from crop production. Whereas in the Sahelian region, we see a much larger composition of growth in the livestock sector. Mali is a good example. Of Mali's 3 percent average agricultural GDP growth rate between 2000 and 2004, approximately 96 percent came from growth in livestock and fisheries (Table 3.1.3). This stresses the important role of the livestock sector as a key driver of agricultural growth in Mali, despite the fact that the sector only accounts for about 29 percent of the total agricultural GDP.

Within non-agricultural sectors, the service sector accounts for the largest share of non-agricultural GDP. It accounts for more than half the GDP in most countries. It is also the sub-sector that has contributed the most to growth, yet it has been hardly effective in influencing rural welfare (see Table 3.1.2). The exception is countries like Mali and Cameroon where growth in industry has played a more prominent role. Much of the industry growth in Mali has been led by the minerals export sector while manufacturing leads in Cameroon (Table 3.1.4). The experience of Mali closely resembles that of resource-rich countries Chad and Nigeria in which oil sectors have clearly driven rapid industry growth rates.

Looking Beyond Economic Indicators

Until this point, broad economic structural indicators have been evaluated as a basis for determining the importance of agriculture in West African economies. But these indicators by themselves fail to fully explain the variances in agricultural performance within the region. By combining these economic indicators, with additional considerations such as proximity to the coast, agroecological conditions, and the political enabling environment (specifically, incidence of conflict), a more complete picture emerges. The interplay of these important factors determines the degree to which agriculture influences overall growth in the economy.

Tables 3.1.6 classifies countries according to agricultural potential and economic structure. Fifteen of the 19 West African countries in the sample appear to enjoy more favorable conditions for agriculture. The remaining 4 countries with less favorable conditions are primarily located in the Sahelian region, which is not surprising given the region's challenging environment for agriculture. Even these measures conceal important variations that exist within a single country, as will be explored further in Chapter 4. For the purposes of this chapter's broad overview, though, they are useful aggregates to draw regional trends. Countries with more favorable agricultural conditions are then classified according to their geographic location and natural resource endowments in an effort to draw further insights on agricultural and economic

opportunities. The seven coastal countries can take advantage of their location to promote export-oriented agriculture. Landlocked countries, on the other hand, face considerable geographic barriers to global trade. Thus, regional integration appears to be an important option for promoting agricultural exports. Integration also benefits coastal countries by allowing them to diversify their export destinations rather than rely solely on global markets. This is important considering many of these countries' agriculture sectors face increasing global competition and declining prices for their exports. Endowments in natural resources and minerals can also affect the degree of agriculture's prominence in growth and poverty reduction, regardless of the favorability of agricultural conditions. In resource-rich countries, agriculture sectors often compete with non-agriculture sectors for public investments. Funds diverted from agriculture sectors can slow rural development which in turn can lead to higher income disparities and higher poverty rates.

Agricultural potential, geographic location and natural resource endowments cannot always explain poor agricultural and economic performance, however. Protracted armed conflicts and wars in countries like Liberia, Sierra Leone, Democratic Republic of Congo, and more recently Côte d'Ivoire, have had long-standing affects on the agricultural sector and economic growth, resulting in an increased incidence of poverty and food insecurity. Armed conflicts and civil wars not only destroy physical capital such as roads, they disrupt economic exchange by paralyzing input delivery and marketing channels and divert long term public investments away from basic rural infrastructure and services like health and education. Table 3.1.7 broadly evaluates the impact armed civil conflict has had on growth performance across West Africa. There is a striking difference between the performances of countries that have experienced relatively little to no conflict compared to those countries that have experienced severe wars.

A multitude of factors contribute to the overall performance and competitiveness of West African agriculture in regional and global markets. The ability of the agricultural sector to play a more critical role in driving poverty reduction in the region will depend on how rapidly the sector can grow and compete. Agricultural productivity depends upon "both technical change and the presence of input, seasonal finance and marketing systems to increase farm production and deliver it to consumers at a competitive price." (Poulton et al. 2006, p244). Thus, increased agricultural productivity cannot solely rely on improved yields from production efficiencies (such as the adoption of modern or improved technologies and practices), but it must also rely on factors such as adequate access to productive resources, well-functioning markets and infrastructure, and an environment (complete with stable macro-economic policies) conducive to agriculture development. Without these enabling factors, low productivity levels in West Africa will persist and depress overall growth in the agricultural sector. This will translate into declining per capita food production and increasing imports as populations continue to grow.

3.2 Agricultural productivity and growth

A natural measure of performance in production processes is a productivity ratio of outputs to inputs in which larger values are associated with better performance. At an aggregate level, productivity estimates can be obtained to analyze performance of a crop (e.g. maize), sector (e.g. agriculture) or the whole economy. Or, they can be used to compare the performance of a sector across geographical regions: districts, states or provinces, countries, etc. The interpretation of productivity measures needs to bring into consideration the levels of aggregation in the analysis. For example, agricultural productivity is affected by the output levels of different crop and livestock activities but also by the composition of outputs. This means that changes in the structure of production can alter the overall output/input ratio.

The measure of productivity defined above involves all inputs used in the production process and is therefore referred to as total factor productivity or TFP. Partial factor productivity (PFP), in contrast, measures the ratio of output to one particular input. These partial measures can provide useful information when used to complement the analysis of TFP, but they can give a misleading indication of overall productivity when considered in isolation.

We use the Malmquist index to measure TFP growth for West African countries. This index uses the distance between each country's TFP and that of the countries on the technologically-efficient frontier. These distances can be interpreted as a measure of the reference country's productivity in year t and t+1 respectively, computed as a proportion of the productivity level at the frontier in year t. The ratio between the second and first distance is a Malmquist index that measures TFP growth for the country of interest between periods t and t+1. This approach does not require a specific production functional form, it does not require prices, and it can be implemented in a multiple-output setting with many inputs. The resulting measures of efficiency are unit-free, so there is not a problem extending the methodology to international comparisons.

To estimate TFP growth in West Africa, the only internationally comparable database available to us was that of the Food and Agriculture Organization of the United Nations (FAO). It provides national time series data from 1961-2003 for the total quantity of different inputs and output volumes measured in international dollars. The Malmquist index was then estimated using three outputs (staples, cash crops and livestock products) and three inputs (labor, horse power and agricultural land). Results follow.

Based on the final estimates of agricultural TFP growth in West Africa, covering the period 1961-2002 and measured as a simple average of TFP growth across individual countries, results show an annual growth rate of only 0.4 percent per year (totaling 17 percent growth in 42 years). Most of this growth occurred within the last 20 years (Figure 3.2.1). Evidently, the coastal countries have seen a higher dynamism of growth in agricultural TFP (or AgTFP) than Sahelian countries. Growth occurred at about 2.1 percent annually between 1985-2002 in the Coastal countries. In contrast, growth was negative (-0.29 percent per year) in the Sahelian countries during the same period.

Among the Coastal countries, Nigeria, Benin, Côte d'Ivoire and Ghana witnessed the fastest AgTFP growth during 1961-2002 (Figure 3.2.2). Nigeria and Ghana have performed markedly well in recent years, experiencing annual productivity growth rates above 2 percent for the period 1985-2002. Among the Sahelian countries, Burkina Faso, Niger and Mali performed relatively well (Figure 3.2.3). Burkina Faso and Niger showed strong growth in 1981-1990, while Mali's growth occurred mainly during 1971-1980. However, almost all countries performed poorly throughout the 1990s, growing at less than 1 percent per year.

Land and Labor Measures

The TFP growth of West African agriculture can be decomposed into measures of labor and land productivity in order to further understand how the region compares to the rest of Africa and other developing regions. These land and labor productivity measures (i.e., output per hectare of land or output per worker) highlight any important changes in the intensity of input use over time. As the plotted measurements in Figure 3.2.4 illustrate, there are wide variations in land and labor productivity for Sub-Saharan Africa, Latin America and South Asia between 1980 and 2002.

Figure 3.2.4 provides a compelling picture that deserves further elaboration. In the figure, land productivity measures the ratio of gross output to the total hectares used in agriculture, be it irrigated or non-irrigated cropland, pastureland, or rangeland. Labor productivity, on the other hand, measures gross output relative to the economically active agricultural population. The diagonal lines indicate constant land/labor ratios. The length of the country or region's productivity locus indicates the growth in AgTFP and the points defining the lines correspond to productivity values in the years 1980, 1990 and 2002. The longer the line, therefore, the more a country experienced growth in agricultural productivity. If the first segment of the line is longer than the second segment, then productivity growth was larger during 1980-1990 than during 1990-2002. The slope of each region's productivity locus reflects its growth path. Country and regional growth paths fall broadly into three groups: a) a land-constrained path in which output per hectare rises faster than output per worker; b) a land-abundant path in which output per worker rises more rapidly than output per hectare; and c) an intermediate growth path in which output per worker and per hectare grow at similar rates. A region with land constraints generally shows a productivity locus that is flatter than the diagonal line going from the origin to the initial productivity value. This indicates that growth in land productivity is faster than growth in labor productivity and hence there is a decrease in the number of hectares per worker over time.

Given the loci of each region in the figure, South Asia clearly follows a more land-constrained path hence a land-saving technology (yield-increasing land intensification) is a rational choice for this region. In contrast, a labor-constrained region would show a steeper productivity locus than the diagonal line, indicating that growth in labor productivity is faster than the growth in land productivity and hence will lead to an increase in the number of hectares per worker over time. Latin America's productivity growth path is a typical land-abundant path along which labor-saving technology

(mechanization) seems to be a rational choice. Some countries with either abundant land or labor have productivity growth paths that do not show a strong bias towards any input. Thus intermediate growth paths are parallel to the diagonal line.

The productivity locus for Sub-Saharan Africa does not show any bias towards technological change, which is not surprising given SSA is relatively land abundant compared to South Asia. Nor, however, does SSA follow the productivity pattern of Latin America for which there are two main explanations. First, there is a much higher population growth rate in most African countries compared to Latin American countries (the Latin American countries having more land abundant economies). This population growth has in turn led to rapidly increasing labor forces. But since there have been generally a lack of opportunities in Africa's underdeveloped nonagriculture sectors, it has been difficult for workers to migrate out of agriculture. Second, Africa has experienced stagnant growth in agricultural productivity, indicated by the much shorter locus in the figure, which also contributes to labor surpluses.

Compared to the rest of sub-Saharan Africa, many West African countries appear to have performed much better than the average productivity growth path. As shown in Figure 3.2.5, Ghana, Benin, Nigeria and Côte d'Ivoire have significantly longer growth paths than Africa as a whole. Moreover, all four countries have much higher initial land and labor productivity levels. However, only during the second period (1990-2002) did Benin and Côte d'Ivoire started to show relatively higher labor productivity growth than land productivity growth. In Ghana and Nigeria, labor productivity growth seems to be slow relative to land productivity growth.

Although agricultural productivity in West Africa is high relative to the rest of Africa, average yields, which serve as proximate indicators of land productivity, have remained well below global levels. Tables 3.2.1 –3.2.2 display the currently average yield levels for irrigated and rainfed crops at the national level. Such figures are an average of the yields defined at varying agroecological domain levels. 20 West African countries that had sufficiently available data have been included in this study. Tables 3.2.3 – 3.2.4 display the yields of five selected cereal and three selected root crops in 20 West African countries. In addition to these West African countries, we have provided aggregate figures for SSA, South Africa and three other developing regions outside Africa. The tables show that a significant yield gap exits between West African countries and developing countries outside Africa for many staple crops. Only the yields of irrigated rice in five West African countries (Mauritania, Niger, Senegal, Côte d'Ivoire and Cameroon) are comparable to yields elsewhere in East and Southeast Asia. The rest of West Africa has rice yields comparable only to those of South Asia. According to FAO data, the yield gap between West Africa and other developing regions is generally greater for root crops than for rain-fed cereal crops (i.e. sorghum and millet). For example, cassava yields are 13 – 20 ton/ha for the three regions outside Africa, while they generally lie between 5 and 9 tons/ha in West Africa.[1]

[1] It should be pointed out that the gap is most likely over-estimated given that past FAO estimates of cassava yields in West Africa have been regarded as unreliable (see Nweke, Spencer and Lynam, 2002).

As previously indicated, improved agricultural performance relies critically not only on increased yields from production efficiencies, but additional factors including sufficient consumer demand, market access and enabling infrastructure. If yields increase without adequate market opportunities or storage facilities to absorb rapid growth there will be a subsequent decrease in prices and an overall loss of productivity gains. Therefore, understanding the dynamics of consumer demand and future market opportunities in West Africa's domestic and regional markets is just as critical when assessing agricultural productivity growth options in the region.

3.3 Exploring market opportunities and household consumer demand

The broad picture of agricultural productivity growth in West Africa reviewed above has major implications for production, consumption, and trade patterns within the region. The majority of countries in West Africa are net importers of most agricultural commodities (Tables 3.3.1(a-e)). Cotton and cocoa, two traditional export crops, dominate the region's agricultural exports. Nontraditional exports, including fruits and vegetables, are also readily found throughout the region. Although their volumes have been small relative to other staple crops, their numbers have been rapidly increasing over the years. Further exploring export opportunities, such as those in Asian markets, can help increase the market sizes for many agricultural commodities produced in the region.

While most countries in West Africa are net food importers, the potential for trade exists within the region for livestock, pulses, oilseeds, and even maize. Between 1996 and 2000, the annual value of West Africa's agricultural trade amounted to over 7.1 billion $US per year (Table 3.3.2 (a-b)). Total exports to the region (intra-regional trade) yielded 363 million $US per year. Within the Economic Community of West African States (ECOWAS), intraregional exports equaled about 11.1 percent of total exports. Within The West African Economic and Monetary Union (WAEMU), trade equaled 12.6 percent of total exports (UNCTAD). Trade in non-traditional goods has also grown, increasing from $26 million in 1993 to about $75 million by 2001 (Sarpong, 2003). These statistics only capture formal trade within the region. The amount of cross-border informal trade, especially in rice and livestock, is estimated to be much greater, as high as 30 percent of total exports.

Growth within West Africa's agriculture sector will depend on how well countries can tap domestic and regional market opportunities for staples and livestock products, especially given rapid urbanization trends in the region and the growing import of these commodities. As Chapter 6's analysis of future alternatives for agriculture growth will indicate, there is indeed a great potential for farmers in the region to tap these growing markets. This is because domestic demand for food staples (including farmers' own consumption levels) is valued at 20 billion $US or more (see Hazell and Diao, 2005). This is more than three times the level of West Africa's international exports and 50 times the level of intra-regional trade within the region captured by official statistics. These figures highlight enormous potential gains from strengthening regional linkages and increasing intra-regional commodity exchanges as productivity increases.

The livestock sector has potential to contribute to overall agricultural growth in the West Africa region. It has particular importance in countries such as Niger, Burkina Faso and Mali, but also in near large urban centers for small ruminants (e.g. poultry and pork). There is great potential for expanding intra-regional trade in live animals between the Sahel and Coastal countries. However, high transaction costs and trade barriers between countries limit growth in such trade. To identify the factors that affect trade and quantify the response of regional trade flows to changes in these factors, a special study presented in the Appendix was conducted. Results confirm that of others (e.g. see Williams 2006). Essentially, productivity growth of the livestock sector in Sahelian countries is a critical binding constraint in their ability to respond to growing urban demand in coastal countries for livestock products. They increasingly face competition with imports from outside the region, and from within for poultry and pork products.

The potential demand for basic food staples is primarily contingent on the size of domestic and regional markets. In order to better understand the important role of such market opportunities, it is necessary to further examine the dynamics at the micro level. Dynamics of household demand have been analyzed for three West African countries, Mali, Ghana and Senegal, in which household survey data was available at the time of this study (more complete details of the study are presented in Appendix B).

Different consumption patterns appear within food spending. Poor households seem to spend more on coarse grains (like maize, millet and sorghum) in Mali and Senegal, and more on coarse grains and root crops in Ghana. In Mali, millet accounted for more than 30 percent of the total spending of the poorest 20 percent of households, and only 6 percent of total spending of the richest 20 percent of households (Table 3.3.3(a)). In Ghana, coarse grains and root crops accounted for 15 percent of the poorest 20 percents' total household spending, and only 7.7 percent of the richest 20 percent's total household spending. (Table 3.3.4 (b)). There are substantial differences among existing patterns of rice and livestock consumption. In Mali, the richest 20 percent of households spent 11 percent of their income on rice compared to 5.2 percent by the poorest 20 percent. On the other hand, in Senegal the rich spend much less on rice, 5.4 percent, while the poor spend 13 percent.

To further explore the dynamics of consumption patterns, the share of each additional unit of income likely to be spent on each commodity was estimated. Results indicate that for every dollar of increased income, households would most likely spend proportionately less on coarse grain consumption and more on other commodities. The dynamics of livestock consumption paint a completely different picture. There tends to be an increase in demand for livestock products as incomes rise. This is not surprising considering livestock products often exhibit higher income elasticities than cereals. However, richer households who already spend a significant share of their income on livestock products will not increase their consumption dramatically as their incomes grow further. Patterns of rice and wheat consumption seem to fall somewhere in between the patterns of coarse grain and livestock consumption. Households may still spend a similar portion of their income on rice and wheat consumption as their incomes increase.

It is often argued that the consumption of staple crops (such as coarse grains) will decline as incomes rise. While this holds true for most basic staples, it can be misleading since it ignores the absolute value of staple markets among the upper quartile households, especially if value added products are included. For example, of the total of 240 US$ million spent on millet consumption in 2001 in Mali, including farmers' home consumption and value added products, households in the highest income quintile consumed more millet than those in the other four low-income quintiles. In fact, the poorest 20 percent of national households consumed only 15 percent of national millet in value terms. In a single year in Ghana, the average person in the richest rural household group spent $14.7 on maize while the average person in the poorest group spent only $6.1 on maize (Table 3.3.4 (a)). In Senegal, the average person in the richest rural household group spent $17.4 on sorghum and millet while the average person in the poorest group spent $6.1 in a year (Table 3.3.5 (b)). Clearly, there is a large existing market for basic staples among higher income earning households in both rural and urban areas.

The analysis suggests many West African countries will still need to increase domestic demand for staples if growth is to be pro-poor. Rapid growth is needed given the huge consumption gaps in staple foods between the rich and poor. If growth favors the rich, there will be limited market opportunities for many staple foods. Wealthier consumers generally prefer to spend more on high value and processed agricultural commodities and even more on nonagricultural commodities like industrial goods and services. This analysis helps to illustrate that market opportunities for agriculture, especially for staple foods and livestock sectors, will depend critically on broad-based agricultural growth. Broad-based agricultural growth rooted in increased agricultural productivity will decrease food prices without lowering farmers' incomes. This will in turn benefit farmers and consumers.

3.4 Summary

This chapter has attempted to draw linkages between agricultural performance and economic growth in West Africa as an important starting point for strategies targeting poverty within the region. The analysis finds that although the importance of agriculture varies across the region, it has strong potential to serve as a driver of growth and poverty reduction for most West African countries, particularly within the Coastal and Central regions.

There are many factors that explain the variations in agriculture performance across West Africa including: agricultural potential, geographic isolation, natural resource endowments, and conflict. What remains clear is that the general performance of the sector has been insufficient to generate the kinds of economic growth rates needed to accomplish this task. Although some countries, particularly the Coastal countries of Benin, Côte d'Ivoire, Ghana and Nigeria, have witnessed trends above Africa's average productivity growth path, average yields have remained well below global levels.

Moreover, a majority of countries continue to be net importers of most agricultural commodities. This implies that the opportunity for regional trade expansion exists for many of these commodities, especially in food staples and livestock. The

potential growth and performance of West African agriculture will depend heavily on countries' abilities to tap domestic and regional market opportunities for staples and livestock products. It will also depend on how well exports can be diversified into other burgeoning global markets (such as those in China and India).

We have examined the extent to which agriculture performs and contributes to overall growth and poverty reduction throughout the region. Great variances exist within countries as well. In the next chapter, we delve into some of the more critical socioeconomic and biophysical underpinnings affecting agricultural performance and how these factors determine livelihood options across countries. This helps serve as a solid foundation for the subsequent analysis in Chapter 5.

4.0 Characterizing the Diverse Socioeconomic and Biophysical Underpinnings of West Africa's Agriculture[2]

The wide variety of farming systems in West Africa reflects the diversity of the region's agro-ecology and climates. This diversity presents great challenges to policymakers in formulating sound agriculture development strategies. A GIS Model (see description in Appendix) allows us to pinpoint those geographic areas across the region wherein development problems and opportunities are likely to be similar, hence allowing for policies, investments and technologies to be targeted. Better identifying the similarities and differences in the agricultural conditions will enable governments and policymakers to focus on areas that cross national borders, thereby setting the stage for potential regional cooperation.

Four of the most prominent agroecological zones in West Africa are the humid zone, semi-humid zone, semi-arid zone and the arid zone. While the first three are suitable for agriculture growth, the arid zone of the Sahel has very limited rainfall and little vegetation coverage and is hence used primarily for livestock herding. The semi-arid region, found in the Sahel as well as the Central sub-regions of West Africa, also has a more limited growing season, but its environment is more conducive to agriculture. Here, traditional course grains and cereals, crop-livestock systems and cereal-root crop systems dominate. Grains like millet and cowpeas are important crops as they can thrive even on soils of relatively low fertility. The crops grown are mainly annual, and systems are determined by rainfall distribution (generally one or two wet seasons), the water-holding capacity of the soil and the topographic position of the area.

The semi-arid regions in West Africa are particularly vulnerable to great climatic variability including frequent droughts as well as flooding. The droughts of the region result in crop failure, declining terms of trade among livestock and cereal (cereal prices rise while livestock prices decline), and widespread hunger and famine at the extreme. The availability of cultivatable land in the more arid regions has been severely restricted by land degradation, increasing desertification and limited water availability, especially for land-locked countries. At least half of West Africa's farmland shows some degree of soil erosion due to intensive "mining" practices in which nutrients are removed from the soil, but not replaced (see IFAD 2001, Koning 2001). Declining soil fertility, together with widespread deforestation and overgrazing, has reduced arable land to precarious levels. Global climate change is likely to be the most damaging to those farming systems in arid and semi-arid regions. These semi-arid and arid regions in the Sahel are also vulnerable to an increased likelihood of conflict between farmers and nomadic herders as land becomes more of a constraint.

West Africa's sizable semi-humid and humid regions are found mainly within the Coastal and Central regions. Forest-based farming systems and tree crop farming systems are both prevalent in the humid zones. In these systems crop failure is less of a concern. Because two of West Africa's most common tree crops, coffee and cocoa, are

[2] This work has been conducted jointly with IITA.

the region's primary global exports, the vulnerability of these farming systems lies in the high variability of global prices. The expansion of export markets will be crucial for the long-term future of these farming systems. Root crop farming systems including those for yams and cassava, are especially prevalent in the semi-humid and humid zones. The growing urban demand for these commodities suggests great potential market opportunities for the region. But the technological advances that would allow for increased production of these crops have not yet been fully realized. Mixed farming systems, including crop-livestock and cereal-root crop systems, are also very common within the semi-humid and humid regions. Farming systems in these areas face considerable challenges, including soil erosion, weeds, pestilence and disease. In addition to these biotic constraints, heat and humidity require special transport and storage mechanisms. Increasing agriculture production without proper concurrent infrastructure development may thus lead to inefficiencies.

These overviews on West Africa's disparate agroecological zones and agricultural systems illustrate that agricultural performance in the region is conditioned by deeper socioeconomic and biophysical realities. In particular, agricultural performance determines and reflects: spatial distributions of human population and associated access to cultivable land, agricultural potential as captured by agroecological conditions, and access to markets (see Wood et al., 1999). This chapter attempts to describe these realities within a spatial context. A basic argument underlying the analysis is that areas exhibiting varying combinations of these three characteristics (agricultural potential, population density and market access) are associated with different management practices and livelihood strategies, and thus overall agricultural performance. While the agricultural potential of any location is a strong indicator of its absolute advantage in agricultural production, the extent to which this might actually be realized—i.e., its comparative advantage—is conditioned by other factors of which market access and population density have been shown to be reliable predictors (Pender et al., 1999). Like agricultural performance, the choice of production system is not only influenced by agro-ecology and climate, but by population density and market access.

Much of the discussion therefore revolves around a series of mapped and tabular representations of population density, agricultural potential and market access in West Africa. The "development domains" then identify areas endowed with similar realizations of these three attributes. The varying degrees of completeness and reliability of some of the data underlying these maps and tables, and the exploratory nature of some of the spatial modeling techniques employed (see Appendix A), renders some tentative conclusions to be drawn from the analysis. This is especially true for the discussion on market access. However, these initial approximations can be an important starting point for better understanding the potentials and challenges for agricultural development in West Africa. By using these development domains to define geographic areas in which constraints and opportunities are likely to be most similar, we can further estimate where development policies, investments and incentives would be most cost-effective. We can also estimate which crops and farming systems to target for productivity-enhancing investments.

4.1 Population distribution and agricultural land use

Population density, a reflection of the land-labor ratio, can be a useful tool for understanding the opportunities and constraints facing agriculture in West Africa. For example, the land-to-labor ratio has been determined to reflect variation in land management and production technology (Boserup, 1981). Holding other factors constant, farmers in areas of high population density are more likely to undertake labor-intensive production strategies than those in areas of low population density. Population density in West Africa follows strict patterns, as shown in Figure 4.1.1. The most densely populated areas are found primarily in the coastal areas, along the Niger River and in the Great Lakes region on the Eastern Democratic Republic of Congo (DRC) border. Population densities tend to be quite low in much of the Sahelian region, as well as in the forested areas of Central Africa.

The concentration of geographical areas suitable for agricultural production mirrors that of human population as rainfall, climate and the proximity to water bodies and rivers play important parts in defining the suitability of land for agriculture. Given that West Africa's most productive farm areas are located in close proximity to its urban centers, urban-rural linkages are likely to continue to increase as farmers capitalize on expanding urban markets. There is great potential for increased employment opportunities and increased rural incomes as the consumer demand for agricultural commodities such as high-value meat and dairy products and processed foods rises.

544 million hectares (roughly a third) of West Africa's total land area is devoted to agricultural uses (Table 4.1.1). About two-thirds of this agricultural land is rangeland and pasture, although this varies somewhat by eco-region. The remaining third is cropland. The relative extent, distribution and mix of crop- and livestock-based agriculture varies widely across the region (Figure 4.1.2). In general, pastoral lands are concentrated in broad West-East swathes that correspond to Sahelian grasslands with low-rainfall and in the savannah and mixed root-crop areas found in the northern portions coastal West Africa. Sahelian cropland is strongly associated with the river systems in the area because in the more arid parts of the region crop production is only feasible with irrigation. However, irrigation levels are extremely low, even where it is the only viable option for crop production. Region-wide, only 1 percent of croplands are irrigated; in the Sahelian countries, where irrigation is more common, the average is still less than 2 percent.

High concentrations of people in particular areas (Figure 4.1.1) suggest that access to agricultural land in West Africa is constrained. For the region as a whole, arable land per capita stands at 0.5 hectares[3] (Table 4.1.2). However, on a country level, almost a fifth of the rural population resides in areas where per capita cultivated land area is less than the regional average. Almost 40 percent of the population lives in areas with less than 30 percent of the region's arable land. Although not as severe a constraint as in other parts of the continent, this rate still represents a generally widespread constraint. National averages of cultivated land per capita range from less than a third of a hectare in the DRC, Sierra Leone, Congo-Brazzaville, Guinea-Conakry and the Gambia, to more

[3] Using rural population only. For total population, the average for the region is somewhat less.

than two hectares for Gabon. In general, the land constraint is greater in the humid parts of the region, particularly in Central Africa. Higher land productivity in these humid areas may explain part of this trend.

4.2 Agroecological conditions and agricultural potential

Demographic pressure is not the only factor straining land availability in West Africa. Much of the region suffers from highly variable rainfall (including frequent droughts and flooding) and vulnerability to pestilence and disease. It is a challenging and unstable environment for farmers, the majority of whom rely on rain-fed irrigation.

As shown by the distribution of agricultural land use, opportunities and constraints in agricultural production vary by location and type of production system (Nkonya et al. 2004; Wood et al. 1999). Within West Africa, where agriculture is dominated by subsistence-oriented smallholders, two of the most binding constraints on agricultural production potential are generally water availability. In theory, both attributes should be reflected in any measure of agricultural potential. In practice, the paucity of appropriate data and heterogeneity of soils in the region renders such treatment infeasible.[4] The availability of water – be it from rainfall, local groundwater or surface water use, or formal irrigation schemes – is generally the most binding of constraints. Since the majority of smallholder farmers depend on rainfed agriculture, we consider available water supply from rainfall in the model. Figure 4.2 shows the distribution of the length of growing period (LGP) across the West African region. The LGP measures the total number of months that rainfall exceeds evapotranspiration, leaving sufficient excess water to support the growth of crops and pasture.

Across West Africa, 47 percent of cropland and 53 percent of the population falls within areas where the LGP exceeds 6 months per year (Table 4.2). There is considerable variation across countries, much of it captured by the major eco-zone groupings. However, in general, much of the currently productive land, and most of the population, fall within the middle ranges (which correspond to a certain extent to the populous coastal areas of West Africa). To the extent that LGP is shorthand for agricultural potential, one observation to derive from these patterns is that large portions of both low-productivity as well as high-productivity areas are scarcely used within the region.

4.3 Access to markets

To fully understand how a location's agricultural potential translates into a comparative advantage for different production activities requires information on access to markets (Omamo 1998a and 1998b) Unfortunately, data describing such conditions of market accessibility in West Africa are incomplete and of questionable quality. Constructing a spatial layer on market access therefore resides firmly in the domain of modeling. Reliable data on factors such as information accessibility, credit availability, and

[4] As will be described further in Chapter 5, however, we do take into account the spatial variation in agro-ecological conditions in so far as how they affect yield gaps across domains. The yield gaps are estimated from using an FAO study on agricultural yield potential based on GIS information of local agro-ecological, climatic, and crop biotic stress conditions (see FAO, 2006).

marketing opportunities are combined and extrapolated to create a picture of market access in West Africa that, while incomplete, comprises a useful entry point into this crucial determinant of agricultural opportunities and constraints.

This study focuses on a simplified set of criteria that reflect the physical accessibility (expressed in terms of expected travel times) to a range of markets (identified as towns/cities of different sizes). Although several distinct types of markets may be identified, here we characterize access based on travel time to a variety of locations with different economic implications. Markets within 4 hours travel of major seaports or large cities of 500,000 or more inhabitants (for international trade routes), within 2 hours of towns of 100,000 or more, or within 1 hour of towns of 10,000 or more are considered to be "high access" areas. Areas of "medium access" are those within 6 hours of large cities, within 4 hours of large towns or within 2 hours of smaller towns. Other locations are considered to be "low access"[5]. (Table 4.3)

Travel times to target market locations were estimated using a model that jointly assesses information on road location and quality, slope, and off-road land cover. Figure 4.3.1 shows the results for one type of market – towns of 100,000 or more inhabitants. There are significant areas in both the Sahelian and Central African countries that are very far from these regional trading centers. For the region as a whole, over two-thirds of all cropland and almost 60 percent of the rural population is more than 8 hours travel away from such markets. Only 5 percent of cropland and 7 percent of rural populations are within two hours travel.

Figures 4.3.1-4.3.2 shows areas classified by high, medium and low levels of market access. Not surprisingly, access to markets tends to be densest in areas where population, transport routes and economic activities, including agricultural, are concentrated. However, there are also very broad areas of low access in every country. In general, the Sahelian and Central African countries have the largest areas of low access while the West African coastal countries have the broadest high access conditions. Still, no area is predominantly or uniformly characterized by high access.

4.4 Agricultural development domains

Figure 4.4 illustrates the intersection of the three socioeconomic and biophysical actors: population density, agricultural potential and market access. Together, these forces indicate the feasibility and attractiveness of specific development strategies and livelihood choices within the region. The distinct areas delineated on this map are defined as agricultural development domains—areas for which a given agricultural development strategy is likely to have similar relevance (Wood et al. 1999). Domains are defined using consistent data and criteria across the region to help policymakers diagnose development constraints and to formulate strategic intervention options.

For the present study, 27 domains are defined by classifying each of the three key factors as follows according to agricultural potential, population density, and market

[5] These rules were derived from review of other characterizations and expert opinion on access conditions within the region.

access. LGP is used as a basis for classifying areas by high, medium and low agricultural potential. Population densities are assumed to be "high" at densities of 100km per square kilometer or greater; "medium" at 20-100; and "low" at < 20. Market access is classified as described in the previous section. Domains are classified by their high or low status in the sequence as shown in Figure 4.3.2. For instance, HHH denotes high agricultural potential, high market access, and high population density. Despite the limited number of domains, the spatial variability of domains can be quite complex, especially in highland areas, reflecting any marked local changes in agricultural potential, market access or population density. Domains straddle national and sub-national boundaries where development conditions are similar thereby indicating real potential for regional cooperation and joint investments.

Tables 4.4.1 through 4.4.5 summarize the distribution of some key measures within the different domain types. The largest individual domain is LLL (37 percent of West Africa land area) followed by HLL (22 percent). Areas with high agricultural potential and high market access account for only 2 percent of the land area, but include more than 8 percent of cropland and almost 20 percent of the rural population. The proportion of cropland to total land area falls markedly as areas become less suitable for agriculture. Domain HHH has 1 percent of total land and over 7 percent of cropland, HLL has 22 percent of land area but only 3 percent of cropland, and LLL has 37 percent of land area and 7 percent of cropland. Over 53 percent of the rural population and almost 43 percent of cropland can be found in the 39 percent of West African area with high potential. But over 15 percent of the population and almost 14 percent of the cropland are located in high potential areas with low market access. Country-specific breakdowns are shown in Tables 4.4.1-4.4.5. Most countries contain at least 6 different domain types.

As noted before, the development domain approach allows spatially disaggregated analysis of alternative development strategies. Linking each of the development domains to specific development strategies gives examples of where in the West African region each domain occurs. Even in those areas with the lowest agricultural development potential (LLL), there are multiple alternative development options, some of which are complementary. A given strategic approach—e.g., the promotion of high-input cereals—might be applicable to several domains, but the implementation details may differ across domains because of differences in dominant crop-mixes or degrees of crop-livestock interactions, for example. These principles are discussed at greater length in the Appendix.

4.5 Summary

While the economic analysis in this study provides quantifiable criteria for increased public investment priorities in the agriculture sector, the complementary role of the domain analysis is to provide a visual basis for where such cross-cutting investments may be most appropriately targeted. Some domains may cross national boundaries, while others will manifest as distinct areas within individual countries. The key recognition is that each domain category is defined in the same way across the region. This provides ample opportunity for the identification of regional agricultural development strategies.

The use of development domains as a summary framework suggests some priority areas for regional development foci. Several observations stand out. There are enormous portions of the region which are economically underutilized. The low-access, low-density areas of the Sahelian and Central African forest areas together account for almost 60 percent of the total area. Even if these areas are fundamentally more limited, exploring sustainable or non-extractive uses of these resources should be a part of a regional development strategy.

Almost a quarter of the region's rural population lives in areas of medium-density and medium-access. We know from work in Ethiopia and elsewhere that such conditions can be conducive to policy interventions; resource bases tend to be more intact and productivity often responds strongly to the enhanced market opportunities and input availability brought about by improvements in market access. The medium-access, medium-density domains are also quite diffuse, found in an average of 10 different countries within their respective eco-zones. Grouping countries by eco-zones appears to capture many non-ecological similarities as well. Because of this, and the commodity/technology sets that sit most comfortably within the same eco-zones (essentially equivalent to the agricultural potential zones in this study), this framework represents an entry point to the analysis of strategic development options.

Further interpretation of the domain conditions will need to be supported by economic modeling. In particular, once the value of different commodities is better understood in terms of pro-poor and overall multiplier affects, the domain framework may be used to link these commodity priorities with the conditions under which different strategies may take root (e.g. labor intensive production strategies will best succeed in high- and medium-density areas).

5. Alternative Futures for West Africa's Agriculture

The New Partnership for Africa's Development (NEPAD) estimates that to achieve the MDG of halving poverty by 2015, African countries must register overall economic growth rates in excess of 6 percent per annum over the next 10 years. In agriculture-dominated economies such as those in West Africa, achieving such GDP growth rates requires generating rapid growth in agriculture.

In the previous chapters, we have evaluated some of the constraints to increasing growth in West African agriculture. The central conclusion drawn from the analysis is that West African agriculture is not performing as well as it could. Large portions of the region are underutilized low-access, low-density areas. Both the Sahel and the Central regions have had stagnant growth in TFP. Land and labor productivity, though higher than the average of SSA, must still improve its performance to sustain growth in the future. According to the FAO-IIASA Global Agro-Ecology Zone (GAEZ) study, the potential for West African agriculture to attain higher yields simply from adopting existing technologies and farmer best practices exists.[6] In the absence of any other data that is comparable across countries in the entire region, and assuming the estimates are closest approximation to the realities on the ground, average yields are consistently below the maximum potential or 'technology frontier'. This "yield gap" is quite large for a majority of countries in West Africa and signal an important opportunity for the region to realize even greater productivity growth in the future with new and improved technologies. Another recent study by IFPRI estimates yields gaps according to potential yields gains to be had from overcoming biotic stress due to disease, pests, and weed control (see Cohen et al. 2005). While the gaps are smaller than the maximum potential under the GAEZ methodology, they are also quite significant.

In this chapter, we delve deeper in examining and comparing the potential and variable effects of narrowing these yield gaps on overall economic growth and farm income. We focus only on potential yield under existing technologies and best farmer practices because in the absence of expert knowledge we can only guess the yield gains from new research (R&D). The yield gaps are measured at both the domain and country level and assumed to represent a 'technology frontier'. This has important implications for informing any future R&D strategy. First, where there are large gaps, R&D adaptation may be more appropriate in order to simply narrow the gap and reach the frontier. Second, where there are small gaps, it is more feasible for new R&D to help shift the frontier further out. Applying this within the framework of an ex-ante economic model simulation provides a way to quantify certain economic criteria useful for ranking future alternative priorities for agricultural investments, including the contribution to overall growth / poverty and economic benefits by crop. Finally, by employing the economic

[6] Using spatial databases, the GAEZ methodology maps out climatic parameters, topography, soil and terrain, vegetation, and population distribution relevant to agricultural production. Crop modeling and environmental matching procedures are used to identify crop specific limitations under assumed levels of input and management conditions. This provides estimates of maximum potential and agronomical attainable crop yields for basic land resource units. For more details of this methodology, please see http://www.iiasa.ac.at/Research/LUC/GAEZ/index.htm.

analysis at the regional and multi-country level, both regional & country-specific priorities can be emphasized.

The analysis proceeds as follows. First, an economy-wide multi-market model for West Africa is used to quantify the economic implications of alternative growth scenarios on African agriculture beyond a "business-as-usual" scenario. It is also used to prioritize both agricultural and non-agricultural sub-sectors by evaluating the potential contributions these sub-sectors have in driving future AgGDP and GDP growth rates. This multi-market model is then integrated with IFPRI's Dynamic Research Evaluation for Management (DREAM) model in order to further assess the major gainers at the commodity level (focusing on crop production) by quantifying the impacts of productivity-enhancing investments in agricultural R&D across spatial development domains (a more in-depth description of the two models is available in the Appendix). With the recognition that not all constraints to West African agriculture are related to production, a growth scenario is run in which potential gains might be realized from improved market access.

Further insights can be drawn from examining consumption trends at the household level. Building an understanding of such potential requires detailed country-level analysis within a multi-market framework. Such analysis was undertaken for Ghana, a country where the requisite household-level income and poverty data were available. Because Ghana's agricultural characteristics are similar to a number of countries in the region, insights drawn from the Ghana study can be seen as broadly representative.

5.1 Alternative Growth Scenarios

To further build on the understanding of strategic opportunities for agricultural development in West Africa, this section considers alternative scenarios of agricultural growth and the subsequent implications they have for overall economic growth and poverty reduction. A central piece of the analysis is a "business-as-usual" outcome that uses recent trends to predict agricultural growth into the future. Given current constraints to West African agriculture, what becomes clear from the analysis is that a business-as-usual path will not lead to significant growth or reductions in poverty. The question then becomes what are the potential gains of countries overcoming these key constraints? Will there be room to achieve greater growth levels? Achieving rapid growth and poverty reduction in West Africa also requires an understanding of which agricultural sub-sectors have the highest potential within the region. By using these models to project growth scenarios, different sub-sectors emerge as potential leading engines of growth.

The business-as-usual scenario serves as a marker against which we can evaluate alternative agricultural growth scenarios for West Africa. Three scenarios are considered. In the first growth scenario, modest growth is attained from overcoming certain biotic constraints that have severely limited African agriculture (e.g., pest, disease, and weed control). This growth would be attained by implementing technology that is currently available, though not adopted on a widespread basis. In the second scenario, a more optimistic scenario, growth is attained from closing the agro-climatically-attainable

potential yield gap. In the third and final scenario, the most optimistic of the three, robust growth is attained by closing the yield gap needed to reach the agro-climatically-attainable frontier while also improving market access.

Business-as-usual

One of the most prominent indicators of the challenge currently facing West African agriculture is the low growth rates within key agricultural sub-sectors. Consider the growth rates for three agricultural commodity groups: staples, cash-crops, and livestock products. These commodity groups combined account for at least three-quarters of the AgGDP of the majority of countries in West Africa. Tables 5.1.1 (a-c) report the growth rates of key agricultural sub-sectors over the last 5-8 years in the three sub-regions (Coastal, Central and Sahel). For many crops, production growth was mainly a result of area expansion, while yield increases remained very small. Keeping these past growth rates in mind, along with recent growth rates in agricultural processing sectors and two non-agricultural sub-sectors, we use the multi-market model to project the rates forward to 2015. The projected annual growth rates for AgGDP and overall GDP are reported in Figure 5.1.1.

These "business-as-usual" outcomes suggest that in all countries, AgGDP growth rates would fall below the 6 percent required by CAADP. Overall economic growth would stay at a similarly low level. Because most West African countries have experienced 2–3 percent population growth rates, per capita AgGDP growth rates would fall below 1 percent (or decline even) in 13 of the 20 West African countries (Figure 5.1.2). Ghana and Nigeria have the highest per capita AgGDP growth rates at close to 2.0 percent per year, and only three other countries could potentially reach a 1.5 percent AgGDP growth rate.

What does this analysis tell us about different sub-sectors projected contributions to total AgGDP (in a business-as-usual scenario)? The EMM model simulates these results (see Figure 5.1.3). Each sub-sector's contribution varies across countries depending on the size of the sub-sector in the economy as well as its past growth rate. For example, the livestock sub-sector has quite a large impact on total agricultural growth in most Sahelian countries, while it is of much less importance in the Coastal and Central regions. While cotton and cocoa are the most important export crops and sources of foreign exchange earnings in the region, their contribution to total AgGDP growth is not as large as expected in a "business-as-usual" scenario. This holds true even when considering cotton's contribution to AgGDP in Mali and Benin and cocoa's contribution in Côte d'Ivoire and Ghana. The shares of these traditional export commodities in total agricultural income become modest when domestic markets and farmers' own consumption are taken into account. The low shares of these export commodities suggest in a business-as-usual scenario there is not much room for them to significantly impact growth.

West Africa's future would clearly not feature broad-based economic growth in a business-as-usual agricultural scenario. If West Africa continues along the current growth path there will be a widening gap between the supply and demand of major food

crops. For cereals, the shortfall in supply would increase to 22 million metric tons by 2015—80 percent more than what it was in 2003. This would represent 27 percent of the total regional demand. This widening gap between supply and demand would make it impossible for most countries to meet the MDGs focused on increased nutrition and food security.

Growth scenario one: Recovering yield loss due to biotic constraints

Due to rampant pests, diseases and weeds, 10–60 percent of yields have been lost in crop production processes in many parts of West Africa. While there is a need for new technology to overcome such biotic constraints, intensified farming practices that raise productivity levels are also the key. Based on the literature regarding yield losses due to biotic constraints, we use the EMM and DREAM model to simulate a situation in which 5–35 percent of yield losses would be re-gained through adopting new technologies and intensified farming practices (see Cohen, et al, 2005). We focus on the areas with medium to high potential and calculate the yield to reach by 2015.

The yield targets vary across countries and crops due to differences in the current yield loss levels and the proportion of the crops produced in areas more agro-climatically suitable. Table 5.1.2 (a-h) displays the national yield targets at the national level for irrigated and rainfed crops across the 20 West African countries included in this study. These national-level targets are averaged from the targets defined at the domain level. The domains dominated by the agricultural areas with better climatic conditions and more accessible markets are assumed to have high yield targets, while the domains dominated by less suitable environments for agriculture have low yield targets. Because of these differences, the yield targets vary across individual countries for each crop.

It is estimated that the yield targets will eventually be reached within the next 10 years. Thus we can calculate the annual growth rates of crop yields for each domain within each country by comparing the yield target with the projected actual yield in 2015. The average national growth rates are reported in Tables 5.1.3 (a-h), which are additional land productivity growth rates from the base-run (see Table 5.1.1). For example, a 1.81 ton/ha yield is chosen for rainfed maize production in Burkina Faso, while the same crop's targeted yield in Niger is 0.77 ton/ha. The majority of Burkina Faso's maize production is found in domains with better climatic suitability while in Niger, only 20 percent of maize production areas are located in such zones.

Growth scenario two–Catch- up to yield potential

As evidenced by growth scenario one, agricultural growth rates will not be sufficiently raised by concentrating solely on overcoming biotic constraints. It is therefore necessary to identify areas of greater agro-climatic potential in order to further stimulate agricultural growth. Thus, in the second scenario, we simulate a situation in which the potential yield will eventually be realized in those domains with better agro-climatic conditions for growing such crops. The potential yield data are drawn from FAO's AEZ project (Fischer, 2001, FAO). The AEZ project takes into account climatic conditions in different geographic locations in the West African region. The goal is to identify the agro-climatically attainable potential yield: 1) under different geographic and ecological

conditions; and 2) under different input combinations and farming technologies. These may include: high-input technologies with irrigation; high-input technologies under rain-fed agriculture; low-input and rainfed; and traditional or farmer best practices.[7]

The potential yield is defined for each pixel based on GIS information. For modeling purposes, we have aggregated this data to match the domains defined in the economywide multimarket model and the subsector-level DREAM model used for this study. Table 5.1.4 (a-h) displays the national average potential yields, which are averaged from the potential yields for different types of agro-climatic conditions used in the models. Because of the heterogeneity in both climate and geographic conditions, the potential to increase land productivity varies by crops, domains and countries (Table 5.1.5). Like the first growth scenario, the target yield in this scenario is assumed to eventually be reached in the next 10 years. The annual growth rate of each crop's yield is defined at the domain level within each country. The national growth rates reported in Tables 5.1.6 (a-h) are averaged from the domain level's growth rates .

Adequate data for livestock growth projections are not available. In order to capture the growth contribution of the livestock sector, an important source of growth in many West African countries, we estimate growth in the livestock sector based on a comparative assessment of its performance in different countries. Growth in agriculture must be supported by income increases in both agricultural and nonagricultural sectors. Thus, additional growth in nonagriculture is also estimated in the growth scenarios.

Growth Scenario Three-Catch- up to yield potential with Improved Market Access

Despite the significant gains that can be achieved from reducing biotic constraints and catching up to the yield potential, West African agriculture still faces considerable barriers based on market and trade access. The first two alternative growth options were based on an assumption that current trade policies and market conditions will not significantly change. But without improvements in market conditions and reductions in intra-regional trade barriers, the increased supply of agricultural products may depress prices and reduce farm incomes. Thus, we use the multimarket model to further simulate a situation in which trade barriers from inefficient trade policies and inadequate infrastructure are reduced. Productivity growth assumptions for the agricultural sector are the same as those employed in the second growth scenario, i.e., growth in agriculture is mainly realized through catching up to the yield potential. Reduced price gaps due to improved market and trade conditions are modeled by exogenously lowering trade margins between domestic producer prices and border prices. Reductions in trade margins also indicate the potential for improvements in trade sector productivity. To capture this, we exogenously increase the service sector's productivity to match reductions in trade margins.

Tables 5.1.7 and 5.1.8 summarize potential agricultural export and import outcomes by 2015 as projected by the model. Compared to the business-as-usual scenario, productivity growth in agriculture results in 6 billion $US more of agricultural exports for the region as a whole. In other words, total regional agricultural exports will

[7] For further details, see Cohen et al. 2005.

rise to 16.4 billion $US. This is significantly higher than the projected 10.6 billion $US gained in the business–as-usual scenario by 2015 (Table 5.1.7). By 2015, agricultural imports will fall from 12.4 billion $US in the base-run to 9.0 billion in growth scenario 2. If agricultural productivity growth is further supported by improved market conditions and trade policies, total agricultural exports would rise to 22.1 billion $US by 2015 in the region as a whole. Total agricultural imports would only increase modestly, to 10.1 billion $US by 2015 (Table 5.1.8).

Improved market conditions, along with increased agricultural productivity, can increase West African countries' competitiveness in both global and regional markets. Constrained by the lack of intra-regional, bilateral trade data among West African countries, our analysis cannot distinguish intra-regional trade from inter-regional trade. However, increasing trade and improvements in the region's international competitiveness, would likely result in the substitution of global imports with intra-regional imports. We focus on trade in cereals and livestock, the two sub-sectors with the highest intra-regional trade potential, to illustrate this argument. If growth follows a business-as-usual path, cereal imports will reach 5.7 billion $US by 2015, and the three sub-regions in West Africa will continue to be cereal-deficient regions with low numbers of cereal exports (Table 5.1.9). While there are significant numbers of livestock exports and imports, imports (4.8 billion $US) total more than exports (1.7 billion $US) in the base-run of 2015. Among the three sub-regions, the Sahelian region is a net exporter, while the other two regions are net importers.

Through productivity growth in agriculture, cereal imports will fall in West Africa, even though demand will significantly increase with income growth. While livestock imports will also decline, livestock exports will increase only modestly indicating certain market constraints in the livestock-exporting countries (Table 5.1.9). However, when productivity growth is supported by improvements in market and trade conditions, livestock exports increase to 2.8 billion $US, of which 1.8 billion $US is exported from Sahelian countries (Table 5.1.9). While livestock imports fall slightly to 4.6 billion $US, imports are still higher than exports for the region, due to the more than 1.4 billion $US imports by Nigeria. About 280 million $US cereal exports are generated through improving market and trade conditions in the region (Table 5.1.9), but cereal imports also increase, compared to the import levels in a growth scenario without market improvements. Thus, it is reasonable to believe that cereal exports could easily find markets in the region given that Nigeria will import 2 billion $US of cereals in the same scenarios.

Table 5.1.10 summarizes the export and import structure of the three sub-regions as well as West Africa as a whole. West Africa's export structure appears to become more diversified with growth in agricultural productivity and improvements in market and trade conditions. In the base-run, cocoa and cotton will account for 27.5 and 20.3 percent of West Africa's total agricultural exports, a similar structure as found in current trade (Table 5.1.10(a). Agricultural productivity growth, together with improvements in market and trade conditions, increases export opportunities of other commodities. Thus,

as observed in Table 5.1.10(c) exports of cocoa and cotton in total agricultural exports fall to 14 and 15 percent, respectively.

5.2 Results: Six percent Agriculture GDP growth is reachable

Based on the aforementioned description of the two growth simulations, and using the multi-market model to project these growth rates forward to 2015, the annual growth rates for AgGDP and overall GDP in the two growth scenarios are reported in Table 5.2.1 Figure 5.2.1 illustrates the clear differences three scenarios show in terms of agricultural growth.

As shown in Figure 5.2.1, growth from recovering current yield losses (by overcoming biotic constraints) contributes to an additional 1 percent annual AgGDP growth in the next ten years for many West African countries. Even with this additional growth, rates in most West African countries are still far below the 6 percent target set by CAADP. However, by catching up to the agro-climatically attainable yield potential, 8 of the 20 West African countries included in the study can come close to reaching the 6 percent target. Among these 8 countries, 6 are located within the Coastal region, 1 is in the Sahel and 1 is in the Central region. There are also 10 countries in which the annual AgGDP will grow at close to 5 percent or greater, while there are only two Sahelian countries, Chad and Mauritania, for which projected annual growth in AgGDP is below 4 percent.

Role for the Public Sector

The business-as-usual outcome sheds important light on West Africa's well-intentioned, but largely ineffective agriculture development policies of the 1980s and 1990s. These policies were brought forth in an effort to reform and liberalize the agricultural sector and open it to market forces. The expectation was that improving price incentives for farmers and reducing government intervention in the agricultural sector would be enough to generate a robust supply response and allow well-functioning markets to emerge quickly. But in the absence of agricultural productivity growth, reducing trade impediments would only generate a weak supply response.

Governments and donor agencies who believed there was no role for the public sector in agricultural development were at the very least misguided. To achieve the sustained levels of productivity growth required to significantly raise incomes and reduce poverty within the region there is indeed an important role for the public sector to build pro-poor markets. The three alternative growth sections of this chapter imply there are great opportunities for the public sector to shape a more positive future than that of a business-as-usual scenario. Each growth scenario will require public investment in R&D and extension to provide or adapt to suitable technology for West African agriculture. Agricultural growth will also depend upon investment on the part of farmers, an increased adoption of modern inputs and public investment in marketing development, roads and other public infrastructure.

Sub-sector contributions to growth are country specific

Sub-sector contributions to total agricultural growth vary across countries due to social and economic conditions, agroecological potential and different agricultural production structures. There are underlying dynamics to the relatively higher impacts growth in livestock and cereal sub-sectors have on AgGDP in most Sahelian countries. Demand for these items tends to grow as incomes rise, and at proportionately greater rates. Such growth in demand allows for sustained productivity growth without significantly negative price effects, and thus, higher overall real income levels. Except for Chad, Gambia and Senegal, livestock contributes to 28.3–57.6 percent of total agricultural growth in the five Sahelian countries included in the study (Table 5.2.2). The cereal sub-sector's contributions to total agricultural growth are in the range of 24-41 percent for seven of the eight Sahelian countries, except for Niger in which cereal growth contributes 13 percent of total agricultural growth.

In the Coastal countries, the sub-sectors that contribute significantly to total growth are much more varied than those in most of the Sahelian countries discussed above. Despite this diversity, the contribution to total growth from root crops seems to be relatively more important than other sub-sectors. For example, root crops contribute to about 23–30 percent of agricultural growth in Ghana, Benin, Togo and Nigeria and 9–10 percent of growth in Sierra Leone and Côte d'Ivoire. Countries in the Central sub-region have relatively low agricultural potential (at the national aggregated level), except for Cameroon. Four Central African countries have the potential to reach levels of 5 percent agricultural growth while Cameroon could reach a growth rate of 6 percent. Given such relatively low agricultural growth rates, livestock and root crops seem to be the most important sources of growth in the region. Livestock contributes to 19–23 percent of agricultural growth in four of the five Central region countries, except for DRC, while root crops contribute to 10–35 percent of total agricultural growth in the five Central region countries.

Export crops and other high value crops play important roles in overall agricultural growth. Traditional export crops, such as cotton and cocoa, contribute to around 10 percent of total agricultural growth in their major exporting countries (cotton in Mali and cocoa in Côte d'Ivoire and Ghana). This share is close to their current contribution to the agricultural GDP. Nontraditional exports and other high value crops seem to be an important growth source in some coastal countries. Their contribution to AgGDP growth is more than 17 percent in Ghana and more than 35 percent in Côte d'Ivoire.

When considered collectively, livestock, cereal and root crop sub-sectors result in relatively large AgGDPs. Results discussed here suggest that the greatest agriculture-led growth opportunities in West Africa reside in commodities for which: 1) there is a relatively large production base to start with 2) there is a large growth potential agro-climatically, and 3) there is a large and growing demand within the region. In the next section, contributions by crops such as maize, rice, cassava, yam and pulses will be further analyzed.

5.3 Producer Benefits by Agricultural Commodity

The impact of alternative growth options at the commodity level is evaluated using IFPRI's DREAM model. Such analysis can help set priorities for commodity-level R&D investment. The baseline in the DREAM model is the same as the multimarket model's "business-as-usual" scenario discussed above. The DREAM model focuses on crop level analysis-- it is designed to evaluate the impacts of technological adoption in crop production. Specifically, we focus on 15 crops including major staple crops (cereals, root crops, pulses, oilseeds) two tree crops (banana and coffee) and two major traditional export crops (cocoa and cotton) for the analysis. Figure 5.3.1 shows the adoption profile for development domains. We choose a sigmoid adoption curve typical for agricultural technology adoptions (Alston et al., 1995). Although adoption rates are slow initially, they then begin to accelerate eventually reaching a plateau. The actual productivity impacts by domains are described in Section 6.2 and in Tables in 5.2.

Table 5.3.1 shows the overall benefits to producers adopting technology to overcome biotic constraints (i.e., the yield-loss recovering scenario described above). Such benefits are projected over the period 2006-2015. The benefits in the earlier years should be smaller, since the full adoption of any new technology takes time. Moreover, gains in later years account for current expenditures made in exchange for future returns.

By adopting new technologies to reduce such yield losses, West African farmers as a whole gain tremendously. The producer gains in rice and cassava production are the highest, both reaching more than $1.3 billion. Gains from growth in rice go mainly to Coastal countries, $1.05 billion in total. Sahelian countries gain about $302 million in total (Table 5.3.1(a)). The producer benefits of cassava growth are only shared between the Coastal and Central sub-regions; $758 million and $590 million, respectively. Cereal crops such as maize, millet and sorghum, root crops like yam and oil crops like groundnuts, would also generate huge gains to farmers in this scenario, reaching $594 million to $1.2 billion for each of these crops in the West Africa region as a whole.

There are also large gains to be had from export crops (such as cotton and cocoa), though these are smaller than the gains from many staple crops. In the case of cotton, producer benefits total around $640 million for the region. Coastal countries gain $360 million and Sahelian countries gain $194.3 million. Cocoa mainly grows in the Coastal countries (with the exception of Cameroon) and thus this sub-region has the greatest producer benefits at $300 million (Table 5.3.1 (b)).

Total producer benefits at the country or commodity level depend on the size of the country and the size of the sector in each country's agricultural economy. To make investments in each sector comparable in terms of its return, we must normalize gains using a commonly measured denominator. Here we choose crop area as a denominator and report producer benefits per hectare in Table 5.3.2. At the per hectare level, gains from rice growth significantly increase and are the highest gains among all crops for the region. There seem to be less market constraints for rice given that the region heavily depends on rice imports. At the per hectare level, producer gains from rice growth are high, ranging from $130/ha in the Central region to $400/ha in the Sahelian region. In

fact, such gains are extremely high in select countries, (e.g. $1470/ha in Mauritania and $1,040/ha in Cameroon) indicating (or implicating?) that there is a relatively large yield loss due to environmental constraints under the current situation. The next top gainer at the per hectare level is yam, reaching $342/ha in the Coastal region and $291/ha in the Central region respectively. It is important to note that such gains are measured in terms of current prices. Increases in rice production might encounter domestic market constraints if there are no additional export opportunities. Producer prices may be lowered with such market constraints, which would reduce the gains from such technological improvements.

As discussed in section 5.2, the second growth scenario focuses on potential yield gaps identified at a geographical pixel level in West Africa. We assume that the agro-climatically attainable yield potential will eventually be realized in those domains with better agro-climatic conditions for growing such crops. For this scenario, investment in agricultural R&D and extension is a key component of successful growth. Table 6.3.3 presents the total producer benefits from such a growth option. The total benefits to West African farmers are far greater than those from yield-loss recovery, due to the gap between the current yield and the potential yield levels. For West Africa as a whole, catching up to the rice yield potential generates the greatest gains to farmers, totaling $6.8 billion over the next ten years (2006-2015). While the three sub-regions all gain, the Coastal sub-region gains the most at $5.3 billion (Table 6.3.3 (a)). Rice, cassava, groundnut, maize, sorghum and yam generate $2.2 to $6.8 billion of producer gains. Three export crops: cocoa, cotton and banana, all generate more than $1.5 billion of producer gains each.

At the per hectare level, gains from each crop vary across the three sub-regions. In the Sahel, per hectare gains are the highest for rice ($1.6 thousand/ha), followed by cassava and yam ($890/ha and $846/ha), while in Coastal region, the gains from sweet rice and groundnut growth are the highest, $1.4 thousand/ha and $611/ha (Table 6.3.4 (a)). For the Central region, per hectare gains are the highest for root crops and export crops, ranging from $1.7 thousand for yam to $981/ha for cotton. The size of the gains at the per hectare level depends upon the captured yield gap and the current price levels. Obviously, differences in market opportunities can significantly impact such projections. In the next section, such market opportunities are further assessed.

Given the size of the region, spatial scales (national, zonal and regional) are important for evaluating priority crops. To get a regional perspective, we aggregate the country results into the three sub-regional zones. In addition, we put the two growth scenarios together for an overall picture. Figure 5.3.2 shows the percentage of producer benefits relative to the base year value of production (VOP). The benefit to rice is the highest among the fifteen crops and could reach over 350 percent of the base year VOP in both the Coastal and Sahelian zones, and over 250 percent in the Central zone. For the remaining crops, the percentages range from 60 to about 200. The top five crops for each zone (displayed in Figure 5.3.2) are: rice, groundnut, oil palm, beans and millet in the Sahelian zone; rice, groundnut, beans, coffee, millet and cotton in the Coastal zone; and rice, bean, cotton, maize and groundnut in the Central zone. We then further aggregate

the three zones to get an even more complete picture. Figure 5.3.3 shows relative producer benefits normalized by base year VOP and Figure 5.3.4 shows the producer benefits per hectare for West Africa as a whole. While these two figures show different priorities among the thirteen crops, there is some consensus between them as rice, groundnut and cotton rank high in both figures. From a regional standpoint, technology investment in these three crops deserves to be a priority.

Our sub-sector analysis strongly indicates that West African countries sharing similar agro-ecological conditions could greatly benefit by pooling resources together to find common technological solutions. Also, while priority crops vary from country to country and zone to zone, rice can be thought as a regional strategic commodity as it seems to have the highest producer benefits across the board. To a lesser extent, groundnut, coffee and cotton could also become regional priorities for Coastal and Central regions.

5.4 Growth options for poverty reduction: Insights from Ghana

It is important to recognize that the production, consumption, investment, and trade of key commodities will impact growth prospects for poverty reduction. Building an understanding of such potential requires detailed country-level analysis within a multi-market framework. Such analysis was undertaken for Ghana, a country where the requisite household-level income and poverty data were available. Ghana's agricultural characteristics are very similar to those of a number of countries in the region, especially in the Coastal region. Insights emerging from the Ghana case study may therefore be viewed as broadly representative for the region. The analytical horizon is once again set at 2015.

Growth

As shown in Figure 5.1.2, Ghana's projected per capita GDP and AgGDP growth rates are relatively high compared to other countries in the region, even along a business-as-usual growth path. Such growth illustrates that Ghana's economy post-reform has grown steadily and persistently for two decades. There are only two records of similar growth in the developing world during the period 1984-2004: China and Vietnam. Although Ghana's growth rate has been comparatively lower, the country appears to be a model of success for Africa.

Cocoa and forestry have grown more rapidly than other agricultural sub-sectors and contributed significantly to Ghana's export growth. However, broad-based crop and livestock production was still the main source of agricultural growth in the last two decades, as it was in many other West African countries. Agriculture's contribution to economic growth has been realized mainly through land expansion. But as available land diminishes in the future and the risk of environmental degradation increases, this type of growth will face considerable constraints.

There is potential for increased, sustainable growth in Ghana's agriculture. The country's achievable yield is 2–3 times that of its current yield for most staple crops (MofA, 2002). Ghana currently depends on imports of rice, wheat, livestock products and

processed food for domestic consumption. Future growth and urbanization will create a market for many agricultural commodities in the country as well as in the region.

Steady, persistent and balanced economic growth has helped Ghana significantly reduce poverty. Available data shows that between 1991/92 and 1998/99, Ghana's national poverty rate fell from 51.7 to 39.5 percent, declining 12.2 percentage points. In terms of absolute declines in poverty headcounts and percentage points of poverty rates, more poverty reduction occurred in rural areas, as the rural population is more than 60 percent that of the total population. The rural poverty rate fell from 63.6 percent in 1991/92 to 49.5 percent in 1998/99, declining 14.1 percentage points. The urban poverty rate in the same period fell from 27.7 percent in 1991/92 to 19.4 percent in 1998/99, declining 8.3 percentage points. However, the percentage of rural poor who moved out of poverty was less than that in urban areas (22 vs. 30 percent). Moreover, regional inequality significantly increased as poverty in the poorest regions either increased or only modestly declined. As a result, the poverty rate fell to approximately 5 percent in Accra but reached as high as almost 90 percent in the Upper East region.

MDGs and further poverty reduction

In 1999, Ghana's national poverty rate was 39.5 percent, 49.5 percent in rural areas and 19.4 percent in urban areas. If Ghana continues to growth along a business-as-usual path, it will meet MDG One and halve 1990's poverty rate of 52 percent by 2015. Using a multimarket model to link with a microsimulation model based on household level data, it is estimated that the poverty rate in Ghana will fall below 27 percent by 2015. Rural poverty rates will also halve by 2015, but it will take a relatively longer period than fulfilling the national poverty reduction goal, because of a much higher initial poverty rate (64 percent) in the early 1990s (Figure 5.4.1).

Increases in regional inequality

During recent growth periods, northern Ghana continues to lag behind the rest of the country in most development indicators, which seems to deserve special attention as Ghana pursues the Millennium Development Goals. Reasons put forth to explain Northern Ghana's poverty and underdevelopment often include history, unfavorable climate and agricultural production conditions, and political neglect post-independence (ODI and CEPA, 2005). Although agriculture is the main component of livelihood strategies, the conditions for agricultural production in many parts of northern Ghana are not optimal, particularly when compared to the south. Rainfall levels are lower and characterized by one peak, soils are poor in organic matter and runoffs are high because of torrential rains concentrated in short periods. As a result, the north is suitable for growing cereals and legumes. The shea tree, a major tree crop, is yet to be domesticated.

Although MDG One-halving the national poverty rate by 2015-is in Ghana's reach, it is important to note that the goal would not be achieved universally at the sub-national level as inequality within the country continues to worsen. The Northern, Upper East, Upper West and Eastern regions will experience only modest reductions in poverty incidence (Table 5.4.1). By 2015, more than half the population in the Northern region and close to 70 percent of the populations in the Upper East and Upper West regions will

remain impoverished. The poverty rates are far above the estimated national average of 30.9 percent for rural areas.

Growth and poverty linkages at the sector level

Varying growth rates in different sub-sectors impact overall growth rates as well as poverty. In the case of Ghana, for example, the simulation results indicate that agriculture-led growth reduces poverty more than the non-agricultural growth (Figure 5.4.2). Furthermore, the largest reductions in poverty would result from staple crop and livestock growth (Figure 5.4.3 and Table 5.4.2). The significance of this result cannot be overstated. Growth in export sub-sectors, especially growth in non-traditional export sub-sectors, is often put forward as a pathway out of poverty for countries such as Ghana and others in West Africa. The current analysis indicates that such advice is highly misplaced.

The results in Figure 5.4.3 show that increasing staple crop production would directly benefit the great majority of small farmers by easing key resource constraints. Demand-side considerations are also important. Staple crops often account for large shares of household expenditures, and are therefore key sources of food energy for both rural and urban poor consumers (see Chapter 4 for demand side analysis). Growth in staple sub-sectors would therefore positively impact both rural and urban poverty. Conversely, nontraditional exports typically cover small groups of relatively well-endowed and geographically concentrated farmers. This limited demographic and geographic scope for yielding broad-based income expansion is accentuated by key supply-side and demand-side constraints. On the supply-side, the initial investments needed to meet stringent technical and financial requirements in export-oriented production and trade render such activities beyond the reach of most smallholders. On the demand-side, the increased production of most exports provides little nutritional benefit to poor consumers in both rural and urban areas, since such products are often intended for export markets.

5.5 Summary

This chapter has outlined the ingredients of growth-enhancing, poverty-reducing agricultural development policy in West Africa. The aim has been to identify strategic priorities for agricultural development in the region that can assist national and regional stakeholders in defining and positioning their own priorities, objectives, strategies, and action plans.

Based on a methodology that integrates spatial analysis with economic modeling in a multi-market model and DREAM model of West Africa's agriculture, the continuation of current trends — termed "business-as-usual"— implies agricultural and overall growth rates are currently inadequate to reduce poverty in the region. As also projected in Chapter 2, under a business-as-usual scenario only a few West African countries (such as Ghana) would achieve the growth rates required to meet the MDG of halving poverty by 2015, while the majority would miss this target. In fact, these growth rates indicate poverty is deepening within the region.

While West Africa faces a daunting challenge for meeting the MDG One, there is huge potential that exists in the region to stimulate agricultural growth. Such potential varies widely across the region, however, given the vast differences in agro-ecological, physical and social-economic conditions. Thus, the question of which agricultural sub-sectors are the most important for overall agriculture growth are better answered at the national level. The analysis of this chapter, based on an agro-climatically feasible yield, drew numerous insights as to the nature of agricultural development that might allow countries to avoid business-as-usual outcomes. Nine of 20 West African countries can achieve the 6 percent annual agricultural growth; and another 7 can attain more than 5 percent growth in the next 10 years. This is the resulting outcome of maximizing the agricultural potential that exists in areas with better agro-ecological conditions.

Although the region varies widely in agro-ecological and climatic conditions, the analysis of this chapter implies rice has the greatest overall growth potential and could subsequently generate the largest producer benefits. To take advantage of this potential, joint investments in rice research and development at the regional level could provide even higher returns given its potential for transferability across borders. Livestock also proves to be an important and strategic option for generating growth, especially for the Sahelian zone. The analysis shows that if the livestock sector were to grow at the same rate as that projected for the crop sector, it would contribute the most to total agricultural growth in the Sahel. This is primarily because of the sheer size of this sector in the economies of most Sahelian countries.

Although the sub-sectors that contribute significantly to total growth are more diverse in the Coastal and Central countries, the growth contribution from root crops appears to be relatively more important in both regions. Root crops contribute to more than one-third of agricultural growth in Ghana, Benin, Togo and Nigeria and 11–15 percent of growth in Sierra Leone and Côte d'Ivoire. Finding foreign markets for these crops targeting Asian markets, for example) will be important for future growth.

Growth in staple crops and the livestock sector depends not only on technology adoption to generate high growth in productivity, but also on regional integration in both commodity and input markets. The analysis shows that improvements in market conditions and trade policies will expand regional and domestic demand for rice and livestock. As West Africa is currently a net importer of both rice and livestock products, increased supplies of these products through productivity growth will easily find regional markets if market and trade conditions improve.

Traditional export crops, such as cocoa in Côte d'Ivoire and Ghana and cotton in Benin and Mali, continue to play an important role in West Africa's agricultural growth. Again, diversifying these commodities' export markets will be critical as the market demand elasticity in OECD countries is currently low. Exploring other market opportunities in Asian countries like China and India and emerging Eastern European markets will be necessary to continue growth in these commodities' exports and production (see Minot 2003 or cite WB report).

West African countries also need to diversify their agricultural exports. The analysis of this chapter shows that improving market and trade conditions and increasing productivity, significantly increases trade in nontraditional agriculture, including the many commodities that are staple food in the region. By diversifying exports and creating new trade opportunities, agricultural growth will increase in general, and risks will be reduced from concentrating in a very few agricultural commodities for exports.

6. Challenges for the Effective Implementation of Regional Strategy[8]

Despite the diversity within the region, one thing is certain, there is enormous potential for agricultural development and an opportunity for governments to capitalize on this potential through committed investments and sound, regionally-coordinated policy making. The integration of West Africa's regional economy would maximize gains and mutually benefit member countries. Regionalization would help take advantage of economies of scale, exploit differences in natural resources endowments and help facilitate and expand opportunities for trade by removing physical, political and economic barriers. The potential for intra-regional trade is great as it is natural, given that the region already has a longstanding history of informal trade.

The opportunities are not without their challenges, however. Prospects of cross-country collaboration in the West Africa region is especially challenging considering the region contains the most heterogeneous concentration of states in terms of language and colonial history. As a result, the two major sub-regional economic communities, the Economic Community of West African States (ECOWAS) and the Union Economique et Monetaire Ouest Africaine (UEMOA), face considerable challenges of coordinating agricultural policies and projects and of identifying appropriate forms of stakeholder participation in regional decision-making. Adding to this challenge, there are more than 20 inter-governmental, inter-sectoral, and regional integration initiatives that exist in the sub-region.

6.1 Overview of challenges

In spite of the prospects for a more transparent, better informed and increasingly democratic and inclusive process of decision-making on agricultural policy and development strategy in West Africa, there is a considerable lack of knowledge regarding the question as to how decision-making processes on agricultural development strategies are actually organized in different countries and at the regional level, what the role of different actors is in this process, what the major challenges are, and which innovative approaches should been tried to overcome the challenges. There is an emerging body of literature on such questions, which has, however, mainly focused on the process of developing general strategies known as Poverty Reduction Strategy Papers (PRSPs) rather than agricultural development strategies. This literature indicates a range of challenges (see Whaites, 2002): representing the poor and marginalized groups in stakeholder consultation processes and reflecting the results of stakeholder consultation adequately in the final strategy documents, avoiding the by-passing of Parliaments, achieving inter-ministerial coordination, making effective use of research-based knowledge, and coordinating effectively with development partners. An additional major challenge is to avoid an implementation gap (Thomas and Grindle, 1990). One can expect that these challenges also apply to agricultural policy-making.

One can also expect that similar challenges arise for decisions on agricultural policy-making. These challenges may even be more pronounced at the regional level, as

[8] Contributed from a paper by Danielle Resnick and Regina Birner

there is a need to achieve agreement among the participating countries. Moreover, there are three major regional organizations in West Africa that are engaged in regional agricultural policy-making: (1) ECOWAS, which covers all West African countries, (2) the West African Economic and Monetary Union (UEMOA) which covers the eight French-speaking countries, and (3) CILSS, the Permanent Inter-State Committee on Drought Control, which covers the Sahel countries. This constitutes an additional challenge for coordination.

Against this background, the study presented here deals with the following questions: How are processes of decision-making on regional agricultural policies organized? What is the role of different actors in these processes? What are the major challenges for decision-making on agricultural policies at the regional level in West Africa? Which innovative approaches have been used or could be used to overcome these challenges?

In view of the limited information available so far, an explorative study has been conducted that aimed at providing an overview regarding these questions and to identify issues for future in-depth research. The focus was placed on ECOWAS and UEMOA. Apart from focusing on the general agricultural policies of the two regional organizations, one specific policy area was considered in more detail: agricultural research policy. To assess policy-making regarding agricultural research policy-making at the regional level, West and Central Africa's regional research organization CORAF was included in the study. The study is based on a review of documents and interviews held with representatives of major stakeholders in the agricultural sector at the country and regional level in July 2006.

We first present agricultural policy processes at the regional level before identifying the major challenges for decision-making on agricultural policies and agricultural research strategies at the regional level, as well as discusses the institutional options and processes to overcome these challenges.

6.2 Profile of principal regional organizations (ECOWAS and UEMOA)

As indicated in Figure 6.2, UEMOA includes only eight West African countries: Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Togo, and Senegal. ECOWAS encompasses the 15 countries that comprise the entire West African sub-region.[9] Table 6.1 provides some basic indicators on the two organizations and compares them with three other key regional economic communities on the continent.

The history of both organizations reflects an uncomfortable relationship between colonial inheritances and the spirit of pan-Africanism. The philosophy underlying ECOWAS was that colonial rule had arbitrarily divided markets and fragmented peoples, thereby placing the continent in general and the West African sub-region in particular in a disadvantageous position for achieving development (Asante, 2004). Thus, ECOWAS' founders were determined to overcome neo-colonial patterns of trade and the signing of

[9] However, Mauritania withdrew in 2000.

the Lagos Treaty in 1975 established that the organization would focus on four key areas: expanding intra-community trade, improving physical infrastructure, reducing excessive external dependence, and creating a single ECOWAS currency. Article 59 of the Treaty also stated that member countries could belong to other sub-regional associations as long as their membership did not detract from the ECOWAS provisions (Bach, 1983). This created the space for francophone member countries to simultaneously belong to what is today known as UEMOA. Today's UEMOA has undergone a variety of transformations over the last forty years. All UEMOA members belong to the CFA franc monetary zone. This currency is pegged to the Euro and convertibility is assured by the French treasury. The UEMOA member states also must adhere to a stringent set of macroeconomic convergence criteria (Asante, 2004).

As within the EU, the UEMOA treaty requires countries to transfer their sovereignty to the regional organization in certain policy areas that were traditionally under national jurisdiction. Moreover, the members of the UEMOA Commission, the organization's executing agency, represent UEMOA in all international organizations and act only in the interest of the union without reference to their personal countries of origin (M'Bet, 1999). By contrast, in ECOWAS, each country has exercised its own sovereignty within the organization, which robbed the organization's Executive Secretariat of any independent power. Although ECOWAS revised its treaty in 1993 to introduce the principle of supra-nationality in the application of decisions, it has yet to fully operate according to that principle (ECOWAS website, 2006; Bach, 2004).

Scholars of regional integration, as well as stakeholders within the sub-region, generally perceive UEMOA as the more successful of the two organizations. According to a former ECOWAS executive secretary, only 45 percent of ECOWAS programs have ever been implemented by its member states while the corresponding figure for UEMOA is 68 percent. Indeed, UEMOA's trade liberalization scheme became effective in January 2000, resulting in the abolishment of all tariffs on goods produced within the member states, the adoption of a common external tariff (CET), and the standardization of business laws (Adedeji, 2004).

Table 6.2 compares the institutional structure of ECOWAS and UEMOA. The table highlights similarities in institutional structure between ECOWAS and UEMOA, but the procedures for accepting and implementing decisions are equally important for explaining divergent outcomes between the two organizations. UEMOA responds to requests from states who want greater regional coherence on particular policy issues. If the request is accepted, UEMOA engages in a series of workshops at the national and regional levels to ensure harmonization of texts specific to the policy area. The executing organ, known as the UEMOA Commission, then passes the finalized text to the Council of Ministers, which examines how to finance the activity in a manner that does not jeopardize the region's macroeconomic stability. This Council consists of two ministers from each member state, one of whom is always the Minister of Finance, and meets at least twice a year. The decisions of this Council are determined according to the principle of unanimity and are subsequently imposed on the member states. If, however, a unanimous decision is not possible at this level, the issue is presented to the Conference

of the Heads of States, which consists of the presidents of the eight member states. This organ meets at least once a year and also needs to abide by the principle of unanimity before a decision can be taken. Once a decision is made, it is binding on all member states.[10] By contrast, the ECOWAS executive secretariat, which is the equivalent to the UEMOA Commission, must submit all decisions, acts, and protocols to a highly involved ratification process that ultimately decreases the number of programs that are actually implemented (Asante, 2004).

UEMOA is also aided by the existence of National Policy Economic Committees that monitor economic developments within UEMOA countries and oversee compliance with the institution's macroeconomic convergence criteria. These Committees consist of high-level economic and financial administrators as well as representatives from central banks and economic ministries. According to Asante (2004), they are much better equipped than the equivalent National Units of ECOWAS. However, ECOWAS is attempting to improve integration by creating a ministry devoted to regional integration in Burkina Faso, Guinea, Ghana, Mali, Niger, Nigeria, and Senegal.[11] Perceptions of the relationship between the two organizations remains mixed. On the one hand, the contentious geo-political climate in which both organizations were originally established no longer exists. There is now an accord of cooperation between the two organizations and institutional mechanisms to ensure greater coherence of their policies.[12] Some interview respondents also confirmed that when one organization convokes a conference or workshop, the other is usually in attendance.[13] On the other hand, there is still a general public belief that a rivalry exists between the two organizations and this could be ameliorated by a greater specialization of activities.[14]

6.3 Regional level stakeholders for agricultural policy making

Regional Network of Peasant and Agricultural Producer Organizations: ROPPA

One of the most important stakeholders of agricultural policy are the region's producer groups, which over the last two decades have increasingly proved to be a major lobbying force. The case of Burkina Faso and Mali shows that producer organizations were primarily formed around different production lines, such as cotton, peanuts, cereals, fruits and vegetables, fish, and livestock, but national federations of these producer organizations emerged during the 1990s.[15] Similar developments took place in other West African countries. These federations formed a regional umbrella organization, the *Réseau des Organisations Paysannes et de Producteurs Agricoles de l'Afrique de l'Ouest* (ROPPA, Network of Peasant and Agricultural Producer Organizations in West Africa) Figure 6.2 displays the structure of ROPPA. The network was born in July 2000 at a

[10] Interview with official from UEMOA, June 30, 2006; UEMOA website, http://www.uemo.int, accessed July 20, 2006.
[11] Ibid
[12] Ibid
[13] Interview with ROPPA members, July 5, 2006
[14] Interview with representative of Interface, June 27, 2006
[15] Interview with official from the World Bank Senegal Country office, June 27, 2006; Interview with representative of CNCR, June 28, 2006

regional conference of peasant organizations in Cotonou, Benin with the mandate of increasing the value of smallholder agriculture in West Africa

In general, ROPPA believes that experiences in other continents have affirmed the importance of agriculture for broad-based development but that agricultural development in Africa needs to be tailored to the reality of current international conditions as well as local ecological and human ones. Headquartered in Burkina Faso, the organization is highly outspoken on policy issues both within the sub-region and on the broader continental scale, with a moderate impact on the substance of policy decisions. ROPPA publicizes its activities via the radio, newspaper, television, and internet as well as by organizing a regional workshop each year on a specific theme.

The organization also disseminates a number of position briefs that articulate its members' consensus on particular issues, including members' dissatisfaction with the exclusionary nature of the elaboration of the Comprehensive Africa Agriculture Development Program (CAADP) of NEPAD (New Partnership for Africa's Development), which is described below in more detail. ROPPA believes that the CAADP goals are very similar to those promoted during the era of agricultural structural adjustment programs and that more emphasis should, among other things, be placed on increasing the availability and consumption of local goods rather than on targeting international export markets that are unfairly biased against African producers (ROPPA, 2003).[16] The clear opposition of West Africa's major producer organization group to CAADP is an important fact, especially in view of the emphasis that the AU and NEPAD place on accountability and democratic participation and in view of the fact that supposedly aims at supporting the smallholders that ROPPA represents.

Regional Network of Agricultural Research Organizations: CORAF

Next to the regional network of producer organizations, CORAF, the network of regional agricultural research organizations is an important political actor in agricultural policy-making. UEMOA's relationship with CORAF is not yet very well-developed, especially given that the two organizations just signed a memorandum of understanding in February 2006. On the other hand, CORAF has a close working relationship with ECOWAS. This is because CORAF is one of four members of the Forum for Agricultural Research in Africa (FARA), which is considered the technical partner for NEPAD. Since ECOWAS is the designated West African implementing body for NEPAD, CORAF in turn is considered the main technical arm within the sub-region.

CORAF was established in 1987 and is comprised of the national agricultural research system (NARS) in 21 countries within the West and Central African sub-regions. The organization works closely with a wide range of regional stakeholders, including producer groups, members of civil society, the private sector, and of course, researchers. These various stakeholders formally meet every two years in CORAF's General Assembly where reports on the previous year's activities are discussed and where, after a number of parallel sessions amongst each type of stakeholder group,

[16] Interview with ROPPA members, July 5, 2006;

recommendations for future activities are decided.[17] In order to implement the decisions of the General Assembly, a Governing Board was established whose members are elected by the General Assembly and who include the directors of six NARS, and one representative each from the private sector, farmers' organizations, and NGOs. A Scientific and Technical Committee that includes 12 international and highly specialized scientists offers the Governing Board advice on the quality of programs being implemented within the sub-region. Yet, since the Governing Board is strictly administrative and requires a permanent structure to implement its work on a daily basis, an Executive Secretariat has also been established.[18] Figure 6.3 provides an overview of CORAF's governance structure and the direction of decision-making.

There are no government officials involved in CORAF's governance structure and strategies for the sub-region do not need to be approved through national parliaments of member states. However, the leaders of the NARS are considered ambassadors of their countries and act as liaisons between their governments and CORAF. Moreover, CORAF considers that its relationship with ECOWAS allows it to receive feedback from the government officials that comprise the latter organization. Nevertheless, with more sensitive topics, such as biotechnology and bio-safety, CORAF does try to more actively involve regional policymakers.[19] Overall, all of the projects that CORAF chooses to implement must reinforce the goal of regional integration, meaning that they need to cover more than two countries. Crucially, these projects need to respond to regional priorities and not simply be academic exercises. In addition, they need to actively demonstrate the involvement of each of the major stakeholder groups.[20]

Intergovernmental and Private Sector Networks

One of the major regional, intergovernmental organizations is the *Conférence des Ministres de l'Agriculture de l'Afrique de l'Ouest et du Centre* (CMA/AOC), which consists of agricultural and livestock ministers from 20 countries within the west and central African sub-region.[21] Recognizing the numerous challenges facing the sub-region's agricultural sector, the CMA/AOC was created in 1991 in order to find solutions for promoting a regional market for agricultural products, improving the competitiveness of export products, and strengthening the capacity of those institutions involved in the formulation and implementation of sub-regional agricultural policies (CMA/OC website, 2006). A subsidiary, but independent, organ of CMA/AOC is the *Réseau d'Expertise des Politiques Agricoles (REPA)*, which analyzes the formulation and application of national and regional agricultural policies, emphasizes the importance of agriculture, encourages the growth of strong rural coalitions, and promotes dialogue amongst researchers, producer organizations, decision-makers, and donors.[22]

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[17] Previously, the General Assembly met every year but due to financial and administrative reasons, it was recently decided to convoke this organ every other year.
[18] Interview with representatives from CORAF, June 22, 2006
[19] Ibid
[20] Ibid
[21] The 20 countries are: Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Republic of Congo, Côte d'Ivoire, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Equatorial Guinea, Mali, Mauritania, Niger, Nigeria, Senegal, and Togo.
[22] Ibid

Another important intergovernmental network with a strong research component is CILSS, the Permanent Inter-State Committee for the Fight Against Drought in the Sahel. CILSS was established in 1973 in response to the drought and famine afflicting the region at that time. CILSS' primary mandate continues to be investment in research that will improve food security and help producers overcome the effects of drought and desertification. CILSS also contributes to the formulation, harmonization, and implementation of sub-regional strategies and policies, reinforces scientific and technical cooperation, augments the capacity of producers and the private sector, and assists with information dissemination. Three organs comprise CILSS, including the Executive Secretariat, the *Institut du Sahel* (INSAH), and the *Centre pour Agronomie, Hydrologie, Meteorologie, de CILSS* (AGHYRMET) (CILSS website, 2006). In order to promote regional collaboration, CILSS established a permanent secretary within each member state, known as the *Comités Nationaux du CILSS* (CONACILSS) that can liaise between the national governments and the regional institution.

The political actors in agricultural policy-making also include the *Chambres d'Agriculture*. The were promoted through a multi-donor funded project known as the *Projet pour le renforcement de l'Interface entre Etat et Chambre d'Agriculture de l'Afrique de l'Ouest* (PRIECA/AO). The Conference of the Agricultural Ministers CMA/AOC is attempting to improve relationships with national *Chambres d'Agriculture* and thereby encourages a participatory approach to the elaboration and implementation of agricultural programs and policies within the region (Bingen, 2004).[23] Since the mid-1990s, the Food and Agricultural Organization (FAO) has helped to establish *Chambres d'Agriculture* within West Africa based on the concept of decentralized decision-making, promoting agriculture as a profession, and ensuring the *Chambres*' participation in agricultural policymaking. Currently, seven countries have national legislation that allows for the creation of a Chambre: Benin, Burkina Faso, Côte d'Ivoire, Guinea, Mali, Niger, and Togo. Since these Chambres are often run by civil servants seconded from the agricultural ministries, there is suspicion of their motives by leaders of autonomous producer organizations (Bingen, 2003). According to Bingen (2003), they also lack the necessary analytical capacity to serve as effective technical and advisory bodies to farmers. Via the PRIECA/AO project mentioned above, these national *Chambres* have also organized into a regional network of agricultural chambers, known as the *Réseau des Chambres d'Agriculture de l'Afrique de l'Ouest* (RECEAO). Created in 2001, RECEAO aims to liaise between regional intergovernmental organizations as well as the public and private agricultural sector. Training, studies, political advocacy, information, and communication represent RECAO's major activities (CMA/OC website, 2006).

Another regional organization is Interface, which is a network of agri-business groups across 14 countries: Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Mali, Mauritania, Niger, Nigeria, Senegal, and Togo. Created in 1997, the two major goals of Interface are to increase collaboration amongst agro-business enterprises so as to augment their managerial and institutional capacity and promote a business environment that is conducive to entrepreneurship development at the

[23] Ibid

regional level. Awareness of Interface's activities has increased over the years via the organization's involvement in important regional and international forums as well as its membership in CORAF's General Assembly (Bingen, 2003.[24]

6.4 Sub-regional initiatives for agricultural policy

UEMOA (PAU)

Given the uniform importance of agriculture to the livelihoods of West Africans, the sector remains the focus of a variety of sub-regional initiatives. The earliest of these initiatives was PAU, the common agricultural policy of UEMOA (the *Politique Agricole d'UEMOA* (PAU), which was adopted by the Heads of State of the eight member countries in December 2001. The three main objectives of the PAU are: 1) achieving food security by reducing food dependency and making agricultural markets more operational; 2) increasing agricultural productivity and production in a sustainable manner; and 3) improving the living conditions of producers through the enhancement of their income and social status and the development of the rural economy (UEOMA, 2001).

In drafting the PAU, UEMOA adopted a participatory process involving a series of consultations. First, a baseline study was conducted by a mixture of international and regional consultants who met with a broad range of stakeholders in each member country to uncover key concerns and priorities. After a draft document was completed, it was submitted to a Scientific Board comprised of high-level African and European researchers. The report of the Scientific Board was subsequently submitted to the three main organs of UEMOA who incorporated their comments into the report. Between July and August, 2001, a national workshop was held in each of the eight states and a final report was presented at a regional workshop in Ouagadougou in October 2001 where ROPPA offered extensive comments. Finally, a draft bill that included the objectives and intervention areas of the PAU was submitted to experts and ministers in charge of agricultural and animal resources and ultimately adopted by the Conference of Heads of States and Governments.[25]

ROPPA confirmed that they were highly involved in the crafting of this policy and that they presented two main demands during the regional workshop, both of which were incorporated into the PAU: an emphasis on family farming and the establishment of a regional fund for agricultural development. On the other hand, ROPPA was generally displeased with the adoption of this common agricultural policy *after* the implementation of a common external tariff (CET) within the UEMOA member states in January 2000. The CET stipulates the adoption of a uniform tariff structure whereby the maximum import tariff is 20 percent, lower than what most states previously applied. As such, the producer organizations believe that the goals of UEMOA are undermined because

[24] Interview with Interface representative, June 27, 2006; Interface presentation pamphlet, "Interface-Network of African Agro-Food Industry Professionals: Working towards a prosperous Africa";

[25] Ibid ; Interview with officials from UEMOA, June 30, 2006.

farmers are more vulnerable to the importation of lower-priced, subsidized goods from overseas.[26]

Officials from UEMOA claimed that the next step is to actually implement the PAU and that they are in the midst of creating a Regional Agricultural Development Fund to finance it.[27] This conclusion is rather surprising considering that the policy is almost five-years-old but it was nonetheless confirmed by a number of interview participants who were aware of the PAU's existence yet unsure of its practical meaning. Perhaps due to the controversy over the CET, one participant even believed that the policy's main focus was agricultural trade rather than an identification and achievement of regional agricultural objectives.[28]

ECOWAS (ECOWAP)

By January 2005, the heads of states and government of the ECOWAS member countries had accepted another agricultural policy for the sub-region, known as the Agricultural Policy of the Economic Community of West African States (ECOWAP). This policy is the West African version of the broader Comprehensive Africa Agriculture Development Program (CAADP) implemented under the auspices of the New Partnership for Africa's Development (NEPAD). This strategy also affirms the centrality of family farms and emphasizes each country's ability to exercise its sovereignty with regards to achieving food security. The operation plan to implement ECOWAP was adopted in May 2005 and a program of investment is currently underway (ECOWAS, 2005).

Although ROPPA claims that approximately 70 percent of their recommendations were incorporated into ECOWAP, they were disappointed to learn that in January 2006, the Heads of State and Governments of ECOWAS (see Table 6.2) decided to extend the CET for UEMOA to the ECOWAS states. This decision was mainly taken to proceed with the goal of regional economic integration as well as to preclude smugglers from benefiting from differential tariff rates within the ECOWAS zone. In the opinion of producer organizations, however, this decision undermines ECOWAP's emphasis on food self-sufficiency and increasing small farmers' incomes because it may facilitate the importation of food imports. ROPPA's Burkinabè member, the CPF, also expressed displeasure with the lack of transparency in the process of making this decision. Indeed, the choice to adopt the CET was not debated in the parliaments of any of the ECOWAS states.[29]

Nevertheless, ECOWAS has proceeded with designing a roadmap for the introduction of the CET, which is expected to become operational in January 2008. The objective is a four-band tariff regime that will range from 0 to 20 percent for certain categories of goods imported from non-ECOWAS countries. Contrary to ROPPA's

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[26] Interview with ROPPA members, July 5, 2006 ;
ROPPA, "Conclusions de l'atelier regional sur la Politique Agricole de l'UEMOA, " Ouagadougou, October, 2001. http://www.roppa.info/old/doc/roppa_conclusio_pau_041001.pdf
[27] Interview with officials from UEMOA, June 30, 2006.
[28] Interview with member of Senegal's National Biosafety Committee, June 24, 2006.
[29] Interview with ROPPA members, July 5, 2006.

fears, it is also anticipated that additional taxes will be applied to certain goods that threaten the sub-region's agricultural and industrial sectors (ECOWAS, 2003).

In general, the presence of two agricultural policies within practically the same geographic space appears to create unnecessary duplication. However, a representative from UEMOA noted that they are in the midst of working with ECOWAS to ensure the creation of only one agricultural policy for the West African sub-region. Moreover, the objectives of PAU are believed to be consistent with the CAADP, and UEMOA is always invited to those NEPAD meetings discussing the CAADP. Of course, the agricultural ministers of the UEMOA countries are also members of ECOWAS and are therefore aware of developments within both organizations.[30] Nevertheless, concrete examples of harmonization beyond the extension of the UEMOA CET were not provided.

CORAF's Sub-Regional Strategic Plan

According to the interviews conducted, the research community is well-integrated into the formulation of these sub-regional agricultural policies. Since it is considered the technical arm of ECOWAS, CORAF was asked to contribute to certain elements of ECOWAP. In particular, CORAF has been involved in the component of ECOWAP that focuses on agricultural research and technology as well as market integration. This component mirrors the fourth pillar of CAADP at the pan-African level and is referred to as the West African Agricultural Productivity Program (WAAPP) within the sub-region. The WAAPP is currently a five-year plan and is considered the first component of a longer-term plan, known as CORAF's Strategic Plan, which extends until 2015.[31]

The overall objective of CORAF's strategy is "to concentrate investments, research and extension on high potential areas and on crops with the highest comparative advantage, whether food or cash crops, and livestock for local consumption and for export markets" (CORAF, 2003). In defining the priorities for the long-term Strategic Plan, CORAF relied on a very participatory and decentralized approach. The process began shortly after the meeting of the General Assembly in Accra in 1998 where it was decided that a strategic planning process should be launched in three phases. First, there were national consultations in 15 member countries that enabled participants to derive research priorities at the national level and which often used existing national agricultural plans as their foundation.[32] These national priorities were subsequently shared at zonal level consultations that encompassed countries within three separate zones: the Sahel, Central Humid, and West Coastal zones. The consensus from these three zonal conferences was then brought to the sub-regional consultations where a quantitative system was introduced that required participants to rank priorities from 3 (top priority, substantial contribution to development objectives) to 0 (non-priority, no contribution to development objectives). Besides involving all country representatives and scientific

[30] Interview with UEMOA officials, June 30, 2006
[31] Interview with CORAF representatives, June 22, 2006
[32] Some countries were excluded because they were either engaged in or recovering from civil conflict. These included Chad, the Central African Republic, the Democratic Republic of the Congo, Guinea-Bissau, Liberia, and Sierra Leone.

partners, regional civil society organizations, and some members of the private sector and investors were invited to the sub-regional workshop.[33]

According to CORAF officials, harmonizing priorities at the sub-region was a contentious undertaking. Indeed, they noted that these consultations took six days because many members initially adhered to their national priorities. For example, both Mauritania and Chad wanted to increase research on camels but other countries did not believe that investment could be attracted for research in this area. Many Sahelian countries also stressed the importance of sorghum and millet while others believed that these crops should not be priorities since thousands of varieties had already been developed. Although there are now commodity and cross-cutting thematic priorities defined for the sub-region, CORAF has requested IFPRI's assistance in refining these priorities according to their respective economic importance and their potential to improve livelihoods until 2015. Ideally, CORAF aims to implement the Strategic Plan in five-year increments until 2015. This approach will allow CORAF to re-assess the Plan routinely and revise it according to lessons learned.[34]

Awareness of CORAF's agricultural strategy was relatively mixed amongst the stakeholders interviewed. Key regional actors, such as ROPPA, the *Conseil des Organisations Non Gouvernementales d'Appui au Développement* (CONGAD), and Interface all confirmed that they are not only part of CORAF's General Assembly but also that they contributed to the formulation of the Strategic Plan.[35] However, a number of nationally-based civil society organizations and even some members of national agricultural ministries did not even know of the existence of CORAF.[36] Moreover, awareness of their organization's participation in crafting the CORAF Strategic Plan was minimal among some stakeholder groups.[37] This highlights the need for both greater communication by CORAF of its activities and better vertical information-sharing amongst members within institutions who are actively involved with CORAF.

6.5 Analysis and discussion

As can be derived from the earlier discussion, there is a broad array of stakeholders involved in agricultural initiatives within West Africa. Even though the description is not exhaustive, it is clear that there is a growing emphasis on participatory processes. The approaches to achieve participation pursued at the regional level can be analyzed on the basis of a framework on "institutional design space" (Fung, 2006), which distinguishes between the three dimensions of (1) participation, (2) communication and decision mode, and (3) authority and power.

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[33] Ibid.
[34] Interview with CORAF representatives, June 22, 2006
[35] Interviews with ROPPA members (July 5, 2006), Interface representative (June 27, 2006), and CONGAD representative (June 26, 2006)
[36] Interviews with CV-OGM (July 5, 2006), COPAGEN (July 4, 2006), Afrique Verte (July 7, 2006), and Burkina Faso Ministry of Agriculture (July 4, 2006)
[37] Interview with CNCR representative, June 28, 2006

Who participates?
As shown in the previous sections, efforts to achieve an inclusive participation in agricultural policy-making were by all three regional organizations considered here, UEMOA, ECOWAS and CORAF. At this level, involving organized stakeholders, including farmers' organizations, research organizations, civil society groups and private sector organizations appears to be the major model. The fact that all these groups are organized at the regional level appears to be a major factor that facilitates this approach. The fact that these regional organizations exist is, among other factors, the outcome of dedicated efforts by West African governments and donor organizations to foster agricultural producer organizations and *Chambres d'Atriculture,* and to support the emergence of regional networks among them.

While there are considerable efforts to involve professional stakeholder organizations at all levels, and even to support their creation, there seems to be a need to develop more effective feed-back mechanism between the representatives of stakeholder organizations and the constituencies they actually represent. The interviews indicated that representatives of stakeholder organizations where often not aware in which meetings colleagues of the same organization had participated. This even applies to Government Agencies.

The study findings also suggest that elected representatives still appear to play a minor role in agricultural policy-making at the regional level, which points to a possible democracy deficit. This may be related to the fact that neither UEMOA nor ECOWAS has a parliament that is directly elected by the citizens, even though plans for such an institution exist in both organizations.

It is also relevant to note that the interviewed stakeholders, most notably the regional farmers' organization ROPPA, perceives the process of developing CAADP to be the least participatory and most exclusionary of all processes considered here.

Mode of communication and decision-making
An in-depth study on the mode of communication and decision-making in each of the various participatory processes conducted at the regional level could not be carried out in the course of this study. However, it appears that, apart from listening as spectators, the expression of preferences, and to some extent the development of preferences are the main modes of interaction in participatory events. In some instances, interest group aggregation and bargaining also seems to play an important role. An example is bargaining for research priorities within CORAF. Workshops seem to be the most frequently used form of conducting participatory events. The use of decision-support tools, such as multi-criteria analysis (a useful approach for priority setting) does not appear to be widespread. Likewise, efforts to promote citizen deliberation, defined in the sense of deliberative democracy (see, e.g., Gastil and Levine, 2005), appear limited. In deliberative approaches, participants usually absorb educational background materials and exchange perspectives, experiences, and reasons with one another in order to develop their views and discover their interests as individuals. As Fung (2006: 10) notes, "in the

course of developing their individual views in a group context, deliberative mechanisms often include procedures to facilitate the emergence of principled agreement, the clarification of persisting disagreements, and the discovery of new options that better advance what participants value." The format of citizen juries or consensus conferences is useful in this regard. Citizen juries have been tried for specific issues, such as biosafety regulation in Mali, but it seems that the potential of such approaches could be explored more fully.

Authority and power

This dimension of the "institutional design space" refers to the relation between conclusions from participatory events and actual public policy and action. The major approach, so far, seems to be communicative influence and advice and consultation. There is also evidence that such advice is in fact taken into account in agricultural policy-making. For example, as noted earlier, ROPPA claims that approximately 70 percent of their recommendations were incorporated into ECOWAP, the regional agricultural policy of ECOWAS. However, as this example also shows, some rather central policy decisions are made without taking into account stakeholders' objections. Most notably, the Common External Tax (CET) level of UEMOA was applied to the ECOWAS states against the explicit objection of producer organizations, who feel that this decision undermines ECOWAP's emphasis on food self-sufficiency and increasing small farmers' incomes because it may facilitate the importation of food. Institutions of representative democracy were not involved in this decision either, as it was not debated in the parliaments of any of the ECOWAS states.

As indicated above, stakeholder influence on CAADP also seems to be rather limited. ROPPA has openly declared its opposition to the CAADP, which the group views as simply being a reincarnation of the agricultural structural adjustment programs of the 1980s and 1990s. Yet, there is little indication that ROPPA's opinion and that of smallholders more generally has influenced NEPAD in any way to alter the CAADP. Indeed, both producer groups and civil society organizations consistently noted that their impact becomes more muted as decisions move from the national to the sub-regional and pan-African realms.

With regards to agricultural policies at the national level, for example, producers and civil society groups in Senegal were relatively satisfied with how many of their recommendations were included within the agricultural framework law, LOASP. There are also examples that could be described as "co-governance". Most notable is the agricultural advisory and extension body of Senegal ANCAR, in which producer organizations hold a share of 28 percent, alongside the shares of the government, the private sector and local communities. By contrast, producer organizations were disappointed with their impact on Burkina Faso's rural development strategy SDR. Stakeholders in Burkina Faso also criticized the nature of involvement in the Poverty Reduction Strategy (PRS), where civil society groups were told at stakeholder workshops that they could not offer criticisms if they did not propose alternative solutions. Moreover, their suggestions were ultimately relegated to a half-page box within the finalized PRS. In both countries, a main point of contention appears to be the growing

emphasis on agri-business without a clear understanding of how that will affect the future of smallholders.

Although producer groups and civil society organizations are diverse entities themselves with a wide array of opinions and interests that cannot always be taken into account by decision-making authorities, it is important to pay attention to the way and extent to which conclusions from participatory events are translated into agricultural policy, especially at the sub-regional levels. In the past, the lack of organizational strength, especially on the part of rural producers without the capacity for collective action, was deemed a major reason why agriculture did not receive the degree of state attention commensurate with its importance to African economies. Yet, with the growing organizational strength of producers and civil society within Africa over the last decade, their voice within debates over agricultural policies can no longer be ignored. As such, future research on West African agriculture should therefore examine why governments have decided to accept some of the recommendations of these stakeholders while ignoring others. Research may also be useful to identify the priority-setting process within agricultural producer organizations themselves. It appears that farmers' organizations are far more inclined to campaign on issues of agricultural protection (as indicated by the focus on the common external tax) than on issues related to public investment, e.g., in agricultural research, or on making agricultural services and infrastructure provision more effective. This question is rather important, because farmers' organizations as well as other civil society groups could play an important role in improving governance by demanding more transparency and accountability for the public investments made in the agricultural sector.

Challenges of Implementation

Existing gaps in linking the results of stakeholder consultations to public policy and action are aggravated by the challenges of actually implementing the policies that are the outcome of participatory processes.

At country levels, in both Senegal and Burkina Faso, it is evident that current approaches to the agricultural sector have benefited from lessons learned from previous mistakes, such as the excessively quick disengagement of the state without a private sector to fill the gap and the creation of multiple sectoral policies in the countryside with little coordination amongst them. Yet, by incorporating these many lessons into new policies and strategies, both countries may have created overly ambitious goals that cannot feasibly be achieved given existing levels of financial and human resources. Political will may be equally important since the implementation of Senegal's LOASP has been stalled by the lack of pressure for a *Decree d'Application,* and Burkina Faso's interministerial coordination mechanism for rural development (SP-CPSA) cannot depend on government money to implement the SDR.

It is precisely because countries have limited financial and human resources that regional collaboration is offered as a viable alternative. Yet, unfortunately, implementation at the sub-regional level is retarded for similar reasons. Thus, as West Africa continues to pursue a thirty-year quest for regional integration, success with

improving agricultural growth may require identifying a narrow set of issues that affect the most amount of countries, which are informed by researchers as well as producer groups and NGOs and which are supported by coordinated donor interventions and implemented by only one regional economic organization. This may help to realize the benefits of regional collaboration envisioned by ECOWAS and UEMOA.

6.6 Regional integration: Challenges and opportunities

One of the major problems in West Africa does not seem to be convincing countries about the benefits of regionalism but ensuring that these benefits are not undermined by duplicate activities. The traditional challenges of multiple memberships in different economic organizations and poor donor coordination appear to underlie the emergence of duplicate agricultural policies and bio-safety frameworks from ECOWAS and UEMOA. Both organizations have deemed the harmonization of agricultural policy a priority, and this seems to be a realistic goal given that the PAU is not fully implemented and given that ECOWAS has decided to adopt UEMOA's CET. Research institutes can further encourage harmonization efforts by ensuring that the results from its economic and scientific studies are disseminated in a forum where representatives from both organizations are present. In the interim, however, it appears that ECOWAS' greater geographical coverage and mandate from NEPAD will continue to be balanced against UEMOA's greater efficiency and implementing authority. Since donor organizations play an important role in supporting regional organizations in West Africa, improved donor coordination can also help to avoid duplication of initiatives.

Acceptance of NEPAD's CAADP and adoption of a PRSP are some of the factors influencing the priority accorded to agriculture within a number of West African countries. The result has been the development of the LOASP in Senegal and the SDR in Burkina Faso, both of which were only finalized after a two-year period of consultations. Yet, the common complaint in both countries is that these approaches do not constitute a coherent, strategic vision for the agricultural sector with clearly defined objectives.

Given this fact, perhaps it is not surprising that sub-regional agricultural strategies and policies, such as the PAU and the ECOWAP, are only partially built on existing national policies. Instead, sub-regional organizations tend to conduct new studies and new workshops to identify agricultural priorities. CORAF's priority-setting approach, which started with national and zonal workshops before moving onto sub-regional meetings, seems to be a sensible means by which to determine those issues that continue to remain salient as the level of analysis moves from the micro to the macro levels. Attention to where funding opportunities seem most promising was also a criterion for determining priorities.

6.7 Summary

In conclusion, the study has shown that there is a variety of promising initiatives in the region to make agricultural policies as well as agricultural research policies more evidence-based and participatory, and to use the benefits from regional integration. The study has also highlighted a number of challenges, which need further attention. Major challenges include the link between participatory processes and actual public policy, the implementation of agricultural policies and strategies, the effective use of research-based

knowledge in participatory policy processes to create transparency and accountability, the coordination of various parallel policy initiatives at the regional level, the development of the institutions of representative democracy at the regional level, and the participation of stakeholders in agricultural policy initiatives developed at the pan-African level. There is a variety of institutional options and approaches that could be used to meet these challenges, which may be explored in future research. They include, for example, using approaches of deliberative democracy to improve stakeholder participation, and improving the availability of research-based knowledge on agricultural policy in consultative processes.

7. Conclusions and Policy Recommendations

The analysis of this report has suggested that while there are daunting challenges to improving the performance of the agricultural sector in West Africa in order to meet the MDG One, it is not an impossible task. The region will require a growth rate of 6.8 percent per year on average. This varies widely across countries, however. Some countries, e.g. Ghana, are already on track to meet MDG One at current growth rates. Stimulating the required agricultural growth rates is possible, especially if the full potential in productivity improvements can be realized. A majority of countries could witness agricultural growth rates above 5 percent and almost half (9 countries) could achieve agricultural growth rates above 6 percent.

The study has been motivated by these regional potentialities for agricultural growth and poverty reduction in the West and Central Africa region. The most immediate aim of the report, however, has been to identify a set of alternative development priorities for agriculture that cut across West Africa, at both the country and regional level. It is intended to help delineate the context in which organizations such as ECOWAS and CORAF, including their national and regional development partners, might position their own strategies, objectives and action plans. This is especially timely as these partners seek to align their strategies with the Comprehensive African Agricultural Development Partnership (CAADP) of the New Partnership for Africa's Development (NEPAD).

Based on the results of analysis, a combination of policy and investment measures emerge for policy makers to consider and summarized to include: [38]

1. ***Spur productivity growth, focusing on sub-sectors with high demand within West Africa***

- The importance of agricultural sub-sectors in relation to overall growth varies across countries and major zones (e.g., coastal versus Sahelian), given different agro-ecological, physical, and social-economic conditions. The model analysis details such variations. This emphasizes the importance of priority-setting at the country level.

- Keeping such variations in mind, rice seems to have the highest potential for growth and subsequently could generate the greatest producer benefits for many countries. Rice could be thought of as a region-wide strategic commodity. To take advantage of its potential, joint investments in rice research and development at the regional level can provide even higher returns given its potential for transferability across borders.

- Livestock also proves to be an important and strategic option for generating growth, especially for the Sahelian zone. The analysis shows that if the

[38] More detailed crop specific rankings based on various economic criteria and other considerations for research (R&D) are summarized in **Table 7.1**.

livestock sector grows at the same rate as that projected for the crop sector, it would contribute the most to total agricultural growth in the Sahel. This is primarily because of the sheer size of this sector in the economies of most Sahelian countries.

- In the Coastal and Central sub-regions, sub-sectoral contributions to total growth are much more diverse while the contribution from growth in root crops seems to be relatively important in many countries. Root crops contribute to more than one-third of agricultural growth in Ghana, Benin, Togo and Nigeria and 11–15 percent of growth in Sierra Leone and Côte d'Ivoire. Finding foreign markets for these crops, e.g. Asian markets, will be important for future growth.

- Traditional export crops, such as cocoa in Côte d'Ivoire and Ghana and cotton in Benin and Mali, continue to play important roles in West Africa's agricultural growth. However, diversification in these commodity markets is critical as current OECD market demand elasticity is low. Exploring other market opportunities, including those in some Asian countries like China and India and emerging East European markets, will be a necessary condition for continuous growth in the production and exportation of these commodities.

2. *Strengthen regional agricultural markets, trade and economic integration*

- To enhance the integration of the regional economy, both joint public investments (such as in R&S and infrastructure) and improvements in market conditions and trade policy are important. Agricultural productivity growth will need to be supported by market development.

- The analysis shows that staple crop and livestock growth depends not only on technology to generate high productivity growth, but also on regional integration in both commodity and input markets. Improving market conditions and trade policies has proven to be an important source of agricultural growth as market investments and reforms will expand regional and domestic demand. West Africa as a whole is a net importer of rice and livestock products. Increased supplies of rice and livestock products, through productivity growth, can easily find markets in the region if market and trade conditions are improved.

- West African countries also need to diversify their total agricultural exports. Analysis shows that better market and trade conditions, together with increased productivity, significantly increase trade in nontraditional agriculture, including the many commodities that are staple food in the region. The creation of such trade, and its diversification, helps agricultural growth and also reduces the risk from concentrating in very small numbers of agricultural export commodities

3. *Enhance linkages between agricultural and non-agricultural sectors*.

- In areas where transport costs and other structural factors prevent local economies from reaching outside sources of demand for local products, the strongest links between agricultural and non-agricultural sectors spring from the production and consumption of non-tradable commodities.

- Determining links to agro-industries is also important (e.g. for processed foods, feed, and intermediate products). Three related sets of measures would be needed over time: first, the growth of agro-processing, distribution, and farm-input provisions off-farm; second, institutional and organizational adjustments in relations among agro-industrial firms and farms such as greater vertical integration (this may involve producer organizations, cooperatives as well as contract farming); and third, concomitant changes in product composition, technology, and sectoral and market structures.

4. Exploit opportunities for greater regional cooperation and harmonization

- Growth needs to be supported by public investment. To make agriculture grow more rapidly to meet MDG One, huge investments in agriculture are needed. Expenditures will need to increase from the current base of $6.6 billion (2004) to $8 billion by 2008 and reach $31.8 billion by 2015, amounts equivalent to an annual growth of 20 percent over a 15-year period.

- Effective institutions at both country and regional levels are important preconditions for promoting agriculture growth and regional integration through greater cooperation and harmonization of policies and strategies. By demanding transparency and accountability, farmers' organizations and civil society groups can play an important role in improving the governance of agricultural sector institutions, such as agricultural advisory (boards?) and other rural services.

- As West Africa continues to pursue a thirty-year quest for regional integration, successfully improving agricultural growth may require identifying a narrow set of issues that affect the greatest number of countries. These issues should be informed by researchers as well as producer groups and NGOs, supported by coordinated donor interventions and implemented by either one regional economic organization or several organizations closely coordinated with clear divisions of responsibilities. This would help to realize the benefits of regional collaboration envisioned by ECOWAS and UEMOA. Donor coordination can help to reach this goal.

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APPENDICES

APPENDIX A
Overview of Analytical Approaches

The report's strategic perspective is built on three interlinked features of the analytical approach. First, using geographic information systems (GIS) methods, the analysis spans all West African countries thereby permitting simultaneous focus on both national and regional phenomena. Second, using a dynamic economic model of agriculture in West Africa known as a multi-market model, the analysis takes in numerous agricultural and non-agricultural sub-sectors while simultaneously tracking broader economic conditions in a forward-looking setting. Third, using a model that quantifies impacts of productivity-enhancing investments in agricultural R&D known as the Dynamic Research Evaluation for Management (DREAM) model, the analysis explores the potential returns to regional cooperation in agricultural development. This chapter describes the GIS methods, the multi-market model, and the DREAM model. The aim is not to detail all technical matters pertaining to these analytical frameworks, but rather to build understanding of why these approaches were taken, and what was gained from their application. Details about all three frameworks are provided in the Technical Annex to this report.

1. Spatial Analysis Using Geographical Information System Methods

Formulating and evaluating agricultural development strategies for a region as large and diverse as West Africa is extremely challenging, requiring multiple perspectives and judicious simplification. One set of approaches involves gaining a better appreciation of the regional patterns of agriculture and of agricultural development challenges and opportunities using geographic information system (GIS) tools and databases. Visualizing similarities and differences in the context of agriculture across the region is a powerful means of focusing attention on areas and issues that span national borders.

Many types of spatial analysis and mapping are feasible. The current analysis focuses on just two perspectives. First, the spatial extent, distribution, and intensity of cropland and rangelands across the region are illustrated, juxtaposed with some key regional resource and infrastructure features. Second, the region is disaggregated into geographical units (termed "development domains") in which similar agricultural development problems or opportunities are likely to occur.

A key goal is to use a single set of domain criteria, and to apply them consistently across the region. Only with such a consistent approach can the true similarity or dissimilarity of conditions existing in one country be properly compared and contrasted with those in another. These development domains permit consideration of the following issues: Where are those geographic areas within and across countries in West Africa in which development problems and opportunities are likely to be most similar? Where will specific types of development policies, investments and livelihood options, and

technologies likely be most effective? Given proven development successes from any given location (or beyond) West Africa, where in can similar conditions be found in the region?

The analysis is therefore most concerned with the geographies of attributes that constrain or enable different agricultural development options. Based on empirical research findings both within and beyond the West African region the three specific attributes used for defining development domains are: agricultural potential, market access, and population density. While the agricultural potential of any location is a strong indicator of its absolute advantage in agricultural production, the extent to which this might actually be realized—i.e., its comparative advantage—is conditioned by other factors of which market access and population density have been shown to be reliable predictors (Pender et al., 1999).

Beyond mapping development domains assembled on the basis of these three factors, empirical evidence is used to explore which specific strategies are both feasible and advantageous in each domain. The locations and types of opportunities identified by this spatial analysis approach are then used to guild the economic analysis described the following section (2.2). The economic analysis yields insights into agricultural and overall economic implications of alternative agricultural investment strategies at regional, national, and sub-national levels. The complementary role of the domain analysis is to provide a visual, cross-cutting basis for examining where such investments may be most appropriately targeted. Some domains may physically span country boundaries, while others may manifest themselves as distinct areas within individual countries. The key recognition is that each domain category is defined in the same way across the region. As will become clear, this opens scope for identification of truly "regional" agricultural development strategies. (Again, would be well-suited for body text. It's tying chapter 4 in with the rest of the report and gives the "why" behind the whole chapter.)

Data used in the spatial analysis are drawn from a wide variety of secondary sources. Satellite-based interpretations of topography and land cover are from the Global Land Cover 2000 Project, the US National Geospatial-Intelligence Agency (NGA), and the US National Aeronautics and Space Administration (NASA). Population density and human settlement data come from the Center for International Earth Science Information Network and IFPRI. Road infrastructure data are from the US National Imagery and Mapping Agency and IFPRI. Spatially interpolated rainfall and climate station data are obtained from the University of East Anglia. Regional soil and protected area maps are compiled and harmonized from national sources via FAO and the UNEP World Conservation Monitoring Centre. Biophysical crop suitability information is from the International Institute for Applied Systems and FAO.

2. Economywide, Multimarket (EMM) Modeling

The fundamental aim of an economywide multimarket model is quantification of the economic implications of alternative policy decisions or scenarios. They do so by quantifying direct effects on supply, demand, and trade of commodities in several

interlinked markets, and, where possible, by estimating the impacts on household incomes that these market effects elicit.

Most multi-market models focus on particular segments of economies. The model developed for this study focuses on agriculture but puts the agricultural sector in an economywide context. The model includes the following 40 agricultural commodities and commodity groups: cereals (maize, rice, sorghum, millet, barley, wheat, other cereals), root crops (cassava, potatoes, sweet potatoes, yam, and other roots), pulses (beans and other pulses), oil crops (groundnuts, soybeans, and other oil crops), traditional export crops (cocoa, coffee, cotton, tea, and tree nuts), nontraditional export crops (exportable vegetables and exportable fruits), other high value crops (vegetables mainly for domestic markets, fruits for mainly domestic markets, plantain/banana, oil palm, sugar, and rubber), livestock (cattle, goat and sheep, beef, sheep/goat meat, poultry and egg, other meat, milk, and fish), vegetable oil, and other processed food. The model also includes two aggregated non-agricultural sectors thereby permitting capture of linkages to other segments of national and regional economies.

National-level agricultural production, consumption and trade data are from the country, if possible, or from United Nations Food and Agriculture Organization; non-agricultural data are from the World Bank's Word Development Indicator series. Employing GIS methods, a range of economic data are further disaggregated using GIS information. The model therefore permits analysis at multiple levels: regional, national, and sub-national.

Integration of biophysical and socioeconomic information occurs at the sub-national level. For each West African country, 12 potential sub-national areas are defined based on combinations of the presence or absence of irrigation (yes or no), the market access condition (easy to access to ports for exports, easy to access to domestic markets and difficult to access to domestic markets) and population density (high and low). Moreover, each of the 20 West African countries included in the model is further identified into Sahelian, Coastal, and Central regions to partially capture different agroecological conditions across countries. Further details on the classification scheme are provided in Chapter 4.

The production side of the model is based on sub-national information on the spatial distribution of agricultural production (for all 40 commodities mentioned above). National production is derived by summing up from sub-national production.
The consumption side of the model is based on national-level information on commodity demand for key commodities based on population and income levels, disaggregated into rural and urban segments.

The model combines national production and consumption data and solves for optimal level of commodity supply and demand. If supply and demand relationships imply the need to trade (either import or export), prices will be those on world market corrected for market transaction costs (including market barriers). When imports are implied, domestic prices equal world prices plus marketing costs; when exports are

implied, domestic prices equal world prices less marketing costs. If supply and demand relationships imply no trade, then prices are determined within countries.

Regional levels of variables are aggregated from national totals. While the model cannot specifically capture trade flows among the countries within the region, it can identify total regional demand and supply and net trade flows at the regional level, based on national exports and imports of traded commodities.

3. The Dynamic Research Evaluation for Management (DREAM) Model

A central idea in this report is that West African countries might be missing important opportunities to benefit from regionally coordinated national agricultural development efforts. The regional multi-market model of West African agriculture does not include sufficient detail about a range of important variables to permit examination of such potential. Especially lacking in the multi-market model is detailed information about agricultural production technologies, and about scope for agricultural technology development and dissemination. This gap precludes analysis of the impacts of regionally coordinated efforts to promote productivity growth in West Africa. IFPRI's Dynamic Research Evaluation for Management (DREAM) model is ideally suited to that purpose.

The DREAM model allows and accounts for two impact mechanisms arising as a consequence of technical change through farm-level adoption of improved technologies or practices. Essentially, the model can estimate shifting supply and demand curves over time to solve for a stream of equilibrium prices and quantities under a "without" and "with" research or technology scenarios, where both price and technology effects on economic welfare can be measured. A technology-induced supply shift represents the "with" research outcome and permits quantity changes that may or may not influence prices depending on whether the country is a small or large producer of the commodity.

The model's special advantage is that it can accounts for details about research and technology adoption: time lags, technology induced supply shifts, probability of success, diffusion over time, and so forth. It also allows technologies themselves to "spillover" from one region or country to another and to be adopted in recipient regions/countries. The spillover process provides additional economic benefits (and losses) over and above those arising from commodity trade alone. Technology spillover benefits have been shown to account for half, and sometimes more, of the total benefits of agricultural research (Alston 2002).

Technology spillovers in DREAM account for time lags and differences in the use or effectiveness of a technology between regions/countries. For example, a new pest resistant variety of maize might be developed in Benin. Adoption of this variety in Nigeria might increase maize output and place downward pressure on maize prices everywhere. It might also reduce maize imports and have a negative impact on producers in Benin, for example. However, assuming regional institutional and regulatory processes can be put in place, the germplasm itself could be utilized in Benin and in other countries in the region. This would involve additional lag times in the transfer process, and

different levels of adaptation or different agronomic packages to be developed in different "spillin" locations. DREAM helps analysts examine the pattern of potential sub-national, national and regional benefits and costs of alternative technology development and deployment strategies. In particular, it helps to estimate the distribution of economic gains across countries from greater regional cooperation in agricultural research, rather than investing in expensive national research programs for which countries may have limited capacity to do it alone.

APPENDIX B
Estimating Consumer Demand Dynamics in West Africa

In order to better understand potential future demand patterns for basic food staples in West Africa, a demand analysis of households in three West African countries (namely: Mali, Ghana and Senegal, for which household survey data was available at the time of this study) is undertaken. Although the household survey data is from different time periods, it is still comparable for our purposes. Mali and Senegal's household surveys were conducted in 2001, while the most recently available household survey in Ghana was conducted in 1998/99. While consumer preferences can be country-specific, experience indicates that household income tends to be an important factor in determining a country's consumption patterns and changes. For this reason, we first report household per capita annual total expenditure for each country in Table 3.4.1, and the total expenditure is used as a proxy for disposable income. Household per capita income is further grouped according to five quintile groups for each country and for rural and urban households separately. Each quintile group has roughly 20 percent of the total population, and total population can either be a national total (for the five national quintile groups), a rural total (for the five rural groups) or an urban total (for the five urban groups).

In terms of per capita total expenditure at the national level, Ghana has the highest per capita income at $369 a year, followed by Senegal at $212 and Mali at $186 (Table 3.4.1). There are significant income and expenditure gaps between rural and urban sectors. Within a year, the average urban consumer consumed more than twice that of the average rural consumer.

A significant income and expenditure gap also exits among the five quintile household groups within each country. Within the rural households of the three countries, the average consumer in the richest 20 percent spent 5–6 times that of the average consumer in the poorest 20 percent. The richest 20 percent had 45.8–46.7 percent of the national income (measured by total expenditures), while the poorest 20 percent had only 3.2–4.0 percent (Table 3.4.2).

Consumption patterns vary among income quintiles, especially between the lowest four and the highest quintiles. For example, the richest 20 percent of household food expenditure accounted for 62 percent of total spending in Mali (Table 3.4.7(e)), 51 percent in Ghana (Table 3.4.7(b2)), and 53 percent in Senegal ((Table 3.4.7(c2)) (tables located in Appendix). The remaining 80 percent of households spent 72–80 percent of their income on food in Mali, 57–64 percent in Ghana, and 62–66 percent in Senegal.

Different consumption patterns also appear within food spending. Poor households spent more on coarse grains (like maize, millet and sorghum) in Mali and Senegal, and more on coarse grains and root crops in Ghana. In Mali, millet accounted for more than 30 percent of the total spending of the poorest 20 percent of households, and only 6 percent of total spending of the richest 20 percent of households (Table 3.4.7(a1)). In Ghana coarse grains and root crops accounted for 15 percent of the poorest

20 percents' total household spending, and only 7.7 percent of the richest 20 percent's total household spending. (Table 3.4.7(b1)).

There are substantial differences among existing patterns of rice and livestock consumption across countries. In Mali, the richest 20 percent of households spent 11 percent of their income on rice compared to 5.2 percent by the poorest 20 percent. On the other hand, in Senegal the rich spend much less on rice, 5.4 percent, while the poor spend 13 percent. In Ghana, there is no significant difference in rice spending between the poor and the rich as both spend around 3 percent of their income.

The above discussions are based on calculated average budget shares (ABS) for different household groups. The ABS is the share of total current income actually spent on each commodity. To capture the dynamics of consumption patterns, it is also necessary to look at the marginal budget share (MBS), which is the share of each additional unit of income likely to be spent on each commodity. Comparing MBS with ABS can help us understand which commodities households would likely prefer to consume as their income increases.

The MBS needs to be econometrically estimated using complete household survey data. It is often country specific, but can also be defined for different income groups within a country. We focus on three groups of commodities, coarse grains, rice and wheat, and livestock products, displayed in Figure 4.4.1 for the discussion. In West Africa, the value of MBS is significantly smaller than ABS for the coarse grains, including maize, sorghum and millet. This result indicates that for every dollar of increased income, households would spend proportionately less of their new income on coarse grain consumption and more on other commodities. In Senegal, the MBS of coarse grain consumption is negative in the lowest four quintile groups, indicating a shift of consumption away from coarse grains as poor household incomes increase (Figure 4.4.1, three charts in the first column).

The dynamics of livestock consumption paint a completely different picture from the dynamics of coarse grain consumption. As depicted in the same figure (Figure 4.4.1, three charts in the third column), the MBS value is much greater than the ABS value in livestock consumption, which implies an increase in demand for livestock products as incomes rise. In other words, livestock products are high income elastic commodities. However, it should also be noted that the richest quintile group has a much smaller difference between MBS and ABS; the value of MBS is even smaller than that of ABS in Mali. While rich households currently spend much more on livestock products (as shown in the figures), they will not increase their consumption dramatically as their incomes continue to grow.

Patterns of rice and wheat consumption seem to fall in the middle of patterns of coarse grain and livestock consumption, i.e., the value of MBS is generally greater than the value of ABS for the low-income groups, but smaller than the value of ABS for the high income groups (Figure 4.4.1, three charts in the second column). However, the differences between the values of MBS and ABS are much smaller in the rice and wheat

group which indicates that households will spend a similar portion of their income on rice and wheat consumption as their incomes increase.

Declines in marginal propensity for consuming the MBS of some staple crops (e.g., coarse grains) may generate misconceptions regarding market opportunities. For example, the MBS for millet is more than 10 percentage points below the average budget share (AMB) for Mali at the national level (2.2 vs. 12.5 percent). Does this imply an absolute decline in millet consumption in the country if per capita income rises? To answer this question correctly, we need to analyze the absolute consumption patterns by income groups in additional to looking at the spending share across commodities. According to Mali's household survey data used in this study, the country spent a total of 240 million $US on millet consumption in 2001, including farmers' home consumption. Products processed with millet are included too. Surprisingly, both rural and urban households in the highest income quintile consumed more millet than those in the other four low-income quintiles. As shown in Table 3.4.9(a) and measured by the commodity value, the richest 20 percent of national households consumed 22 percent of the millet available in the country. On the other hand, the poorest 20 percent of national households consumed only 15 percent of national millet in value terms.

The national average expenditure on millet consumption is $23.1 per person a year in Mali, and $33.1 for the rural households in the highest income quintile. In comparison, a person in an average rural household belonging to the lowest income quintile spent only $12.9 on millet consumption (Table 3.4.9(b)). A similar situation occurs within the other two countries. For instance, in a year's time in Ghana, the average person in the richest rural household group spent $14.7 on maize while the average person in the poorest group spent only $6.1 on maize (Table 3.4.10(b)). In Senegal, the average person in the richest rural household group spent $17.4 on sorghum and millet while the average person in the poorest group spent $6.1 in a year (Table 3.4.11(b)).

Both budget share and absolute spending analyses seem to suggest that domestic demand for staples in many West African countries will have to increase rapidly if growth is to be pro-poor. Rapid growth is needed given the huge consumption gaps of staple foods between the rich and poor. If growth favors the rich, market opportunities for many staple foods will be limited. Wealthier consumers generally prefer to spend more on high value and processed agricultural commodities and even more on nonagricultural commodities like industrial goods and services. This analysis helps to illustrate that market opportunities for agriculture, especially for staple foods and livestock sectors, depend critically on broad-based agricultural growth. This can directly increase the incomes of the majority of farmers and thus increase their consumption levels. When broad-based agriculture growth is rooted in increased agriculture productivity, food prices can decrease without lowering farmers' incomes. Poor urban consumers will also benefit from cheaper prices further increase consumption levels.

APPENDIX C

Opportunities for Regional Livestock Trade in West Africa[39]

Livestock is one of the commodities that contribute the most to agricultural growth in West Africa. This activity is particularly important in the Sahel, where trade of live animals is one of the most valued commodities in regional markets, linking the Sahelian economies with coastal countries and expanding demand opportunities for livestock producers. Figure C1 below shows regional exports of live animals from the three main exporters: Burkina Faso, Mali and Niger. The average value of regional exports of live animals from these countries during 2000-2003 was US$134 million. Exports for these three countries expanded from US$45 million in 1970 to a peak of US$190 million in 1980 but in the past 20 years, growth has been low and trade fluctuated around an average of about US$126 million.

Several factors could be explaining the slow expansion of trade in the region. Droughts occurred in the early 1970s and early 1980s that severely affected livestock production. According to Williams et al. (2006), cattle population declined significantly in Burkina Faso, Mali and Niger by 1975 opening the regional markets to substantial extra-regional imports of frozen meat. Macroeconomic policies implemented in the region also had a negative effect on regional trade. These policies included currency overvaluation, price controls, and tariff barriers that resulted in negative impacts on the livestock sector. A third factor that negatively affected regional trade possibilities was the availability in coastal markets of cheap meat imports from the European Union (EU). As a consequence of these adverse factors, livestock exports from Sahelian to coastal countries dropped significantly while imports of frozen beef, mainly from the EU, increased from 16% of total imports in the mid 1970s to 44% by the end of 1980 (Williams et al., 2006).

By the mid 1980s, most countries in West Africa changed their macroeconomic policies (macroeconomic stabilization, currency devaluation, elimination of controls on livestock markets and reduction of trade taxes) and new possibilities opened for regional markets, with exporters finding a more favorable environment to expand regional exports. Also favorable for regional meat markets was the policy change in the EU, where export subsidies were reduced. Even though these changes had a positive effect on the region allowing stabilization of livestock markets, they did not result in substantial changes in the rate of growth of regional trade in live animals. Williams et al. (2006), mention “institutional barriers to livestock marketing [that] are often underrated at considerable cost to livestock sector development” as an explanation of the limited response of regional livestock markets to a more favorable macroeconomic environment. Among these barriers these authors highlight transportation and handling costs for cross-border livestock trade that are three times higher than equivalent costs within countries. Other factors affecting trade according to Williams et al. are the lack of credit and market information for exporters.

[39] Contributed from a paper by Alejandro Nin-Pratt

Given the importance and the potential contribution of livestock to agricultural growth in West Africa, this study focuses on the analysis of trade flows of live animals to determine the region's potential for trade in live animals. Specifically, we identify the factors that affect trade, and quantify the response of regional trade flows to changes in these factors. Our results confirm some of the findings in Williams et al. (2006), showing the significant effect that transaction costs, and trade barriers between countries in the region have on regional trade. Results also show that in the long run, productivity growth in the Sahelian countries will be needed if these countries are to respond to a growing demand in coastal countries while facing increasing competition from outside the region and from domestic production (poultry and pork) in the coastal countries. In the next section the methodology used in the analysis is presented, followed by the analysis of results and conclusions.

Methodological approach

According to Cheng and Wall (2005), since Newtonian physics were successfully applied to the study of human behavior in the XIX century, the so-called "gravity equation" has been extensively used in social science and in particular in the analysis of several types of inter-regional and international flows including labor migration, and trade. The gravity model for trade is analogous to Newton's gravity law in mechanics: the gravitational pull between two physical bodies is proportional to the product of each body's mass divided by the square of the distance between their respective centers of gravity. The analogy for trade states that the trade flow between two countries is proportional to the product of each country's "economic mass", divided by the distance between the countries respective "economic centers" of gravity (generally their capitals), which approximates trade costs and has a negative effect on trade. In other words, the standard gravity framework assumes that economic mass and commercial distances are key determinants of bilateral trade flows. These relatively simple models have been remarkably successful in explaining actual bilateral trade flows (Greenaway and Milner, 2002).

Although it is intuitively plausible that bigger countries located closer to each other are likely to trade more with each other, until recently the gravity model was not explained in terms of the determinants of trade as established by trade theory: technology, factor endowments, demand differences, etc. In the past years this shortcoming has been addressed by several papers beginning with Anderson (1979). These papers provided theoretical underpinnings for gravity's forces of resistance and mass, showing that the gravity equation can be now supported not by one but several different theoretical approaches (Evenett and Keller, 1998).

The standard version of the model has bilateral total trade between countries as a function of the product of their GDPs and the geographical distance between them. This relationship is expressed in linear form using the logarithm of these variables. The standard model is generally enriched with additional variables given that there is a huge amount of variation in trade they cannot explain. As the standard model provides a reasonable neutral base as to what levels of trade should be, variables are added to test for specific groups of countries between which trade is believed to be unusually high or low.

For this study, we specify the gravity model using variables that capture the size of demand and supply of live animals in different countries. It is assumed that imports of live animals are proportional to the size of the urban population and income per capita in the importing country and to the volume of meat production in the exporting country. The latter is represented by the size of the animal stock (number of heads) and the yield per animal (meat produced per head of animal stock). Urban population and income in exporting countries are also included as variables representing the size of the domestic market of exporting countries. A large domestic market is expected to have a negative effect in the capacity of countries to export live animals.

It is also assumed that trade of live animals is affected by the comparative advantage of the importing and the exporting countries to produce animal products, which is captured in our model by the ratio of crop to livestock production. The larger the crop production is relative to livestock production, the larger the imports of live animals expected in importing countries and the smaller the exports from exporting countries. In other words, the ratio of crop/livestock production included as a variable in the gravity regression is expected to have a positive sign for the importing country and a negative sign for the exporting country. In the case of the importer, a variable measuring the volume of meat produced per person is included to capture the relative importance of livestock production in the domestic market. This variable is expected to be negatively related to imports of live animals.

Distance in the model is measured using a CES index developed by Head and Mayer (2002), which calculates distances between two countries based on bilateral distances between the biggest cities in those countries, those inter-city distances being weighted by the share of the city in the overall country population (see Clair et al. 2004 and Head and Mayer, 2002). The use of this distance measure instead of the most frequently used geodesic distances calculated following the great circle formula using latitudes and longitudes of the most important cities in each country allows for better estimates of the border effect in each country.

The border effect is the difference in trade between trade within and between countries. In his study using trade data between Canadian provinces and between these provinces and the USA, McCallum (1995) found that the typical Canadian province trades 20 times more with other provinces than with American states, distance and size being equal. Head and Mayer (2002) argue that the effect of national borders on trade as measured by McCallum and others seems too large to be explained by border-related trade barriers concluding that this problem results from wrongly measured distances. They developed the CES distance measure to eliminate what they call “illusory border effects”. Given that intra-country trade flows are not available, border effect are calculated in this study for countries in different regions by measuring country distance to itself and defining “trade with self”as production minus exports to other countries. Including in the regression a dummy variable that takes a value of one for the observations of trade with self, the estimated coefficient for this variable can be interpreted as the border effect (Wei, 1996). This approach has been extensively used but

according to Head and Mayer it only works if one measures distances within and between nations "in an accurate and comparable manner."

The model is augmented including a common border dummy variable; a common language dummy; variables reflecting the animal health status of importers and importers: two variables that take a value of 1 if the exporting or the importing countries respectively are free of foot and mouth disease (FMD) and 0 otherwise; and a variable for trade agreements. Trade is expected to be higher between adjacent countries probably because distance between neighboring states overstates the effective distance. Transaction costs caused by the inability to communicate and cultural differences imply that countries that speak the same language would trade more, which should be captured by the common language dummy. Countries free of FMD are expected to export more than countries with the disease, while importers free of FMD are expected to import less than countries with the disease due to more strict sanitary regulations. Significant coefficients on the regional (FTA) dummies are taken as evidence of a regional trade agreement effect. Several RTAs are included but we focus on the effect of the trade agreement in West Africa (ECOWAS). The border effect is not calculated for specific individual countries but on average for countries in different regions.

Finally, bilateral dummy variables (one for each pair of countries engaged in bilateral trade of live animals) are used to capture non explained trade effects between trade partners. There are factors explaining trade between two countries that cannot be explained simply using the size of their markets and the distance between them. A country would export different amounts to two countries even though these countries are of the same size and are equidistant of the exporter. According to Cheng and Wall (2005), this happens because there are historical, ethnical, cultural, political or geographic factors affecting trade flows between these countries. There could also be differences in infrastructure between the exporter and the importers (a better road connecting the exporter to one of the importing countries), or there could be high transaction costs between two of these countries (road blocks and illegal taxes affecting trade with one of the importers but not with the other); or different institutions and policies (different food safety and animal health standards). Some of these factors can be captured by the dummy variables included in the model and mentioned above (e.g. common language), but most of these effects are difficult to capture and quantify in a model. For these reasons, and to avoid the misspecification of the model, a bilateral dummy, a variable taking the value of 1 when the importer is country *i* and the exporter country *j*, is introduced for each pair of countries *i-j*. As these variables capture the effects of other time invariant variables in the model (border effect, common language, trade agreements, etc), the model cannot be estimated including all these variables together with the bilateral dummy variables. Because of this, and in order to get separate estimates for the coefficients of other fixed variables in the model, the estimation procedure followed in this study[40] separates the effect of these other variables from the total fixed effect captured by the bilateral dummies. In this way, the value of the estimated coefficient of the bilateral dummies obtained reflects a fixed effect on trade between each pair of countries, not captured by other variables.

[40] See technical note in the appendix

These bilateral dummy variables are introduced for technical reasons in the estimation of the model, but they also give useful information of trade integration between countries, capturing specificities in trade between different pairs of countries. If the value of this bilateral dummy variable is negative, this means that these two countries are trading below what is expected given the size of their markets, the distance between them and the effect of other variables explicitly included in the model. These effects not captured by other variables could result from transaction costs and institutional issues affecting trade between these countries. If, on the other hand, the bilateral fixed effect between exporter and importer is positive, this means that those countries are trading above expectations, probably as a result of a history of coordination and the elimination of formal and informal trade barriers between these two countries.

Bilateral trade used for this study (49 importing countries and 34 exporting countries including Burkina Faso and Niger for the years 2000-2003, a total of 864 observations) is from COMTRADE, a trade database of the UN. Other data used in the model are from World Development Indicators of the World Bank and FAOSTAT. Results follow.

Results

The gravity model estimated allows discriminating the effect of size of demand and supply of livestock products, the advantage of the country to produce livestock, distance, language, regional agreements, and animal health on trade of live animals. The model was estimated in a three step procedure. In the first step only time changing variables are used in an OLS estimation using dummy variables for each bilateral flow in order to control for heterogeneity. In the second step, the estimated coefficients of these dummy variables are regressed against all time invariants variables. The residual of this regression is used as a regressor in the final step where the complete model is estimated including all time variant and invariant variables using pooling methods. Results of the estimated gravity model for the beef trade are presented in Table C1. The estimated model predicts trade very accurately as shown in Figure C2, which compares historical trade values with model predictions.

All the estimated coefficients are significant at the 1% level, with all but one[41] coefficient showing the expected sign. Results show that trade of live animals is positively affected by the size of the demand in importing countries (proxied by urban population and income); the size of the supply (yields and animal stock) in exporting countries; the disadvantage of importing countries to produce livestock (crop/livestock ratio); the absence of FMD in exporting countries; and common language between trade partners. On the other hand, trade of live animals is negatively affected by distance between countries; demand (urban population and income) in exporting countries; the volume of livestock production per capita in importing countries; the total volume of exports of animal products from the EU; and the price of diesel fuel in exporting countries.

[41] The sign of the variable “common border” was expected to be positive.

The estimated model also captures the impact of regional trade agreements. Membership to ECOWAS resulted in a negative effect on trade. This means that live animal's trade between ECOWAS members is below its expected value due to size of the markets and distance between countries: the agreement as implemented did not favor trade of live animals between countries.

Border effects related to regulations and barriers imposed by countries on trade of live animals, also limit trade in the region as shown by the positive coefficient obtained for the variable that captures these effects. This result means that trade within a country is much easier (almost 150 times larger than trade between countries for an equivalent distance and market size) than trade between countries in the region, showing the importance that trade barriers and borders still have on trade of live animals in West Africa.

Finally, the model estimates specific bilateral effects on trade between countries in West Africa, not captured by other variables. The value of these variables representing trade barriers and transaction costs between Burkina Faso and Niger as exporters with several countries in the region is presented in Figure C3. Both countries show negative values of these bilateral variables with the largest markets in the region (Nigeria, Cote d'Ivoire and Ghana). A high negative value (in absolute terms) of this variable between Burkina Faso and Nigeria means that trade between those countries is only a small fraction of what can be expected according to the size and distance between markets. Similarly, Niger has lower trade than expected with Cote d'Ivoire and Ghana.

According to these results, trade in the region appears to be mostly cross-border trade with trade occurring between neighboring countries and still facing significant barriers that result in much lower trade than expected according to distance and size of the different markets. These results are in the same line of those in the study by Williams et al. (2006) mentioned above. According to Williams et al., high transportation and handling costs, high direct, indirect and illicit taxes, lack of market information, and lack of credit are major factors affecting trade of live animals. These factors are probably part of the explanation of the negative coefficient obtained in our model for bilateral dummies between Burkina Faso and Niger and the major import markets in West Africa and also of the high border effect discussed above.

In order to quantify the importance of different constraints to trade of live animals in the region, we use the estimated model to project trade to the year 2015. Four different growth scenarios are compared. In Scenario 1, all variables affecting trade in the region follow historical trends, growing at the same rate than in the last ten years. In Scenario 2, all variables continue to grow at their historical growth rates except for yields, which grow at 3%, a much higher growth than the average of recent years (close to zero or even negative in some countries). Scenario 3 simulates a reduction of transaction costs of 3% per year in absolute terms by reducing the value of the bilateral dummy variable (in absolute terms) shown in Figure C3. Finally, Scenario 4 combines scenarios 2 and 3 and shows the potential increase in trade in case both livestock productivity in exporting

countries is increased and transaction costs between countries are reduced. Trade growth that results from these scenarios is depicted in Figure C4.

Simulation results show that with business-as-usual, trade in 2015 will not depart substantially from the average historical trade values. An increase in livestock productivity of exporting countries will increase trade 36% percent above trade in Scenario 1. More significantly, a 3% annual reduction of transaction costs and trade barriers between countries will result in more than twice as much trade than in Scenario 1 in 2015. Combining productivity growth and the elimination of trade barriers and transaction costs (Scenario 4) could result in trade levels that triple those of Scenario 1 in 2015. In terms of trade growth, while in the business-as-usual scenario trade grows at an annual rate of 1.7%, in Scenario 2, a 3% annual growth in productivity expands trade at a 4.4% rate. Trade growth increases to 9% per year with the reduction of transaction costs and trade barriers, and to 11% in Scenario 4.

Conclusions

This study has identified two major issues affecting the future growth of regional market for live animals in West Africa. First, exporting countries from the Sahel will have problems to respond to a growing demand due to productivity constraints and limitations to expand the number of animals. Productivity of livestock production is low in the Sahel and has shown a poor growth performance in recent years. The fragile environment in this region also limits the possibility of expanding animal stock. In this context, it is expected that exporters will face increase competition in coastal markets from meat imports from outside the region and from poultry production in coastal countries, which means that without technical change and new production systems, countries in the Sahel will face increasing difficulties to compete and expand regional markets. Second, and most important, transaction costs and trade barriers between coastal countries and the Sahel are major factors constraining trade in the region. Investment in infrastructure, the elimination of formal and informal barriers to trade, and the development of effective institutions that facilitate market integration, are necessary in order to promote and expand trade of live animals in West Africa

Tables for the Report

(Tables are numbered by the chapters and sections they appear)

Table 1.1 Poverty Rates in West Africa

	Dollar a Day Poverty Rate (%)[1]		Actual annual change, 1990-2000*
Countries	1990	2000*	(%)
Gabon	n/a	n/a	n/a
Sierra Leone	29.8	71.8	9.2
Guinea-Bissau	53.4	84.2	4.7
CAR	51.7	81.5	4.7
Togo	57.5	63.3	1.0
Mali	65.2	71.7	1.0
Niger	70.8	74.5	0.5
Cote d'Ivoire*	32.3	33.6	0.4
Chad	80.8	81.8	0.1
Senegal	57.9	53.9	-0.7
Nigeria	72.8	67.6	-0.7
Guinea	69.6	64	-0.8
Burkina Faso	44.5	40.5	-0.9
Mauritania	56.6	50.5	-1.1
Congo, Rep.	59.1	52	-1.3
Benin*	34.9	30.7	-1.3
Gambia	45.7	37.8	-1.9
Ghana*	52	40	-2.6
Cameroon*	53.3	40.2	-2.8
East Africa	59.4	61.4	0.3
Southern Africa	43.8	42.9	-0.2
West Africa	54.9	57.8	0.5
SSA	44.5	46.4	0.4

Source: UNIDO, 2004
Notes: *Based on national poverty line. The annual percent reduction in poverty required to halve poverty between 1990 and 2015 is 2.7 percent per year.
[1]Years for 2000 vary between 1998 and 2001.
[2] Simple averages across countries

Table 2.1 National poverty rate and a projection for reaching MDG One in West Africa

					Years to Meet MGD1	
Typology[1]	Country/ Region	1990 Poverty Rate[2]	2004 Poverty Rate[3]	MDG1 Poverty Rate	Business as Usual	6% of Agr. Growth with Business as Usual Nonagr. Growth
1	Burkina Faso	44.5	40.5	33.7	2018	2015
1	Cote d'Ivoire	33.6	32.3	17.8	n.a.	2043
1	Gambia	81.6	60.8	40.8	2021	2012
1	Guinea	45.7	38.8	22.8	2031	2022
1	Mali	76.0	60.8	38.0	2024	2014
1	Nigeria	72.8	68.4	36.4	2032	2021
1	Senegal	57.9	53.9	29.0	2030	2015
2	Benin	34.9	30.7	17.5	2015	2015
2	Cameroon	53.0	34.9	26.5	2017	2009
2	Chad	80.8	82.4	40.4	2025	2017
2	Ghana	52.0	34.0	26.0	2010	2009
2	Guinea-Bissau	53.4	84.2	26.7	n.a.	2027
2	Niger	70.8	76.6	35.4	2039	2019
	West Africa	60.0	54.2	30.0	2022	2015
	Africa	44.6	47.5	22.3	2027	2018

Sources: Poverty rates are from available national household surveys. If there is no national poverty rate available, the data from UNIDO is used.

[1] Countries in typology 1 with agricultural GDP share below 35%, and countries in typology 2 with agricultural GDP share above 35%

[2], [3] The years that the countries conducted the surveys may not be exact 1990 and 2004, and the surveys closed to these two years are used

Table 2.2 Required agricultural growth and public resources and Maputo Declaration

Typology	Country/ Region	Current Agricultural Annual Growth Rates (1990-2004)	Required Annual Agricultural Growth Rate to Meet MDG1	Projected Annual Agriculture Expenditures in 2015 Needed to Meet MDG1	Projected Annual Agriculture Expenditures in 2008 Needed to Meet MDG1	Annual Agricultural Expenditures Required by Maputo 10% Budget Allocation	Gap Between the MDG1 and the 10% Maputo Requirement in 2008
		---------- % ----------			---------- Million $US ----------		
1	Burkina Faso	5.2	6.8	2,524	625	282	344
1	Cote d'Ivoire	2.5	6.7	1,844	468	369	99
1	Gambia	3.3	5.5	404	179	79	100
1	Guinea	3.5	7.9	8,142	1,643	658	985
1	Mali	2.6	5.9	1,144	333	257	76
1	Nigeria	3.9	9.3	28,445	4,484	4,814	
1	Senegal	2.1	6.2	919	253	393	
2	Benin	5.8	6.5	495	136	165	
2	Cameroon	3.6	4.1	386	165	558	
2	Chad	4.8	8.4	2,336	452	182	270
2	Ghana	3.8	1.7	252	157	1,545	
2	Guinea-Bissau	3.4	10.0	76	6	42	
2	Niger	3.2	9.3	271	45	170	
	West Africa	3.7	6.8	31,887	8,042	9,135	-

Sources: Authors calculation

Table 2.3 Government agricultural expenditures in West Africa (2004)

Typology	Country/Regina	Agricultural Expenditures, Million International $US	Agricultural Spending as % of Total Government Spending	Agricultural Spending as % of Ag GDP
1	Burkina Faso	281.6	10.2	10.6
1	Cote d'Ivoire	213.8	5.8	3.5
1	Gambia	67.3	8.5	3.1
1	Guinea	280.0	9.9	4.8
1	Mali	164.7	6.4	8.1
1	Nigeria	1,560.0	3.2	5.0
1	Senegal	120.7	3.1	5.3
2	Benin	64.9	3.9	2.0
2	Cameroon	101.0	1.8	1.6
2	Chad	176.9	9.7	5.8
2	Ghana	99.6	6.1	0.4
2	Guinea-Bissau	2.2	0.5	0.5
2	Niger	16.1	1.0	0.5
	West Africa	*3,149*	*4.1*	*3.8*

Sources: Authors calculation

Table 3.1.1 Contribution of agriculture to overall economic growth in West Africa

	GDP growth rate 00-04 annual (%)	AgGDP growth rate 00-04 annual (%)	share of agriculture 2000 (%)	contribution to GDP growth 00-04 (%)	
				agriculture	nonag
Burkina Faso	6.8	4.2	33.9	21.0	79.0
Chad	6.6	0.7	39.2	4.1	95.9
Gambia	3.9	0.9	35.8	7.7	92.3
Guinea-Bissau	5.2	3.5	62.4	43.6	56.4
Mali	6.2	3.0	49.5	32.5	67.5
Mauritania	5.0	0.9	25.1	5.1	94.9
Niger	3.5	3.4	40.2	39.2	60.8
Senegal	4.1	0.1	19.4	0.6	99.4
Guinea	2.9	3.9	23.2	30.5	69.5
Cote d'Ivoire	1.0	2.0	24.7	51.9	48.1
Ghana	4.7	4.5	36.0	35.1	64.9
Togo	2.7	2.2	37.8	29.4	70.6
Benin	4.8	5.6	36.5	44.3	55.7
Nigeria	5.0	4.8	28.8	27.8	72.2
Cameroon	4.5	5.8	43.8	52.3	47.7
Cen. Afr. Rep.	1.1	4.1	49.7	151.5	-51.5
Gabon	1.6	4.8	6.4	17.4	82.6
Congo, Rep.	3.9	5.3	5.3	10.2	89.8
Congo, Dem. Rep.	-1.9	-2.2	63.2	58.9	41.1
Sahelian	5.7	2.3	30.9	14.7	85.3
Coastal	3.8	4.3	28.5	32.1	67.9
Central	3.0	3.3	34.0	43.0	57.0
Central w/t Gabon	3.4	3.2	41.9	47.8	52.2
West Africa	3.9	3.7	30.1	30.5	69.5

Source: Calculated from World Development Indicator (World Bank, 2006)

Table 3.1.2 Contribution of non-agricultural sectors to overall economic growth in West Africa (2000-2004 average)

	Growth rate			Share in GDP		Contribution to GDP	
	GDP	Industry	Service	Industry	Service	Industry	Service
Burkina Faso	6.8	8.5	5.6	17.6	47.3	22.0	38.5
Chad	6.6	12.4	6.6	15.6	49.6	29.1	49.2
Gambia	3.9	6.6	3.9	11.1	58.6	18.7	58.4
Guinea-Bissau	5.2	0.7	0.7	12.1	28.4	1.6	3.7
Mali	6.2	17.7	4.2	17.7	38.9	50.9	26.6
Mauritania	5.0	5.5	6.4	22.5	52.4	24.5	67.3
Niger	3.5	2.8	4.1	17.2	42.1	13.9	50.2
Senegal	4.1	6.3	4.8	20.5	61.9	31.4	72.7
Guinea	2.9	3.5	2.2	30.1	52.0	36.5	39.7
Cote d'Ivoire	1.0	-6.7	-0.6	24.2	53.8	-165.4	-30.4
Ghana	4.7	4.3	4.8	25.4	38.8	23.5	40.2
Benin	4.8	7.4	5.0	12.7	52.1	19.7	54.1
Nigeria	5.0	4.3	5.6	35.1	32.1	30.7	36.0
Cameroon	4.5	7.4	2.6	31.3	45.3	51.2	26.4
Cen. Afr. Rep.	1.1	-1.7	-3.4	14.6	35.9	-23.3	-113.7
Gabon	1.6	0.1	1.7	47.4	45.4	3.4	47.1
Congo, Rep	3.9	-0.9	9.9	61.3	30.4	-14.1	77.1
DRC	-1.9	7.6	3.3	17.7	32.7	-69.9	-56.4

Sources: Authors' calculation using data from WDI and IMF (2000-2005).

Table 3.1.3 Agricultural sub-sectors' contribution to overall agricultural growth in West Africa

	AgGDP growth rate	Ag sub-sector growth rate		Share of crops in AgGDP	Contribution to Agricultural growth	
		Crops	Livestock & fishing		Crops	Livestock & fishing
		00-04 annual (%)		(2000, %)	00-04 (%)	
Burkina Faso	4.2	5.5	3.5	67.5	77.0	23.0
Chad	0.7	3.2	2.7	57.8	61.5	38.5
Gambia	0.9	-1.0	5.1	65.1	-57.8	157.8
Guinea-Bissau	3.5					
Mali	3.0	0.0	2.6	71.5	4.5	95.5
Mauritania	0.9	-8.3	0.7	21.0	150.9	-50.9
Niger	3.4	4.5	2.3	66.6	79.6	20.4
Senegal	0.1	-0.7	0.9	50.2	-267.6	367.6
Guinea	3.9	4.0	4.2	77.6	76.6	23.4
Cote d'Ivoire	2.0					
Ghana	4.5					
Benin	5.6	5.7	3.4	79.3	86.7	13.3
Nigeria	4.8	3.7	4.7	85.6	82.2	17.8
Cameroon	5.8	6.6	5.6	82.9	85.1	14.9
Cen. Afr. Rep.	4.1	0.7	2.9	69.0	36.3	63.7
Gabon	4.8					
Congo, Rep	5.3					
DRC	-2.2					

Sources: Authors' calculation using data from WDI and IMF (2000-2005).

Table 3.1.4 Non-agricultural sub-sectors' contribution to non-agricultural growth in West Africa (2000-2004 average)

	Industry GDP growth rate	Industry sub-sector growth rate			Share in Industry GDP			Contribution to Industry growth		
		Manufacturing	Construction	Mining	Manufacturing	Construction	Mining	Manufacturing	Construction	Mining
Burkina Faso	8.5	8.9	6.0		72.8	20.6		74.2	14.2	
Chad	12.4	1.8	6.4	40.8	62.9	10.4	22.4	9.9	5.7	77.9
Gambia	6.6	3.5	10.3		42.7	43.0		23.7	71.1	
Guinea-Bissau	0.7									
Mali	17.7	4.3	5.7	40.3	42.5	26.6	30.9	11.6	9.7	78.8
Mauritania	5.5	4.7	14.4	-1.1	19.4	27.6	53.0	21.3	92.0	-13.3
Niger	2.8	3.7	6.4	2.8	37.9	10.1	39.2	39.5	18.4	31.3
Senegal	6.3	6.3	6.3	8.3	64.0	23.2	1.4	64.3	23.0	1.9
Guinea	3.5	3.2	5.2	2.6	12.5	30.4	55.1	11.7	46.3	41.6
Cote d'Ivoire	-6.7	-7.4	-6.8	23.8	21.0	14.1	1.2	22.4	13.8	-4.1
Ghana	4.3	4.3	5.5	2.7	35.5	33.9	20.1	35.3	42.3	12.4
Benin	7.4	7.1	6.3	5.7	63.2	28.9	1.6	62.2	25.4	1.3
Nigeria	4.3	7.6	2.3	3.8	12.5	2.3	85.1	22.3	1.2	75.9
Cameroon	7.4	6.9	3.9	14.5	68.1	8.1	20.3	56.2	3.8	35.5
Cen. Afr. Rep.	-1.7	-10.0	2.4	-0.6	23.2	26.7	45.0	117.2	-31.8	12.8
Gabon	0.1	4.1	3.2	-1.9	10.0	5.6	82.0	-45.5	-20.1	175.7
Congo, Rep	-0.9	15.2	16.9	-4.4	8.9	3.0	87.1	-75.5	-27.8	213.6
DRC	7.6	-0.6	13.5	12.0	26.8	14.4	47.4	-2.8	32.3	94.3

Sources: Authors' calculation using data from IMF (2000-2005).

Table 3.1.5 Sectors' share in country's GDP in West Africa (2000)

Share (%)	Share of AgGDP in GDP	Share in Ag sector: Crops	Share in Ag sector: Livestock & fishing	Share of industry in GDP	Share in Industry sector: Manufacturing	Share in Industry sector: Construction	Share in Industry sector: Mining	Share of services in GDP	Share of public adm. in service sector
Burkina Faso	35.1	67.5	32.5	17.6	72.8	20.6	0.0	47.3	32.2
Chad	34.8	57.8	42.2	15.6	62.9	10.4	22.4	49.6	32.3
Gambia	30.3	65.1	34.9	11.1	42.7	43.0	0.0	58.6	35.0
Guinea-Bissau	59.4	0.0	0.0	12.1	0.0	0.0	0.0	28.4	31.5
Mali	43.4	71.5	28.5	17.7	42.5	26.6	30.9	38.9	33.7
Mauritania	25.1	21.0	79.0	22.5	19.4	27.6	53.0	52.4	39.1
Niger	40.7	66.6	33.4	17.2	37.9	10.1	39.2	42.1	25.1
Senegal	17.6	50.2	49.8	20.5	64.0	23.2	1.4	61.9	14.2
Guinea	18.0	77.6	22.4	30.1	12.5	30.4	55.1	52.0	17.8
Cote d'Ivoire	22.0	0.0	0.0	24.2	21.0	14.1	1.2	53.8	30.0
Ghana	35.8	0.0	0.0	25.4	35.5	33.9	20.1	38.8	52.2
Benin	35.2	79.3	20.7	12.7	63.2	28.9	1.6	52.1	38.4
Nigeria	32.8	85.6	14.4	35.1	12.5	2.3	85.1	32.1	25.9
Cameroon	23.4	82.9	17.1	31.3	68.1	8.1	20.3	45.3	0.0
CAR	49.4	69.0	31.0	14.6	23.2	26.7	45.0	35.9	32.6
Gabon	7.3	0.0	0.0	47.4	10.0	5.6	82.0	45.4	36.0
CongoRep	8.4	0.0	0.0	61.3	8.9	3.0	87.1	30.4	36.0
DRC	49.5	0.0	0.0	17.7	26.8	14.4	47.4	32.7	14.0

Sources: Authors' calculation using IMF data (2000).

Table 3.1.6 Grouping of West African countries according to agricultural potential and economic structure

		Low income countries (GDP per capita in 2004 <= US$ 1,000)				**Middle income countries** (GDP per capita in 2004 > US$ 1,000)
		Agricultural share above average (36% GDP)		**Agricultural share below average** (36% GDP)		
		Falling GDP per capita (1995-04)	Rising GDP per capita (1995-04)	Falling GDP per capita (1995-04)	Rising GDP per capita (1995-04)	
More-favorable agricultural conditions (top two-thirds of FAO country-level farming system assessment)	Coastal	Guinea Bissau (84) Togo (63)	Benin (16) Ghana (45)	Cote d'Ivoire (14)	Gambia (38) Senegal (13)	
	Landlocked	Central African Rep (82) Dem Rep of Congo (92)			Burkina Faso (57)	
	Natural resources-rich	Sierra Leone (72)	Cameroon (40)	Republic Congo (52)	Guinea (64) Nigeria (68)	
Less-favorable agricultural conditions (lowest third of FAO country-level farming system assessment)		Niger (75)	Chad (82)		Mali (72) Mauritania (27)	Gabon (23)

Notes: The number in parentheses is national dollar-a-day poverty rate in 1999 (UNIDO, 2004; World Bank, 1995, 1997 and 2003). Agriculture shares are for 2004 from World Development Indicators (World Bank, 2006). Geographic and natural resource classification based on UNIDO (2004). Per capita GDP growth is measured in constant 2000 US dollars (World Bank, 2006).

Table 3.1.7 Conflicts and economic performance in West Africa, 1995-2004

		positive GDP per capita growth		negative GDP per capita growth	
		quick recovery	slow recovery	quick recovery	slow recovery
No war		Benin Burkina Faso Gambia Ghana Mali Mauritania		Togo	
at least 1 year in war	Minor conflicts	Cameroon Guinea Nigeria Chad		Niger	Central African Rep Cote D'Ivoire
	Intermediate conflicts	Senegal			
	Severe wars				Congo, Dem Rep Guinea Bissau Congo, Rep Sierra Leone

Note: Per capita GDP growth is measured in constant 2000 US dollars (World Bank, 2006). War data is from Harbom and Wallensteen "Armed Conflict and Its International Dimensions, 1946–2004" (2005). The definition of minor conflicts is at least 25 battle-related deaths per year for every year in the period. Intermediate conflicts are more than 25 battle-related deaths per year and a total conflict history of more than 1000 battle-related deaths, but fewer than 1,000 per year. Wars are at least 1000 battle-related deaths per year.

Table 3.2.1(a) Crop yield level in West Africa, irrigated (2000 – 2004 average, ton/ha)

	Maize	Rice	Wheat	Sorghum	Millet	Cereal Other
Burkina Faso		3.2				
Chad		2.6	1.6			
Gambia		3.0				
Guinea						
Bissau		2.6				
Mali		2.6	2.8	1.7	1.7	1.5
Mauritania		4.5		0.9		
Niger	1.7	5.6	1.8			
Senegal		4.2				
Guinea		3.30				
Sierra Leone		2.33				
Cote dIvoire		5.63				
Ghana		3.33				
Togo		3.41				
Benin		2.55				
Nigeria		2.77	1.24			
Cameroon		3.99				
CAR						
Gabon						
CongoR						
DRC		2.55				

Table 3.2.1 (b) Crop yield level in West Africa, irrigated (2000 – 2004 average, ton/ha)

	Potato	Sweet potato	Groundnut	Vegetable Do.	Vegetable Ex.
Burkina Faso				8.3	20.9
Chad				10.2	25.8
Gambia					13.2
Guinea					
Bissau					12.8
Mali			0.7	6.4	16.4
Mauritania					8.2
Niger	17.8			12.3	
Senegal				14.4	44.4
Guinea					7.51
Sierra Leone					16.38
Cote dIvoire				5.75	20.71
Ghana					11.47
Togo					33.12
Benin				4.01	9.49
Nigeria		7.93	1.92	5.86	16.68
Cameroon					11.18
CAR					20.15
Gabon			1.60		
CongoR				6.45	
DRC					26.60

Table 3.2.1 (c) Crop yield level in West Africa, irrigated (2000 – 2004 average, ton/ha)

	Fruit Do.	Fruit Ex.	Sugar Raw	Tree nuts	Tea	Rubber
Burkina Faso	5.2	39.4	100.0	0.4		
Chad	4.0		99.3			
Gambia		10.8				
Guinea Bissau		12.5				
Mali	12.2	42.4	72.1	0.7	0.6	
Mauritania		7.5				
Niger	4.9		63.0			
Senegal	6.9	14.1	108.5	0.4		
Guinea		6.77				
Sierra Leone		8.47				
Cote dIvoire	6.76	42.10	31.11	0.71		1.81
Ghana		12.48				
Togo		11.43				
Benin	6.81	13.93	40.16	0.22		
Nigeria	5.49	13.40	21.29	0.64		0.36
Cameroon		17.90				
CAR						
Gabon						
CongoR	6.44		55.74			
DRC						

Table 3.2.2 (a) Crop yield level in West Africa, rainfed (2000 – 2004 average, ton/ha)

	Maize	Rice	Wheat	Sorghum	Barley	Millet
Burkina Faso	1.6	1.0		0.9		0.8
Chad	0.7	0.9		0.7		0.5
Gambia	1.4	1.8		1.1		1.0
Guinea Bissau	1.3	1.1		0.8		0.8
Mali	1.1	0.9		0.7		0.6
Mauritania	0.9		1.0	0.4	2.0	0.2
Niger	0.8	2.8	0.9	0.2		0.4
Senegal	1.5	1.1		0.8		0.6
Guinea	1.1	1.4		0.8		0.8
Sierra Leone	0.9	1.4		1.0		1.0
Cote dIvoire	0.9	2.1		0.5		0.8
Ghana	1.5	2.0		1.0		0.8
Togo	1.2	1.9		0.8		0.5
Benin	1.1	1.9		0.9		0.8
Nigeria	1.2	1.0		1.2		0.9
Cameroon	1.3	1.6	1.3	0.9		0.7
CAR	1.0	1.9		0.8		0.9
Gabon	1.5	2.0				
CongoR	0.8	0.7				
DRC	0.8	0.7	1.1	0.7	0.64	0.7

Table 3.2.2 (b) Crop yield level in West Africa, rainfed (2000 – 2004 average, ton/ha)

	Cereal Other	Cassava	Potato	Sweet potato	yams	Root Other
Burkina Faso	0.8	2.0	6.0	8.2	7.9	
Chad	1.0	11.7	5.6	2.6	9.6	3.0
Gambia		3.0				
Guinea Bissau	0.5	15.3				6.2
Mali	0.6	11.0		13.9	12.7	
Mauritania			5.1	1.0	6.3	
Niger	0.8	21.0	9.5	15.4		
Senegal	0.5	5.6	18.8	5.0		
Guinea	1.0	5.1		3.0	11.7	6.2
Sierra Leone	1.1	5.3		2.5		2.6
Cote dIvoire	0.6	5.1		2.2	9.6	1.4
Ghana	0.7	9.5		1.4	12.5	6.6
Togo	1.0	6.0		1.1	10.5	1.4
Benin	0.6	8.8	2.8	5.1	11.6	3.5
Nigeria	0.5	11.4	4.5	4.2	9.9	5.9
Cameroon		8.7	4.1	5.0	8.3	5.8
CAR		2.9	2.6		6.3	2.8
Gabon		5.1		1.8	7.1	5.9
CongoR		9.1	9.2	6.8	6.5	8.0
DRC		8.1	4.6	5.0	5.2	5.3

Table 3.2.2 (c) Crop yield level in West Africa, rainfed (2000 – 2004 average, ton/ha)

	Beans	Pulse Other	Groundnut	Soybean	Oilcrop Other	Vegetable Do.
Burkina Faso		0.5	0.8	1.1	0.5	8.3
Chad	0.5	0.8	0.9		0.4	10.2
Gambia		0.2	1.0		0.3	5.1
Guinea Bissau		0.6	1.2		5.1	5.1
Mali		0.3	0.8		0.3	6.4
Mauritania	1.0	0.4	0.8			1.3
Niger	0.5	0.1	0.6		0.4	12.3
Senegal		0.2	0.8		0.8	14.4
Guinea		0.86	1.25		2.86	3.01
Sierra Leone		0.68	0.76		0.77	6.08
Cote dIvoire		0.68	1.02	1.20	3.21	5.75
Ghana		0.95	1.04		2.87	4.55
Togo	0.28	0.68	0.54		1.71	4.92
Benin	0.71	0.82	0.83	0.80	1.07	4.01
Nigeria		0.43	0.84	0.72	1.16	5.86
Cameroon	0.87	1.90	0.67	0.59	0.31	3.84
CAR		0.93	1.10		1.35	8.07
Gabon		0.67	0.93	1.05		6.61
CongoR	0.79	0.76	0.60		2.47	6.45
DRC	0.54	0.61	0.78	0.48	0.45	6.16

Table 3.2.2 (d) Crop yield level in West Africa, rainfed (2000 – 2004 average, ton/ha)

	Vegetable Ex.	Fruit Do.	Fruit Ex.	Banana	Sugar Raw	Cocoa
Burkina Faso		5.2				
Chad		4.0				
Gambia	13.2	4.5	10.8			
Guinea Bissau		6.2		3.1	27.5	
Mali		12.2				
Mauritania	8.2	3.2	7.5			
Niger	42.1	4.9	18.2		36.9	
Senegal		6.9		17.3		
Guinea		3.46		4.72	52.69	0.39
Sierra Leone		4.12		5.64	72.20	0.36
Cote dIvoire		6.76		4.03		0.59
Ghana		5.82		8.05	25.45	0.52
Togo	33.12	5.17	11.43	7.09		0.31
Benin		6.81		5.20		0.33
Nigeria		5.49		5.39		0.17
Cameroon		5.76		6.48	10.00	0.45
CAR		4.78		4.20	7.20	0.35
Gabon		1.63		5.46	58.82	0.07
CongoR	57.18	6.44		7.75	36.67	0.30
DRC		14.90		4.32	43.24	0.30

Table 3.2.2 (e) Crop yield level in West Africa, rainfed (2000 – 2004 average, ton/ha)

	Coffee	Cotton Lint	Tree nuts	Rubber	Oil palm	Tea
Burkina Faso		0.4	0.4			
Chad		0.2				
Gambia		0.1			0.6	
Guinea Bissau		0.4	0.4		0.8	
Mali		0.5	0.7			
Mauritania						
Niger		0.3				
Senegal		0.5	0.4		0.8	
Guinea	0.41	0.50	0.70	0.55	0.17	
Sierra Leone	1.08				1.02	
Cote dIvoire	0.37	0.53	0.71		0.32	
Ghana	0.18	0.28	0.40	0.67	0.31	
Togo	0.28	0.39	0.95		0.78	
Benin	0.20	0.41	0.22		0.84	
Nigeria	0.91	0.25	0.64		0.19	
Cameroon	0.28	0.51		1.20	0.79	0.82
CAR	0.49	0.25		0.83	0.56	
Gabon	0.32			1.00		
CongoR	0.30			0.80	0.42	
DRC	0.39	0.23		0.23	0.32	0.69

Table 3.2.3 (a) Cereal yield comparison between West African countries and other regions in the world, irrigated crops in West Africa (2000 – 2004 average, ton/ha)

	Maize	Rice	Wheat	Sorghum	Millet
Burkina Faso		3.2			
Chad		2.6	1.6		
Gambia		3.0			
Guinea Bissau		2.6			
Mali		2.6	2.8	1.7	1.7
Mauritania		4.5		0.9	
Niger	1.7	5.6	1.8		
Senegal		4.2			
Guinea		3.3			
Sierra Leone		2.3			
Cote dIvoire		5.6			
Ghana		3.3			
Togo		3.4			
Benin		2.6			
Nigeria		1.8	1.24		
Cameroon		4.0			
CAR					
Gabon					
CongoR					
DRC		2.6			
Other regions in the world					
East and Southeast Asia	4.1	4.6	3.7	1.0	1.6
South Asia	2.0	2.3	2.8	2.8	3.0
LAC	2.7	3.7	2.2	1.3	1.5
Sub-Saharan Africa (w/t South Africa)	1.3	1.6	1.5	2.0	1.9
South Africa	2.8	3.3	3.2	1.3	0.8

Note: data for the regions/countries outside West Africa is for 2000 and for both irrigated and rain crops

Table 3.2.3 (b) Cereal yield comparison between West African countries and other regions in the world, rained crops in West Africa (2000 – 2004 average, ton/ha)

	Maize	Rice	Wheat	Sorghum	Millet
Burkina Faso	1.6	1.0		0.9	0.8
Chad	0.7	0.9		0.7	0.5
Gambia	1.4	1.8		1.1	1.0
Guinea Bissau	1.3	1.1		0.8	0.8
Mali	1.1	0.9		0.7	0.6
Mauritania	0.9		1.0	0.4	0.2
Niger	0.8	2.8	0.9	0.2	0.4
Senegal	1.5	1.1		0.8	0.6
Guinea	1.1	1.4		0.8	0.8
Sierra Leone	0.9	1.2		1.0	1.0
Cote d'Ivoire	0.9	2.1		0.5	0.8
Ghana	1.5	2.0		1.0	0.8
Togo	1.2	1.9		0.8	0.5
Benin	1.1	1.9		0.9	0.8
Nigeria	1.1	0.6		1.1	1.0
Cameroon	1.3	1.6	1.3	0.9	0.7
CAR	1.0	1.9		0.8	0.9
Gabon	1.5	2.0			
CongoR	0.8	0.7			
DRC	0.8	0.7	1.1	0.7	0.7
Other regions in the world					
East and Southeast Asia	4.1	4.6	3.7	1.0	1.6
South Asia	2.0	2.3	2.8	2.8	3.0
LAC	2.7	3.7	2.2	1.3	1.5
Sub-Saharan Africa (w/t South Africa)	1.3	1.6	1.5	2.0	1.9
South Africa	2.8	3.3	3.2	1.3	0.8

Note: data for the regions/countries outside West Africa is for 2000 and for both irrigated and rain crops

Table 3.2.4 Root crop yield comparison between West African countries and other regions in the world, rainfed crops in West Africa (2000 – 2004 average, ton/ha)

	Cassava	Potato	Sweet potato
Burkina Faso	2.0	6.0	8.2
Chad	11.7	5.6	2.6
Gambia	3.0		
Guinea Bissau	15.3		
Mali	11.0		13.9
Mauritania		5.1	1.0
Niger	21.0	9.5	15.4
Senegal	5.6	18.8	5.0
Guinea	5.1		3.0
Sierra Leone	5.3		2.5
Cote dIvoire	5.1		2.2
Ghana	9.5		1.4
Togo	6.0		1.1
Benin	8.8	2.8	5.1
Nigeria	9.6	4.0	4.2
Cameroon	8.7	4.1	5.0
CAR	2.9	2.6	
Gabon	5.1		1.8
CongoR	9.1	9.2	6.8
DRC	8.1	4.6	5.0
Other regions in the world			
East and Southeast Asia	13.3	13.9	18.5
South Asia	19.5	16.6	9.5
LAC	13.3	14.5	7.8
Sub-Saharan Africa (w/t South Africa)	9.2	6.8	7.9
South Africa			10.5

Table 3.3.1 (a) Agricultural importing and exporting countries in West Africa (2000 – 2004 average)

	Maize	Rice	Wheat	Sorghum	Barley	Millet	Other cereals
Burkina Faso	**E**	**M**	**M**		**M**		
Chad	**M**		**M**		**M**		
Gambia	**M**	**M**	**M**		**M**		
Guinea Bissau	**M**	**M**	**M**		**M**		
Mali	**M**	**M**	**M**		**M**	**M**	
Mauritania	**M**	**M**	**M**	**M**	**M**		
Niger	**M**	**M**	**M**		**M**		
Senegal	**M**	**M**	**M**		**M**		
Guinea	**M**	**M**	**M**		**M**		
Sierra Leone	**M**	**M**	**M**		**M**		
Cote dIvoire		**M**	**M**	**M**	**M**		
Ghana		**M**	**M**		**M**		**M**
Togo		**M**	**M**		**M**		
Benin		**M**	**M**		**M**		
Nigeria		**M**	**M**		**M**		
Cameroon	**M**	**M**	**M**		**M**		
CAR		**M**	**M**		**M**		
Gabon	**M**	**M**	**M**		**M**		
CongoR	**M**	**M**	**M**		**M**		
DRC	**M**	**M**	**M**		**M**		

M indicates the ratio of imports over domestic consumption greater than 1.5%; E indicates the ratio of exports over total production greater than 1.5%; the empty sets indicate almost balance in production and consumption.
Source: Authors' calculation using FAO data

Table 3.3.1 (b) Agricultural importing and exporting countries in West Africa (2000 – 2004 average)

	Cassava	Potato	Sweet potato	Yams	Other roots	Banana
Burkina Faso					**M**	**M**
Chad						
Gambia					**M**	
Guinea Bissau						
Mali				**M**	**M**	**M**
Mauritania					**M**	**M**
Niger				**M**	**M**	**M**
Senegal						**M**
Guinea		**M**				
Sierra Leone		**M**			**M**	
Cote d'Ivoire		**M**				**E**
Ghana		**M**				
Togo		**M**				
Benin		**M**				
Nigeria						
Cameroon						**E**
CAR						
Gabon		**M**	**M**		**M**	
CongoR		**M**			**M**	
DRC		**M**				

M indicates the ratio of imports over domestic consumption greater than 1.5%; E indicates the ratio of exports over total production greater than 1.5%; the empty sets indicate almost balance in production and consumption.
Source: Authors' calculation using FAO data

Table 3.3.1 (c) Agricultural importing and exporting countries in West Africa (2000 – 2004 average)

	Beans	Groundnut	Soybean	Other oilcrops	Oilpalm	VegOil
Burkina Faso	**M**			**E**		**M**
Chad						**M**
Gambia		**E**		**M**		**M**
Guinea Bissau					**E**	**M**
Mali	**M**	**E**		**M**	**M**	**M**
Mauritania		**M**	**M**	**M**		**M**
Niger	**E**			**E**		**M**
Senegal	**M**	**E**		**M**		**M**
Guinea	**M**		**M**			**M**
Sierra Leone	**M**	**M**				**M**
Cote dIvoire	**M**			**E**	**E**	
Ghana	**M**		**M**	**E**	**M**	**M**
Togo		**E**		**E**	**E**	**M**
Benin			**M**	**E**	**E**	**M**
Nigeria	**M**		**E**	**E**	**E**	**M**
Cameroon	**E**		**M**	**M**		**M**
CAR	**M**					**M**
Gabon	**M**	**M**	**M**			**M**
CongoR	**M**	**M**	**M**	**M**	**E**	**M**
DRC	**M**			**M**		**M**

M indicates the ratio of imports over domestic consumption greater than 1.5%; E indicates the ratio of exports over total production greater than 1.5%; the empty sets indicate almost balance in production and consumption.

Source: Authors' calculation using FAO data

Table 3.3.1 (d) Agricultural importing and exporting countries in West Africa (2000 – 2004 average)

	Raw sugar	Cocoa	Coffee	Cotton	Tree nuts	Rubber	Tea	Vegetable	Fruits
Burkina Faso	M	M	M	E	M		M	E	E
Chad	M		M	E	M		M	E	
Gambia	M	M	M	E			M	E	E
Guinea Bissau	M	M	M	E	E		M	E	E
Mali	M	M	M	E	M		M	E	E
Mauritania	M	M	M	M			M	E	E
Niger	M	M	M	E	M		M	E	E
Senegal	M	M	M	E	E		M	E	E
Guinea	M	E	E	E	E	E	M	E	E
Sierra Leone	M	E	E				M	E	E
Cote dIvoire	E	E	E	E	E	E	E	E	E
Ghana	M	E	E	E	E	E	M	E	E
Togo	M	E	E	E	E	M	M	E	E
Benin	M	M	M	E	E	M	M	E	E
Nigeria	M	E	M		E	E	M	E	E
Cameroon	M	E	E	E		E	M	E	E
CAR	M	M	E	E		E	M	E	
Gabon	E	E	M	M	M	E	M		
CongoR	E	E	E	M	M	E	M	E	
DRC	M	E	E	M	M	E	E	E	

M indicates the ratio of imports over domestic consumption greater than 1.5%; E indicates the ratio of exports over total production greater than 1.5%; the empty sets indicate almost balance in production and consumption.

Source: Authors' calculation using FAO data

Table 3.3.1 (e) Agricultural importing and exporting countries in West Africa (2000 – 2004 average)

	Cattle	Sheep and goat	Beef	Sheep and goat meat	Poultry and eggs	Other meat	Fish	Milk
Burkina Faso	**E**	**E**					**M**	**M**
Chad	**E**	**E**						**M**
Gambia					**M**	**M**		**M**
Guinea Bissau			**M**		**M**		**E**	**M**
Mali	**E**	**E**					**M**	**M**
Mauritania		**E**			**M**		**E**	**M**
Niger	**E**	**E**					**E**	**M**
Senegal	**M**	**M**	**M**		**M**		**E**	**M**
Guinea	**E**	**E**	**M**		**M**	**M**	**M**	**M**
Sierra Leone	**M**	**M**	**M**	**M**	**M**	**M**	**E**	**M**
Cote dIvoire	**M**	**M**	**M**		**M**	**M**	**M**	**M**
Ghana	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**
Togo	**M**		**M**		**M**	**M**	**M**	**M**
Benin	**M**	**M**			**M**	**M**	**M**	**M**
Nigeria	**M**	**M**					**M**	**M**
Cameroon	**M**				**M**	**M**	**M**	**M**
CAR	**E**	**M**					**M**	**M**
Gabon	**M**		**M**	**M**	**M**	**M**	**M**	**M**
CongoR		**M**	**M**	**M**	**M**	**M**	**M**	**M**
DRC	**M**		**M**		**M**		**M**	**M**

M indicates the ratio of imports over domestic consumption greater than 1.5%; E indicates the ratio of exports over total production greater than 1.5%; the empty sets indicate almost balance in production and consumption.
Source: Authors' calculation using FAO data

Table 3.3.2 (a) West African major agricultural export commodities –1996-2000 annual average

		Rank*	(1) W. Africa to the world		(2) W. Africa to SSA		(3) W. Africa to W. Africa		Share of intra-regional trade
			Value (Million $US)	Share in (1) (%)	Value (Million $US)	Share in (2) (%)	Value (Million $US)	Share in (3) (%)	(2)/(1) (%)
Staples	Other cereals	*16*	23	0.3	19	4.5	19	5.1	82.3
	Meat	*19*	15	0.2	10	2.2	9	2.5	64.9
	Livestock	*21*	10	0.1	10	2.2	10	2.6	98.3
	Maize	*25*	2	0.0	2	0.5	2	0.5	88.7
	Cassava	*26*	2	0.0	0	0.0	0	0.0	0.4
	Beans	*28*	1	0.0	1	0.2	1	0.2	67.2
	Sub-Total		**52**	**0.7**	**41**	**9.6**	**40**	**11.0**	**79.8**
Non-traditional	Fish	*2*	1,122	15.8	136	31.5	135	37.1	12.1
	Vegetable&fruits	*4*	551	7.8	11	2.6	11	3.0	2.0
	Oils and fat	*7*	195	2.8	45	10.4	44	12.2	23.0
	Miscellaneous	*8*	172	2.4	15	3.5	1	0.4	8.9
	Oilseeds	*11*	82	1.2	6	1.5	5	1.4	7.7
	Processed food	*14*	62	0.9	32	7.4	31	8.6	51.5
	Beverages	*20*	12	0.2	7	1.7	7	1.9	59.6
	Sub-Total		**2,194**	**31.0**	**252**	**58.6**	**234**	**64.5**	**11.5**
Traditional	Cocoa bean	*1*	2,321	32.8	9	2.0	1	0.4	0.4
	Cotton	*3*	1,028	14.5	57	13.2	30	8.1	5.5
	Coffee green	*5*	534	7.5	3	0.6	1	0.4	0.5
	Cashew nuts	*10*	102	1.4	1	0.1	0	0.1	0.6
	Sugar	*15*	53	0.8	11	2.7	11	3.0	21.5
	Other nuts	*17*	22	0.3	6	1.3	5	1.4	25.2
	Tobacco	*22*	8	0.1	1	0.3	1	0.4	17.4
	Tea	*24*	3	0.0	1	0.3	1	0.3	49.1
	Other fibers	*27*	1	0.0	0	0.0	0	0.1	14.2
	Sub-Total		**4,072**	**57.5**	**89**	**20.6**	**51**	**14.1**	**2.2**
Others	Processed cocoa	*6*	450	6.3	10	2.4	2	0.5	2.3
	Animal skin	*9*	144	2.0	2	0.4	2	0.5	1.2
	Coffee roasted	*12*	78	1.1	17	4.0	17	4.6	22.1
	Feed stuffs	*13*	70	1.0	6	1.5	5	1.3	9.2
	Cigarettes	*18*	18	0.3	12	2.9	12	3.3	68.1
	Spices	*23*	6	0.1	0	0.1	0	0.1	7.6
	Sub-Total		**765**	**10.8**	**48**	**11.2**	**38**	**10.4**	**6.3**
TOTAL			**7,084**		**430**		**363**		**6.1**

Source: Authors' calculation using UN comtrade data

Table 3.3.2 (b) West African major agricultural import commodities –1996-2000 annual average

			(1) W. Africa from the world		(2) W. Africa from SSA		(3) W. Africa to W. Africa		Share of intra-regional trade
		Rank*	Value (Million $US)	Share in (1) (%)	Value (Million $US)	Share in (2) (%)	Value (Million $US)	Share in (3) (%)	(2)/(1) (%)
Staples	Other cereals	*1*	1,306	29.4	26	5.8	19	5.1	2.0
	Meat	*3*	543	12.2	15	3.5	9	2.5	2.8
	Maize	*16*	21	0.5	5	1.1	2	0.5	23.0
	Livestock	*17*	15	0.3	10	2.2	10	2.6	64.4
	Beans	*20*	11	0.3	1	0.3	1	0.2	10.2
	Cassava	*28*	0	0.0	0	0.0	0	0.0	90.0
	Sub-Total		**1,897**	**42.8**	**57**	**12.8**	**40**	**11.0**	**3.0**
Non-traditional	Fish	*2*	545	12.3	157	35.3	135	37.1	28.8
	Oils and fat	*5*	347	7.8	46	10.3	44	12.2	13.2
	Processed food	*6*	288	6.5	34	7.7	31	8.6	11.9
	Vegetable&fruits	*8*	173	3.9	17	3.9	11	3.0	10.1
	Beverages	*9*	152	3.4	10	2.3	7	1.9	6.7
	Miscellaneous	*10*	71	1.6	3	0.7	1	0.4	4.4
	Oilseeds	*19*	12	0.3	5	1.2	5	1.4	44.4
	Sub-Total		**1,588**	**35.8**	**273**	**61.5**	**234**	**64.5**	**17.2**
Traditional	Sugar	*4*	485	10.9	19	4.4	11	3.0	4.0
	Tea	*11*	59	1.3	4	0.8	1	0.3	6.2
	Tobacco	*12*	50	1.1	4	0.9	1	0.4	8.3
	Cotton	*14*	39	0.9	30	6.8	30	8.1	76.2
	Coffee green	*21*	10	0.2	7	1.5	1	0.4	65.7
	Other fibers	*24*	9	0.2	0	0.1	0	0.1	4.3
	Other nuts	*25*	6	0.1	5	1.1	5	1.4	89.0
	Cocoa bean	*26*	4	0.1	1	0.3	1	0.4	31.1
	Cashew nuts	*27*	1	0.0	0	0.1	0	0.1	80.5
	Sub-Total		**663**	**14.9**	**71**	**16.1**	**51**	**14.1**	**10.8**
Others	Cigarettes	*7*	182	4.1	15	3.4	12	3.3	8.3
	Coffee roasted	*13*	48	1.1	17	3.9	17	4.6	35.9
	Feed stuff	*15*	28	0.6	6	1.3	5	1.3	20.2
	Processed cocoa	*18*	12	0.3	2	0.5	2	0.5	19.4
	Spices	*22*	10	0.2	0	0.1	0	0.1	4.8
	Animal skin	*23*	9	0.2	2	0.4	2	0.5	20.1
	Sub-Total		**289**	**6.5**	**43**	**9.6**	**38**	**10.4**	**14.8**
TOTAL			**4,437**		**444**		**363**		**10.0**

Source: Authors' calculation using UN comtrade data

Table 3.3.3 (a) Average budget share by commodity (%), Mali 2001

		Maize	Millet	Rice	Sorghum	Wheat	Other Cereal
Urban	1st	1.21	10.95	14.98	1.49	1.13	0.51
	2nd	1.36	7.82	14.95	0.92	2.30	0.09
	3rd	1.09	6.63	13.90	0.67	2.39	0.35
	4th	0.57	5.40	11.62	1.04	2.96	0.14
	5th	0.47	3.75	8.07	0.74	3.31	0.22
	Urban total	0.76	5.65	11.21	0.87	2.79	0.23
Rural	1st	5.50	33.65	3.99	4.92	0.27	0.32
	2nd	4.87	27.18	8.05	4.42	0.39	0.52
	3rd	4.02	23.91	10.35	3.48	0.53	0.43
	4th	2.32	17.49	11.68	4.54	0.69	0.53
	5th	1.33	10.71	12.52	2.75	1.49	0.24
	Rural total	2.68	17.80	10.87	3.60	0.95	0.37
National	1st	5.11	30.41	5.19	5.00	0.35	0.43
	2nd	4.64	25.07	9.53	3.65	0.50	0.62
	3rd	2.24	17.71	12.38	3.94	0.71	0.32
	4th	1.70	12.12	13.12	2.20	1.56	0.36
	5th	0.75	5.96	10.67	1.43	2.62	0.20
	National total	1.84	12.53	11.02	2.42	1.75	0.31

Table 3.3.3 (b) Average budget share by commodity (%), Mali 2001

		Roots	Pulses	Groundnut	Oilseed	Sugar	Banana
Urban	1st	0.56	0.93	4.90	0.09	3.71	0.05
	2nd	1.08	0.94	3.64	0.04	3.20	0.06
	3rd	1.51	0.97	3.50	0.03	3.08	0.17
	4th	1.96	1.11	3.15	0.04	3.02	0.35
	5th	1.97	0.63	2.15	0.04	2.56	0.42
	Urban total	1.68	0.85	2.99	0.04	2.91	0.29
Rural	1st	0.88	1.78	2.41	0.16	3.15	0.03
	2nd	0.74	1.74	2.29	0.19	3.36	0.03
	3rd	0.47	1.19	2.82	0.07	3.24	0.02
	4th	0.67	1.75	3.77	0.13	4.38	0.04
	5th	1.12	1.25	2.76	0.09	3.57	0.09
	Rural total	0.86	1.45	2.91	0.11	3.64	0.06
National	1st	1.10	1.64	2.42	0.17	3.32	0.04
	2nd	0.44	1.58	2.70	0.13	3.28	0.02
	3rd	0.68	1.53	3.78	0.10	4.09	0.04
	4th	0.92	1.18	3.42	0.11	3.56	0.05
	5th	1.70	0.94	2.58	0.04	2.98	0.29
	National total	1.21	1.19	2.95	0.08	3.33	0.16

Table 3.3.3 (c) Average budget share by commodity (%), Mali 2001

		Fruit	Vegetable	Vegoil	Beef	Mutton	Pork
Urban	1st	0.70	13.82	3.16	7.69	1.94	0.08
	2nd	0.84	13.05	3.30	6.71	2.45	0.00
	3rd	0.94	12.69	3.28	7.20	2.44	0.00
	4th	0.82	12.12	2.97	6.83	2.55	0.01
	5th	0.71	10.06	2.53	5.82	1.75	0.02
	Urban total	0.79	11.61	2.90	6.53	2.14	0.02
Rural	1st	0.53	12.97	1.07	1.91	2.04	0.01
	2nd	0.84	11.14	1.55	2.59	1.98	0.01
	3rd	0.78	10.88	1.56	3.54	1.88	0.01
	4th	0.68	9.50	1.79	5.42	2.20	0.07
	5th	0.70	7.79	2.00	5.92	2.16	0.05
	Rural total	0.71	9.40	1.77	4.77	2.10	0.04
National	1st	0.52	12.24	1.30	2.30	2.11	0.05
	2nd	0.87	11.43	1.54	3.19	1.79	0.01
	3rd	0.70	10.47	2.04	5.67	2.05	0.05
	4th	0.79	10.81	2.65	6.06	2.70	0.06
	5th	0.74	9.63	2.43	6.18	1.93	0.02
	National total	0.74	10.36	2.26	5.53	2.12	0.03

Table 3.3.3 (d) Average budget share by commodity (%), Mali 2001

		Poultry	Other Meat	Milk	Egg	Fish	Other Livestock
Urban	1st	0.22	0.12	0.91	0.00	6.53	0.22
	2nd	0.53	0.13	1.25	0.01	6.77	0.16
	3rd	0.84	0.16	1.72	0.05	6.26	0.22
	4th	0.80	0.20	1.86	0.09	7.00	0.12
	5th	1.69	0.21	2.67	0.12	6.97	0.14
	Urban total	1.10	0.18	2.02	0.08	6.80	0.16
Rural	1st	0.21	0.04	0.76	0.00	4.21	0.12
	2nd	0.48	0.06	1.35	0.01	5.25	0.05
	3rd	0.41	0.03	1.47	0.00	5.57	0.11
	4th	0.44	0.03	2.01	0.01	5.16	0.11
	5th	0.74	0.07	2.06	0.01	5.19	0.13
	Rural total	0.56	0.05	1.78	0.01	5.18	0.11
National	1st	0.26	0.06	0.99	0.00	4.96	0.08
	2nd	0.48	0.05	1.31	0.00	5.21	0.10
	3rd	0.35	0.05	1.72	0.01	5.51	0.11
	4th	0.63	0.08	1.78	0.01	5.80	0.16
	5th	1.15	0.16	2.23	0.08	6.31	0.14
	National total	0.79	0.11	1.89	0.04	5.88	0.13

Table 3.3.3 (e) Average budget share by commodity (%), Mali 2001

		Beverage	Processed Food	Nonfood
Urban	1st	0.96	0.61	22.53
	2nd	1.13	0.83	26.46
	3rd	1.13	0.76	28.03
	4th	1.01	1.46	30.81
	5th	0.96	1.13	40.89
	Urban total	1.02	1.07	33.33
Rural	1st	1.65	0.41	17.02
	2nd	1.58	0.44	18.88
	3rd	1.86	0.47	20.91
	4th	1.69	0.44	22.47
	5th	1.57	0.50	33.20
	Rural total	1.65	0.47	26.11
National	1st	1.58	0.45	17.90
	2nd	1.71	0.46	19.69
	3rd	1.62	0.48	21.65
	4th	1.43	0.59	26.13
	5th	1.17	0.97	36.74
	National total	1.38	0.73	29.24

Table 3.3.4 (a) Average budget share by commodity (%), Ghana, 1998/99

		Maize	Rice	Wheat	Other Cereals	Roots	Pulse and Groundnut	Banana	Fruit and Vegetable
Urban	1st	4.19	3.48	1.84	1.16	9.11	3.05	1.18	7.56
	2nd	2.39	3.80	2.46	0.71	8.65	2.36	1.33	6.79
	3rd	1.69	3.24	2.70	0.07	8.87	1.80	1.70	6.16
	4th	1.18	3.06	3.23	0.03	6.90	1.47	1.99	5.92
	5th	0.70	2.67	3.14	0.02	4.79	1.22	1.91	5.41
	Urban total	1.39	3.03	2.93	0.18	6.66	1.62	1.78	5.95
Rural	1st	6.90	2.88	0.84	6.17	9.47	6.13	0.19	8.32
	2nd	5.20	2.73	1.61	1.78	15.39	3.75	0.55	7.53
	3rd	3.67	2.87	1.91	0.65	16.50	3.42	0.97	6.77
	4th	3.10	2.66	1.86	0.37	17.38	2.74	0.94	6.10
	5th	2.31	2.77	2.13	0.36	13.07	2.51	1.52	5.80
	Rural total	3.30	2.76	1.90	0.93	14.61	3.06	1.12	6.37
National	1st	6.14	2.84	1.13	4.40	10.67	5.40	0.35	8.24
	2nd	4.32	2.97	1.79	1.02	14.72	3.24	0.89	7.15
	3rd	3.25	2.97	1.95	0.73	15.23	2.94	1.00	6.48
	4th	2.28	3.11	2.30	0.26	12.74	2.37	1.45	6.17
	5th	1.28	2.75	2.86	0.11	7.54	1.63	1.82	5.59
	National total	2.38	2.89	2.40	0.57	10.77	2.37	1.44	6.16

Table 3.3.4 (b) Average budget share by commodity (%), Ghana, 1998/99

		Vegoil and Sugar	Poultry	Milk	Other Livestock	Fish	Beverage	Other Food	Nonfood
Urban	1st	4.12	0.76	0.49	2.57	9.89	2.13	6.13	42.31
	2nd	4.56	0.98	0.90	2.82	8.78	2.54	5.64	45.28
	3rd	4.61	1.66	1.27	2.99	8.07	2.46	5.82	46.89
	4th	4.02	2.04	1.44	3.15	7.48	3.34	4.89	49.87
	5th	3.80	2.78	1.57	3.32	6.15	4.04	6.28	52.20
	Urban total	4.09	2.09	1.35	3.12	7.31	3.33	5.80	49.37
Rural	1st	3.33	1.24	0.23	1.80	8.72	4.93	3.38	35.46
	2nd	3.59	1.21	0.47	1.76	11.40	3.03	4.62	35.38
	3rd	3.28	1.21	0.49	1.93	12.02	2.70	4.32	37.31
	4th	3.00	1.41	0.55	2.08	11.73	2.69	4.22	39.16
	5th	3.07	1.76	0.97	3.70	10.03	3.78	3.96	42.26
	Rural total	3.16	1.50	0.70	2.73	10.79	3.35	4.11	39.61
National	1st	3.62	1.23	0.39	1.87	9.93	4.05	4.09	35.64
	2nd	3.53	1.10	0.36	1.97	11.41	2.82	5.02	37.69
	3rd	3.49	1.12	0.62	2.27	10.84	2.57	4.61	39.92
	4th	3.80	1.61	0.95	2.61	9.70	2.78	4.71	43.15
	5th	3.57	2.30	1.38	3.60	7.68	3.89	5.21	48.77
	National total	3.61	1.79	1.01	2.92	9.11	3.34	4.93	44.33

Table 3.3.5 (a) Average budget share by commodity (%), Senegal 2001

		Maize	Rice	Wheat	Other Cereals	Roots	Pulses and Groundnut	Banana	Fruit and Vegetable
Urban	1st	0.7	9.3	6.6	1.2	1.4	1.7	0.0	10.8
	2nd	0.6	7.6	6.7	1.1	1.3	1.4	0.0	10.1
	3rd	0.6	7.1	6.7	0.9	1.3	1.2	0.0	9.8
	4th	0.6	5.7	6.1	0.6	1.3	1.0	0.1	9.2
	5th	0.2	3.5	4.0	0.4	1.1	0.7	0.1	6.8
	Urban total	0.5	5.5	5.4	0.7	1.2	1.0	0.1	8.5
Rural	1st	1.0	13.6	2.2	10.7	0.6	4.3	0.0	10.4
	2nd	1.3	12.3	3.3	9.6	0.8	4.0	0.0	10.4
	3rd	1.3	11.4	3.3	9.0	1.0	3.8	0.0	10.4
	4th	0.9	12.9	3.7	7.8	0.9	3.3	0.0	9.9
	5th	1.1	11.9	3.4	6.1	1.0	2.7	0.0	8.7
	Rural total	1.1	12.2	3.3	7.8	0.9	3.3	0.0	9.6
National	1st	1.1	12.7	2.7	9.5	0.8	4.0	0.0	10.5
	2nd	1.2	11.6	3.9	7.8	1.0	3.5	0.0	10.5
	3rd	0.8	10.9	4.8	5.4	1.0	2.7	0.0	9.9
	4th	0.8	9.3	5.5	2.8	1.2	1.8	0.0	9.6
	5th	0.5	5.4	4.5	1.5	1.2	1.1	0.1	7.7
	National total	0.7	8.2	4.6	3.6	1.1	2.0	0.1	8.9

Table 3.3.5 (b) Average budget share by commodity (%), Senegal 2001

		Vegoil and Sugar	Poultry	Milk	Other Livestock	Fish	Beverage	Other Food	Nonfood
Urban	1st	10.4	0.7	2.4	4.0	7.7	2.5	0.9	39.8
	2nd	10.0	0.7	2.8	6.2	6.3	2.3	0.8	42.0
	3rd	9.0	0.6	3.1	8.8	5.9	2.3	1.0	41.6
	4th	7.9	0.9	3.6	9.8	5.8	2.2	0.9	44.3
	5th	5.4	1.3	3.3	11.3	4.3	1.9	2.2	53.3
	Urban total	7.4	1.0	3.2	9.4	5.4	2.1	1.5	47.1
Rural	1st	11.3	0.2	0.9	1.0	6.1	2.4	0.5	34.6
	2nd	11.8	0.6	1.1	1.7	5.5	2.9	0.6	34.1
	3rd	11.8	0.6	1.4	2.4	6.0	3.0	0.7	33.8
	4th	12.2	0.5	1.7	4.2	5.5	3.2	0.6	32.7
	5th	11.6	0.6	2.7	11.7	4.5	3.2	0.9	29.9
	Rural total	11.8	0.5	1.9	6.3	5.2	3.1	0.7	32.1
National	1st	11.6	0.4	1.0	1.4	6.3	2.5	0.6	35.0
	2nd	11.6	0.6	1.6	2.4	6.1	3.0	0.7	34.4
	3rd	11.4	0.6	2.1	4.8	6.0	2.9	0.7	36.0
	4th	10.2	0.7	2.8	8.2	5.6	2.6	0.8	37.9
	5th	7.1	1.1	3.3	11.6	4.6	2.2	1.7	46.6
	National total	9.2	0.8	2.7	8.1	5.3	2.5	1.2	41.0

Table 3.3.5 (a) Marginal budget share by commodity (%), Mali 2001

		Maize	Millet	Rice	Sorghum	Wheat	Other Cereal
Urban	1st	0.38	4.08	12.91	0.93	4.14	-0.24
	2nd	0.30	3.17	10.15	0.77	4.00	-0.10
	3rd	0.26	2.62	8.48	0.68	3.93	-0.01
	4th	0.21	2.12	6.96	0.59	3.85	0.06
	5th	0.12	1.07	3.76	0.41	3.70	0.23
	Urban total	0.23	2.36	7.67	0.63	3.89	0.03
Rural	1st	0.93	11.09	21.50	2.90	1.80	0.21
	2nd	0.79	9.20	18.83	2.44	1.56	0.17
	3rd	0.68	7.76	16.80	2.08	1.37	0.14
	4th	0.57	6.44	14.93	1.75	1.21	0.12
	5th	0.35	3.60	10.93	1.05	0.85	0.06
	Rural total	0.60	6.84	15.50	1.85	1.26	0.13
National	1st	0.18	4.08	20.38	1.23	3.10	0.10
	2nd	0.15	3.24	17.08	1.01	3.02	0.11
	3rd	0.13	2.61	14.65	0.84	2.96	0.12
	4th	0.10	1.93	11.97	0.67	2.89	0.12
	5th	0.05	0.75	7.35	0.36	2.77	0.14
	National total	0.11	2.21	13.07	0.74	2.92	0.12

Table 3.3.5 (b) Marginal budget share by commodity (%), Mali 2001

		Roots	Pulses	Groundnut	Oilseed	Sugar	Banana
Urban	1st	2.65	1.12	3.28	-0.05	3.54	0.46
	2nd	2.65	0.87	2.56	-0.02	2.91	0.56
	3rd	2.65	0.71	2.12	0.00	2.53	0.62
	4th	2.65	0.57	1.73	0.01	2.19	0.68
	5th	2.65	0.28	0.90	0.05	1.46	0.80
	Urban total	2.65	0.64	1.91	0.01	2.35	0.65
Rural	1st	1.20	1.79	6.46	0.05	5.01	0.05
	2nd	1.04	1.54	5.48	0.04	4.31	0.05
	3rd	0.93	1.35	4.74	0.03	3.78	0.04
	4th	0.82	1.18	4.05	0.02	3.30	0.04
	5th	0.59	0.80	2.58	0.01	2.25	0.03
	Rural total	0.85	1.23	4.26	0.02	3.45	0.04
National	1st	1.99	1.36	5.72	-0.01	4.71	0.17
	2nd	1.97	1.13	4.70	-0.01	4.00	0.25
	3rd	1.96	0.96	3.95	0.00	3.47	0.31
	4th	1.95	0.78	3.12	0.01	2.89	0.37
	5th	1.94	0.45	1.70	0.02	1.89	0.48
	National total	1.96	0.85	3.46	0.00	3.13	0.34

Table 3.3.5 (c) Marginal budget share by commodity (%), Mali 2001

		Fruit	Vegetable	Vegoil	Beef	Mutton	Pork
Urban	1st	1.08	12.60	3.49	7.55	2.15	0.02
	2nd	0.93	10.89	2.96	6.56	2.01	0.03
	3rd	0.84	9.85	2.63	5.95	1.92	0.03
	4th	0.76	8.91	2.34	5.41	1.85	0.04
	5th	0.59	6.93	1.72	4.26	1.68	0.05
	Urban total	0.80	9.35	2.47	5.66	1.88	0.04
Rural	1st	0.89	9.46	3.39	10.48	3.87	0.02
	2nd	0.75	8.13	2.96	9.03	3.32	0.02
	3rd	0.65	7.12	2.63	7.92	2.91	0.02
	4th	0.56	6.19	2.33	6.90	2.53	0.01
	5th	0.36	4.20	1.68	4.72	1.71	0.01
	Rural total	0.59	6.47	2.42	7.21	2.65	0.01
National	1st	1.08	13.08	4.16	10.82	3.06	0.01
	2nd	0.95	11.51	3.61	9.32	2.70	0.01
	3rd	0.85	10.35	3.21	8.21	2.42	0.02
	4th	0.75	9.08	2.76	7.00	2.12	0.02
	5th	0.56	6.88	1.99	4.89	1.61	0.03
	National total	0.79	9.60	2.95	7.50	2.25	0.02

Table 3.3.5 (d) Marginal budget share by commodity (%), Mali 2001

		Poultry	Other Meat	Milk	Egg	Fish	Other Livestock
Urban	1st	0.57	0.52	2.42	0.04	7.48	0.33
	2nd	1.48	0.40	2.50	0.09	7.35	0.25
	3rd	2.04	0.32	2.56	0.12	7.26	0.20
	4th	2.54	0.25	2.61	0.15	7.19	0.16
	5th	3.60	0.11	2.71	0.21	7.03	0.07
	Urban total	2.31	0.29	2.58	0.14	7.22	0.18
Rural	1st	0.93	0.04	2.48	0.03	7.71	0.33
	2nd	0.78	0.04	2.14	0.02	6.73	0.28
	3rd	0.67	0.04	1.88	0.02	5.99	0.25
	4th	0.57	0.03	1.64	0.02	5.30	0.21
	5th	0.35	0.03	1.13	0.01	3.83	0.14
	Rural total	0.60	0.03	1.71	0.02	5.51	0.22
National	1st	0.34	0.35	2.25	0.02	8.10	0.35
	2nd	0.76	0.30	2.19	0.04	7.53	0.29
	3rd	1.07	0.26	2.14	0.06	7.12	0.24
	4th	1.42	0.22	2.09	0.08	6.66	0.20
	5th	2.01	0.15	1.99	0.12	5.88	0.12
	National total	1.28	0.24	2.11	0.08	6.85	0.22

Table 3.3.5 (e) Marginal budget share by commodity (%), Mali 2001

		Beverage	Processed Food	Nonfood
Urban	1st	1.29	1.01	26.26
	2nd	1.09	0.97	34.67
	3rd	0.96	0.94	39.78
	4th	0.85	0.91	44.42
	5th	0.61	0.86	54.14
	Urban total	0.90	0.92	42.25
Rural	1st	1.89	0.41	5.07
	2nd	1.63	0.35	18.34
	3rd	1.43	0.31	28.46
	4th	1.25	0.27	37.78
	5th	0.86	0.18	57.70
	Rural total	1.30	0.28	34.92
National	1st	1.47	0.78	11.12
	2nd	1.27	0.75	22.11
	3rd	1.12	0.72	30.24
	4th	0.95	0.69	39.17
	5th	0.66	0.65	54.57
	National total	1.02	0.71	35.49

Table 3.3.6 (a) Marginal budget share by commodity (%), Ghana, 1998/99

		Maize	Rice	Wheat	Other Cereals	Roots	Pulse and Groundnut	Banana	Fruit and Vegetable
Urban	1st	0.43	3.20	3.26	-0.03	4.80	1.06	2.10	5.69
	2nd	0.41	2.86	3.06	-0.03	4.37	0.99	1.94	5.31
	3rd	0.39	2.62	2.92	-0.04	4.07	0.94	1.83	5.05
	4th	0.38	2.39	2.78	-0.04	3.78	0.90	1.72	4.79
	5th	0.34	1.84	2.44	-0.04	3.07	0.79	1.46	4.17
	Urban total	0.38	2.44	2.81	-0.04	3.84	0.91	1.74	4.85
Rural	1st	1.60	2.72	1.51	-0.88	17.89	1.79	1.18	3.75
	2nd	1.53	2.61	1.67	-0.71	15.78	1.73	1.30	4.01
	3rd	1.49	2.54	1.77	-0.61	14.45	1.70	1.38	4.17
	4th	1.45	2.46	1.90	-0.47	12.79	1.65	1.47	4.37
	5th	1.34	2.28	2.17	-0.18	9.27	1.55	1.67	4.81
	Rural total	1.46	2.48	1.87	-0.51	13.25	1.66	1.45	4.32
National	1st	0.84	3.29	2.68	-0.63	9.55	1.26	1.90	5.10
	2nd	0.77	3.03	2.65	-0.52	8.27	1.19	1.84	4.99
	3rd	0.71	2.83	2.63	-0.43	7.28	1.13	1.80	4.90
	4th	0.65	2.60	2.60	-0.33	6.12	1.06	1.75	4.80
	5th	0.54	2.17	2.55	-0.14	3.96	0.93	1.66	4.60
	National total	0.67	2.68	2.61	-0.36	6.50	1.08	1.77	4.83

Table 3.3.6 (b) Marginal budget share by commodity (%), Ghana, 1998/99

		Vegoil and Sugar	Poultry	Milk	Other Livestock	Fish	Beverage	Other Food	Nonfood
Urban	1st	2.70	3.24	2.04	4.71	5.24	3.33	0.37	57.84
	2nd	2.80	2.96	1.91	4.16	4.93	3.40	1.53	59.40
	3rd	2.87	2.77	1.82	3.77	4.71	3.46	2.33	60.49
	4th	2.93	2.58	1.73	3.40	4.50	3.50	3.11	61.54
	5th	3.09	2.13	1.52	2.51	3.99	3.62	4.99	64.07
	Urban total	2.92	2.62	1.75	3.49	4.55	3.49	2.94	61.31
Rural	1st	2.17	1.35	0.71	5.55	10.67	2.27	2.34	45.38
	2nd	2.28	1.44	0.82	6.01	10.35	2.66	2.61	45.93
	3rd	2.34	1.49	0.89	6.29	10.14	2.90	2.77	46.27
	4th	2.42	1.56	0.97	6.65	9.88	3.21	2.98	46.70
	5th	2.59	1.71	1.16	7.40	9.34	3.85	3.43	47.62
	Rural total	2.40	1.54	0.95	6.55	9.95	3.12	2.92	46.58
National	1st	2.84	2.26	1.50	5.67	7.88	2.60	1.82	51.45
	2nd	2.90	2.22	1.50	5.33	7.31	2.83	2.44	53.26
	3rd	2.95	2.19	1.50	5.06	6.88	3.01	2.91	54.66
	4th	3.00	2.15	1.51	4.75	6.37	3.21	3.46	56.29
	5th	3.10	2.08	1.51	4.17	5.42	3.60	4.50	59.34
	National total	2.98	2.16	1.51	4.85	6.54	3.15	3.29	55.76

Table 3.3.7 (a) Marginal budget share by commodity (%), Senegal 2001

		Maize	Rice	Wheat	Other Cereals	Roots	Pulses and Groundnut	Banana	Fruit and Vegetable
Urban	1st	0.41	3.82	6.35	0.46	1.33	0.78	0.00	8.47
	2nd	0.32	3.19	5.18	0.36	1.22	0.64	0.06	7.40
	3rd	0.27	2.84	4.54	0.30	1.16	0.57	0.09	6.81
	4th	0.21	2.48	3.87	0.24	1.09	0.49	0.12	6.19
	5th	0.08	1.58	2.21	0.10	0.94	0.29	0.20	4.68
	Urban total	0.23	2.61	4.11	0.27	1.12	0.52	0.11	6.42
Rural	1st	-11.63	15.19	5.98	-10.87	1.37	2.91	0.08	11.24
	2nd	-6.95	13.72	5.05	-5.08	1.24	2.57	0.07	9.86
	3rd	-4.25	12.88	4.52	-1.74	1.17	2.37	0.06	9.07
	4th	-1.28	11.95	3.93	1.94	1.10	2.16	0.05	8.20
	5th	4.86	10.02	2.71	9.54	0.94	1.72	0.04	6.40
	Rural total	-2.69	12.39	4.21	0.20	1.13	2.26	0.06	8.61
National	1st	-0.30	7.50	8.45	-1.58	1.55	0.62	-0.05	10.19
	2nd	-0.04	6.30	7.18	-1.04	1.43	0.53	0.00	9.04
	3rd	0.15	5.46	6.29	-0.66	1.34	0.47	0.04	8.23
	4th	0.35	4.54	5.31	-0.24	1.24	0.40	0.08	7.34
	5th	0.76	2.65	3.30	0.61	1.04	0.26	0.16	5.52
	National total	0.26	4.96	5.76	-0.43	1.28	0.43	0.06	7.75

Table 3.3.7 (b) Marginal budget share by commodity (%), Senegal 2001

		Vegoil and Sugar	Poultry	Milk	Other Livestock	Fish	Beverage	Other Food	Nonfood
Urban	1st	6.95	1.28	4.32	20.85	5.14	1.27	0.59	37.99
	2nd	5.78	1.39	4.00	18.30	4.57	1.46	1.01	45.12
	3rd	5.14	1.46	3.83	16.89	4.25	1.56	1.25	49.05
	4th	4.47	1.52	3.64	15.42	3.92	1.67	1.49	53.18
	5th	2.81	1.68	3.19	11.79	3.10	1.93	2.10	63.32
	Urban total	4.71	1.50	3.71	15.94	4.04	1.63	1.41	51.70
Rural	1st	15.39	0.60	4.30	15.45	6.54	4.02	1.07	38.39
	2nd	13.75	0.59	3.77	16.90	5.30	3.58	1.06	34.56
	3rd	12.81	0.59	3.46	17.73	4.59	3.33	1.05	32.36
	4th	11.77	0.58	3.13	18.65	3.80	3.05	1.04	29.93
	5th	9.62	0.58	2.43	20.55	2.17	2.48	1.02	24.91
	Rural total	12.26	0.59	3.28	18.22	4.17	3.18	1.04	31.08
National	1st	10.49	0.73	4.47	20.98	5.88	1.80	0.37	28.89
	2nd	8.93	0.91	4.19	19.15	5.28	1.82	0.72	35.59
	3rd	7.82	1.04	3.99	17.86	4.85	1.84	0.97	40.33
	4th	6.61	1.18	3.77	16.45	4.38	1.85	1.24	45.51
	5th	4.13	1.47	3.33	13.56	3.42	1.89	1.79	56.11
	National total	7.17	1.12	3.87	17.09	4.60	1.85	1.11	43.13

Table 3.4.1 (a) Per capita annual expenditure by income quintile ($US), Mali 2001

	Lowest quintile	2nd	3rd	4th	Highest quintile	Total
Rural	51.1	81.1	111.9	153.8	309.0	141.7
Urban	117.8	187.3	255.5	337.4	627.3	305.4
National	56.7	94.6	136.1	205.9	429.5	184.6

Table 3.4.1 (b) Per capita annual expenditure by income quintile ($US), Ghana 1998/99

	Lowest quintile	2nd	3rd	4th	Highest quintile	Total
Rural	88	157	224	320	638	286
Urban	174	298	444	622	1,140	536
National	102	187	273	419	862	369

Table 3.4.1 (c) Per capita annual expenditure by income quintile ($US), Senegal 2001

	Lowest quintile	2nd	3rd	4th	Highest quintile	Total
Rural	63	95	121	160	288	145
Urban	117	186	246	331	672	311
National	72	114	159	230	484	212

Table 3.4.2 (a) Share of each quintile's total expenditure in the national total (%), Mali 2001

	Lowest quintile	2nd	3rd	4th	Highest quintile	Total
Rural	4.0	6.6	8.8	12.5	24.7	56.6
Urban	3.3	5.3	7.2	9.6	17.9	43.4
National	6.1	10.2	14.8	22.3	46.5	100.0

Table 3.4.2 (b) Share of each quintile's total expenditure in the national total (%), Ghana 1998/99

	Lowest quintile	2nd	3rd	4th	Highest quintile	Total
Rural	3.2	5.7	8.1	11.6	23.1	51.7
Urban	3.1	5.4	8.0	11.2	20.6	48.3
National	5.5	10.1	14.9	22.7	46.7	100.0

Table 3.4.2 (c) Share of each quintile's total expenditure in the national total (%), Senegal 2001

	Lowest quintile	2nd	3rd	4th	Highest quintile	Total
Rural	3.5	5.3	6.8	9.0	16.2	40.8
Urban	4.5	7.1	9.4	12.6	25.7	59.2
National	6.8	10.7	15.0	21.6	45.8	100.0

Table 3.4.9 (a) Total food consumption of three coarse grains in Mali, 2001

		maize	millet	sorghum
National total consumption (million $US)		34.9	236.8	45.7
% of each quintile's total spending in national total				
urban	1st	2.2	2.9	2.1
	2nd	3.9	3.3	2.0
	3rd	4.3	3.8	2.0
	4th	2.9	4.1	4.1
	5th	4.5	5.4	5.4
	Urban total	17.8	19.6	15.6
rural	1st	11.9	10.7	8.1
	2nd	17.5	14.4	12.1
	3rd	19.2	16.8	12.7
	4th	15.7	17.4	23.4
	5th	17.9	21.1	28.1
	Rural total	82.2	80.4	84.4
national	1st	17.0	**14.9**	12.7
	2nd	25.7	20.5	15.4
	3rd	18.0	20.9	24.1
	4th	20.5	21.6	20.3
	5th	18.8	**22.1**	27.5
	National total	100.0	100.0	100.0

Table 3.4.9(b) Per person food consumption of three coarse grains in Mali, 2001 ($US)

		maize	millet	sorghum
urban	1st	1.4	12.9	1.8
	2nd	2.5	14.7	1.7
	3rd	2.8	16.9	1.7
	4th	1.9	18.2	3.5
	5th	2.9	23.5	4.6
	Urban total	2.3	17.3	2.7
rural	1st	2.8	**17.2**	2.5
	2nd	3.9	22.0	3.6
	3rd	4.5	26.8	3.9
	4th	3.6	26.9	7.0
	5th	4.1	**33.1**	8.5
	Rural total	3.8	25.2	5.1
national	1st	2.9	17.2	2.8
	2nd	4.4	23.7	3.5
	3rd	3.0	24.1	5.4
	4th	3.5	25.0	4.5
	5th	3.2	25.6	6.1
	National total	3.4	23.1	4.5

Table 3.4.10(a) Total food consumption of selected staple crops in Ghana, 1998/99

		maize	Sorghum/millet	Root crops
National total consumption (million $US)		160.4	38.3	726.9
% of each quintile's total spending in national total				
urban	1st	5.5	6.4	2.6
	2nd	5.4	6.7	4.3
	3rd	5.7	1.1	6.6
	4th	5.6	0.6	7.2
	5th	6.0	0.9	9.2
	Urban total	28.2	15.6	29.9
rural	1st	9.3	34.8	2.8
	2nd	12.4	17.9	8.1
	3rd	12.5	9.2	12.4
	4th	15.1	7.6	18.7
	5th	22.5	14.9	28.0
	Rural total	71.8	84.4	70.1
national	1st	**14.3**	43.0	5.5
	2nd	18.4	18.3	13.8
	3rd	20.3	19.0	21.0
	4th	21.8	10.5	26.9
	5th	**25.1**	9.2	32.7
	National total	100.0	100.0	100.0

Table 3.4.10(b) Per person food consumption of selected staple crops in Ghana, 1998/99 ($US)

		maize	Sorghum/millet	Root crops
urban	1st	7.2	2.0	15.8
	2nd	7.1	2.1	25.9
	3rd	7.5	0.3	39.3
	4th	7.4	0.2	43.0
	5th	7.9	0.3	54.6
	Urban total	7.4	1.0	35.7
rural	1st	**6.1**	5.5	8.4
	2nd	8.2	2.8	24.2
	3rd	8.2	1.4	37.0
	4th	9.9	1.2	55.7
	5th	**14.7**	2.3	83.3
	Rural total	9.4	2.6	41.7
national	1st	6.3	4.5	10.9
	2nd	8.1	1.9	27.5
	3rd	8.9	2.0	41.8
	4th	9.6	1.1	53.6
	5th	11.0	1.0	64.7
	National total	8.8	2.1	39.7

Table 3.4.11(a) Total food consumption of selected staple crops in Senegal, 2001

		maize	Sorghum/millet	Root crops
National total consumption (million $US)		12.6	62.7	19.4
% of each quintile's total spending in national total				
urban	1st	4.3	1.5	5.5
	2nd	6.1	2.2	8.3
	3rd	8.4	2.4	11.4
	4th	9.8	2.2	15.1
	5th	8.9	2.9	25.9
	Urban total	37.5	11.2	66.1
rural	1st	4.9	**10.5**	1.9
	2nd	9.3	14.2	3.9
	3rd	12.1	17.1	6.1
	4th	11.7	19.6	7.2
	5th	24.5	**27.4**	14.7
	Rural total	62.5	88.8	33.9
national	1st	10.0	18.1	4.7
	2nd	18.0	23.4	9.9
	3rd	17.1	22.7	14.2
	4th	22.6	17.1	22.9
	5th	32.2	18.8	48.2
	National total	100.0	100.0	100.0

Table 3.4.11(b) Per person food consumption of selected staple crops in Senegal, 2001 ($US)

		maize	Sorghum/millet	Root crops
urban	1st	0.8	1.4	1.6
	2nd	1.2	2.0	2.4
	3rd	1.6	2.2	3.3
	4th	1.8	2.1	4.4
	5th	1.7	2.8	7.5
	Urban total	1.4	2.1	3.8
rural	1st	0.6	**6.7**	0.4
	2nd	1.2	9.1	0.8
	3rd	1.5	10.9	1.2
	4th	1.5	12.5	1.4
	5th	3.1	**17.4**	2.9
	Rural total	1.6	11.3	1.3
national	1st	0.8	6.9	0.6
	2nd	1.4	8.9	1.2
	3rd	1.3	8.6	1.7
	4th	1.7	6.5	2.7
	5th	2.4	7.1	5.7
	National total	1.5	7.6	2.4

Table 4.1.1 National and WCA region agricultural land uses by area and area shares

	Total Land Area	Agricultural Area	Arable & Perm Crops	Non-Arable & Non-Perm	Irrigated Cropland	Permanent Pasture	Ag Land/ Total Land	Arable/ Total Ag	Pasture/ Total Ag	Irrigated/ Arable
				(1000 ha)					*(percent)*	
Sahelian West Africa	*527,556*	*181,001*	*30,562*	*496,994*	*540*	*150,439*	*34.3*	*16.9*	*83.1*	*1.8*
Burkina Faso	27,360	10,100	4,100	23,260	25	6,000	36 9	40 6	59 4	0 6
Chad	125,920	48,550	3,550	122,370	26	45,000	38 6	7 3	92 7	0 7
Gambia	1,000	749	290	710	2	459	74 9	38 7	61 3	0 7
Guinea-Bissau	2,812	1,628	548	2,264	25	1,080	57 9	33 7	66 3	4 6
Mali	122,019	34,674	4,674	117,345	236	30,000	28 4	13 5	86 5	5 0
Mauritania	102,522	39,750	500	102,022	49	39,250	38 8	1 3	98 7	9 8
Niger	126,670	37,500	14,500	112,170	73	23,000	29 6	38 7	61 3	0 5
Senegal	19,253	8,050	2,400	16,853	104	5,650	41 8	29 8	70 2	4 3
Coastal West Africa	*203,498*	*128,770*	*51,770*	*151,728*	*496*	*77,000*	*63.3*	*40.2*	*59.8*	*1.0*
Benin	11,062	3,195	2,645	8,417	12	550	28 9	82 8	17 2	0 5
Côte d'Ivoire	31,800	19,800	6,800	25,000	73	13,000	62 3	34 3	65 7	1 1
Ghana	22,754	14,450	6,100	16,654	31	8,350	63 5	42 2	57 8	0 5
Guinea	24,572	12,300	1,600	22,972	95	10,700	50 1	13 0	87 0	5 9
Liberia	9,632	2,595	595	9,037	3	2,000	26 9	22 9	77 1	0 5
Nigeria	91,077	70,050	30,850	60,227	245	39,200	76 9	44 0	56 0	0 8
Sierra Leone	7,162	2,750	550	6,612	30	2,200	38 4	20 0	80 0	5 5
Togo	5,439	3,630	2,630	2,809	7	1,000	66 7	72 5	27 5	0 3
Central Africa	*395,460*	*52,809*	*18,019*	*377,441*	*47*	*34,790*	*13.4*	*34.1*	*65.9*	*0.3*
Cameroon	46,540	9,160	7,160	39,380	26	2,000	19 7	78 2	21 8	0 4
Central Afr Rep	62,298	5,149	2,024	60,274	1	3,125	8 3	39 3	60 7	0 0
Congo, Dem Rep of	226,705	22,800	7,800	218,905	11	15,000	10 1	34 2	65 8	0 1
Congo, Rep of	34,150	10,540	540	33,610	2	10,000	30 9	5 1	94 9	0 4
Gabon	25,767	5,160	495	25,272	7	4,665	20 0	9 6	90 4	1 4
WCA	*1,725,472*	*544,159*	*170,140*	*1,555,332*	*1,626*	*374,019*	*31.5*	*31.3*	*68.7*	*1.0*

Source: Authors from FAOSTAT (accessed Oct. 2006)

Table 4.1.2 Agricultural land and rural population

	Agricultural Area	Arable & Perm.Crops	Rural Population	Total Population	Arable Land Per Capita (rural pop)	Arable Land Per Capita (total pop)
Sahelian West Africa	*181,001*	*30,562*	*40,704*	*57,129*	*0.8*	*0.5*
Burkina Faso	10,100	4,100	9,914	11,905	0.4	0.3
Chad	48,550	3,550	5,991	7,861	0.6	0.5
Gambia	749	290	968	1,312	0.3	0.2
Guinea-Bissau	1,628	548	936	1,367	0.6	0.4
Mali	34,674	4,674	8,310	11,904	0.6	0.4
Mauritania	39,750	500	1,117	2,645	0.4	0.2
Niger	37,500	14,500	8,531	10,742	1.7	1.3
Senegal	8,050	2,400	4,937	9,393	0.5	0.3
Coastal West Africa	*128,770*	*51,770*	*100,574*	*176,425*	*0.5*	*0.3*
Benin	3,195	2,645	3,592	6,222	0.7	0.4
Côte d'Ivoire	19,800	6,800	8,925	15,827	0.8	0.4
Ghana	14,450	6,100	10,987	19,593	0.6	0.3
Guinea	12,300	1,600	5,470	8,117	0.3	0.2
Liberia	2,595	595	1,622	2,943	0.4	0.2
Nigeria	70,050	30,850	64,143	114,746	0.5	0.3
Sierra Leone	2,750	550	2,796	4,415	0.2	0.1
Togo	3,630	2,630	3,039	4,562	0.9	0.6
Central Africa	*52,809*	*18,019*	*45,636*	*72,108*	*0.4*	*0.2*
Cameroon	9,160	7,160	7,713	15,117	0.9	0.5
Central Afr Rep	5,149	2,024	2,184	3,715	0.9	0.5
Congo, Dem Rep of	22,800	7,800	33,858	48,571	0.2	0.2
Congo, Rep of	10,540	540	1,647	3,447	0.3	0.2
Gabon	5,160	495	234	1,258	2.1	0.4
WCA	*544,159*	*170,140*	*333,124*	*554,195*	*0.5*	*0.3*

Source: Authors from FAOSTAT (accessed Oct. 2006)

Table 4.2 Crop, pasture and rural population shares by length of growing period

length of growing period (months)	crop area (1000s ha)	pasture (1000s ha)	rural pop (1000s)	crop area %	pasture %	rural pop %
0	466	42,540	2,732	1%	17%	1%
1	40	9,057	1,681	0%	4%	1%
2	1,543	23,697	10,432	4%	10%	5%
3	9,211	26,100	22,961	22%	11%	11%
4	5,408	27,519	21,301	13%	11%	11%
5	1,427	17,873	17,297	3%	7%	9%
6	4,296	28,896	17,692	10%	12%	9%
7	5,407	26,733	21,754	13%	11%	11%
8	3,965	15,745	25,085	9%	6%	13%
9	5,705	18,168	33,164	14%	7%	17%
10	2,454	8,390	18,536	6%	3%	9%
11	1,071	2,047	4,585	3%	1%	2%
12	968	1,249	2,839	2%	1%	1%
WCA total	41,962	248,014	200,058	100%	100%	100%

Source: Authors calculations

Table 4.3 Crop, pasture and rural population shares by access to towns of 100,000+

travel time to nearest town of 100,000+	crop area (1000s ha)	pasture (1000s ha)	rural pop (1000s)	crop area %	pasture %	rural pop %
< 2 hours	2,238	7,118	14,388	5%	3%	7%
2-4 hours	6,109	17,631	32,119	12%	7%	16%
4-6 hours	8,363	28,022	35,874	16%	11%	18%
6-8 hours	6,204	27,061	29,838	12%	11%	15%
>8 hours	22,766	168,870	87,645	55%	68%	44%
WCA total	41,660	248,701	199,743	100%	100%	100%

Source: Authors calculations

Table 4.4.1 Land area shares by country and development domain

Domain	Benin	Burkin Faso	Came roon	CAR	Chad	Congo	Gabon	Gambia	Ghana	Guinea	Guinea Bissau	Ivory Coast	Liberia	Mali	Mauri tania	Niger	Nigeria	Sene gal	Sierra Leone	Togo	Zaire	*WCA total*
High / High / High	3%		1%						5%								7%		3%	1%		*1%*
High / High / Med	3%		1%						4%				2%				6%		1%	1%	1%	*1%*
High / High / Low													3%				2%				1%	
High / Med / High	2%		3%			1%			5%	5%		10%					5%		20%	10%	1%	*1%*
High / Med / Med	4%		2%						17%	6%		21%	2%				9%		27%	19%	5%	*3%*
High / Med / Low	3%		1%			1%			13%	1%		5%	2%				3%			5%	4%	*2%*
High / Low / High	1%		8%	2%		4%	3%			10%		5%	18%				1%		8%		3%	*2%*
High / Low / Med	2%		33%	14%		8%	10%		9%	20%		22%	35%				2%		42%	4%	13%	*7%*
High / Low / Low	1%		32%	46%		86%	87%		11%	1%		15%	37%				3%			4%	64%	*22%*
Med / High / High	1%	1%							2%								2%			3%		
Med / High / Med									1%								2%			3%		
Med / High / Low																						
Med / Med / High			1%						2%		18%	1%					2%	1%		3%		
Med / Med / Med	5%	3%	3%		1%				8%	1%	9%	1%		1%			11%	2%		14%		*2%*
Med / Med / Low	2%								1%	5%							5%			3%		*1%*
Med / Low / High	5%	1%							2%	13%	16%	1%		1%			1%			1%	1%	*1%*
Med / Low / Med	40%	11%	3%	4%	3%				14%	31%	50%	11%		3%			4%	7%		20%	2%	*4%*
Med / Low / Low	17%	2%	5%	30%	2%				5%	7%	5%	8%		2%			3%	5%		11%	6%	*5%*
Low / High / High		2%						4%									3%	4%				
Low / High / Med		1%															7%	1%				*1%*
Low / High / Low																						
Low / Med / High		9%	3%					20%						1%		2%	2%	7%				*1%*
Low / Med / Med		24%	4%		1%			45%						3%		6%	10%	8%				*3%*
Low / Med / Low		4%												1%		1%	1%					
Low / Low / High		3%			1%			6%						2%	1%	1%	2%	4%				*1%*
Low / Low / Med	3%	24%			7%			26%			1%			10%	5%	7%	5%	31%				*5%*
Low / Low / Low	7%	15%		5%	83%									77%	94%	82%	2%	29%				*37%*
country total	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*

Source: Authors calculations

Table 4.4.2 Rural population shares by country and development domain

Domain	Benin	Burkina Faso	Came roon	CAR	Chad	Congo	Gabon	The Gambia	Ghana	Guinea	Guinea Bissau	Ivory Coast	Liberia	Mali	Mauri tania	Niger	Nigeria	Sene gal	Sierra Leone	Togo	Zaire	*WCA total*
High / High / High	18%		10%						17%	2%							17%		12%	1%	3%	9%
High / High / Med	17%		8%						9%			1%	16%				13%		3%	2%	7%	8%
High / High / Low			1%						1%				26%				3%				5%	2%
High / Med / High	4%		7%			9%			9%	9%		18%	1%				3%		26%	12%	5%	5%
High / Med / Med	6%		6%			7%			20%	15%		37%	4%				7%		35%	22%	15%	10%
High / Med / Low	4%		2%			7%			12%	1%		8%	3%				2%			4%	12%	4%
High / Low / High			5%	6%		18%	1%			9%		4%	14%						4%		2%	2%
High / Low / Med	1%		16%	28%		13%	17%		3%	16%		15%	20%				1%		20%	2%	10%	5%
High / Low / Low			9%	49%		47%	81%		5%	1%		7%	17%				1%			2%	35%	9%
Med / High / High	8%	3%							5%	2%							3%	1%		8%		2%
Med / High / Med	3%	1%							3%								3%			8%		2%
Med / High / Low																						
Med / Med / High		1%	7%		1%				2%	1%	35%	1%		3%			1%	3%		3%		1%
Med / Med / Med	7%	4%	8%		11%				7%	1%	16%	1%		3%			8%	5%		17%		5%
Med / Med / Low	2%				3%				1%	6%							3%			4%		2%
Med / Low / High	3%	1%			1%				1%	14%	17%	1%		2%								1%
Med / Low / Med	17%	5%	1%	6%	11%				4%	18%	26%	5%		9%			1%	4%		9%	1%	3%
Med / Low / Low	6%	1%	1%	11%	6%				1%	4%	4%	3%		3%			1%	1%		6%	3%	2%
Low / High / High		7%						8%								1%	8%	23%				4%
Low / High / Med		3%														8%	13%	4%				5%
Low / High / Low																						
Low / Med / High		15%	8%		2%			23%			1%			6%		13%	1%	17%				3%
Low / Med / Med		34%	11%		15%			51%						19%		46%	7%	15%				9%
Low / Med / Low		4%												8%	3%	4%	1%					1%
Low / Low / High		1%			2%			2%						5%	7%	3%		3%				1%
Low / Low / Med	1%	13%			15%			15%			2%			19%	19%	13%	1%	16%				3%
Low / Low / Low	2%	6%			35%									24%	70%	13%		8%				4%
country total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Authors calculations, based on population distribution data from CIESIN/IFPRI/WB/CIAT (2005)

Table 4.4.3 Cropland area shares by country and development domain

Domain	Benin	Burkina Faso	Cameroon	CAR	Chad	Congo	Gabon	The Gambia	Ghana	Guinea	Guinea Bissau	Ivory Coast	Liberia	Mali	Mauritania	Niger	Nigeria	Senegal	Sierra Leone	Togo	Zaire	*WCA total*
High / High / High	1%					66%			3%	5%		10%					4%		1%	12%	1%	7%
High / High / Med	1%		1%																15%	11%	12%	1%
High / High / Low									3%													
High / Med / High	7%		69%			17%			2%			1%	4%						2%		17%	14%
High / Med / Med	2%		1%						42%	3%		6%					2%		32%	1%	16%	4%
High / Med / Low										10%		7%	24%							15%	6%	2%
High / Low / High	1%		9%				7%			4%		36%	12%				2%		2%		23%	6%
High / Low / Med			5%	7%		14%	62%		14%	12%		10%	12%				2%				11%	5%
High / Low / Low	22%			3%		3%	27%		12%	1%		23%	9%						1%	18%		3%
Med / High / High									2%	18%										6%		1%
Med / High / Med	1%								4%											3%		
Med / High / Low																	1%					
Med / Med / High	5%				1%				1%	3%	12%							2%		1%		1%
Med / Med / Med	1%				12%				3%	5%	1%	1%					1%	2%		1%		1%
Med / Med / Low	5%		11%		2%				2%	1%										14%		2%
Med / Low / High					7%					9%	6%									2%		1%
Med / Low / Med	12%	1%		4%	5%					23%	9%		37%	2%				1%		5%	11%	4%
Med / Low / Low	37%	8%		78%						4%	36%	5%		2%						10%	1%	4%
Low / High / High		6%						11%	5%								16%	18%				4%
Low / High / Med		1%														3%	27%	3%			2%	4%
Low / High / Low																	1%					
Low / Med / High		23%	2%					45%	6%		22%			4%		11%	4%	21%				5%
Low / Med / Med		33%	1%		1%			19%						14%		41%	21%	15%				9%
Low / Med / Low		3%			15%					2%				5%			2%					2%
Low / Low / High		2%			3%			7%			13%			5%	2%	9%	5%	5%	48%			3%
Low / Low / Med	2%	18%			12%			18%			1%		2%	36%	77%	25%	9%	20%				8%
Low / Low / Low	2%	4%		8%	43%		4%							33%	21%	10%	1%	13%				7%
country total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Authors calculations, based on crop and pasture distribution data from SAGE (2002)

Table 4.4.4 Pasture area shares by country and development domain

Domain	Benin	Burkina Faso	Cameroon	CAR	Chad	Congo	Gabon	The Gambia	Ghana	Guinea	Guinea Bissau	Ivory Coast	Liberia	Mali	Mauritania	Niger	Nigeria	Senegal	Sierra Leone	Togo	Zaire	*WCA total*
High / High / High			1%			63%			14%	6%		4%					2%			4%		3%
High / High / Med			1%														5%		13%	1%	26%	2%
High / High / Low			1%						1%								1%					
High / Med / High	10%		57%			14%			3%			1%	28%				2%		4%		5%	6%
High / Med / Med	1%		1%						15%	3%		6%					6%		57%	3%	32%	4%
High / Med / Low	1%					2%				11%		14%	13%				2%			4%	5%	2%
High / Low / High	1%		6%			1%	5%			15%		13%	27%				5%		3%		12%	4%
High / Low / Med			5%	6%		9%	79%		18%	2%		12%	3%				4%		3%	1%	8%	3%
High / Low / Low	4%			3%		10%	14%		7%			26%	3%				1%			11%		2%
Med / High / High		1%							1%	18%										3%	1%	1%
Med / High / Med		1%							15%											14%		1%
Med / High / Low																	1%					
Med / Med / High	34%	1%							4%		3%	1%					1%			2%		2%
Med / Med / Med	2%		5%		7%				6%	9%	2%	3%		1%			3%	2%		6%	2%	3%
Med / Med / Low	13%	1%	11%		1%				5%	7%										26%		3%
Med / Low / High	1%		1%		1%					8%	3%	1%								2%		1%
Med / Low / Med	3%	6%	1%	1%	4%					15%	7%	2%	22%	4%			1%	3%		10%	5%	4%
Med / Low / Low	21%	5%	1%	81%						3%	9%	17%		2%				2%		13%		4%
Low / High / High		2%						4%	8%								8%	5%				1%
Low / High / Med		1%														1%	15%	1%			4%	2%
Low / High / Low																						
Low / Med / High		10%	3%					20%	2%		59%			1%		4%	4%	9%				3%
Low / Med / Med		26%	4%					43%						5%		14%	23%	9%				6%
Low / Med / Low		4%			2%									3%		1%	2%					1%
Low / Low / High		3%			2%			8%			16%			3%	1%	3%	4%	4%	20%			2%
Low / Low / Med	2%	25%			14%			25%					2%	15%	15%	16%	7%	33%				9%
Low / Low / Low	4%	14%	2%	9%	67%		2%							66%	84%	61%	3%	33%				29%
country total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Authors calculations, based on crop and pasture distribution data from SAGE (2002)

Table 4.4.5 Domain shares by CORAF eco-zone

Domain	Central African	share of zone Sahelian	West Coastal	total
high potential, high access, high dens			4%	1%
high potential, high access, med dens	1%		3%	1%
high potential, high access, low dens			1%	
high potential, med access, high dens	1%		6%	1%
high potential, med access, med dens	3%		12%	3%
high potential, med access, low dens	3%		4%	2%
high potential, low access, high dens	3%		4%	2%
high potential, low access, med dens	15%		11%	7%
high potential, low access, low dens	61%		7%	22%
med potential, high access, high dens			1%	
med potential, high access, med dens			1%	
med potential, high access, low dens				
med potential, med access, high dens			1%	
med potential, med access, med dens		1%	7%	2%
med potential, med access, low dens			3%	1%
med potential, low access, high den			3%	1%
med potential, low access, med dens	2%	3%	12%	4%
med potential, low access, low dens	9%	1%	5%	5%
low potential, high access, high dens			2%	
low potential, high access, med dens			3%	1%
low potential, high access, low dens				
low potential, med access, high dens		1%	1%	1%
low potential, med access, med dens		4%	5%	3%
low potential, med access, low dens		1%	1%	
low potential, low access, high dens		2%	1%	1%
low potential, low access, med dens		9%	2%	5%
low potential, low access, low dens	1%	77%	1%	37%
Grand Total	100%	100%	100%	100%

Source: authors' calculations

Table 5.1.1 (a) Production growth rate employed in the base-run – Sahelian region (Based on the trends of 1998-04)

Cereals	Burkina Faso	Chad	Gambia	Guinea Bissau	Mali	Mauritania	Niger	Senegal
	2.82	2.99	2.87	2.39	3.43	2.74	2.68	2.73
Root Crops	**Burkina Faso**	**Chad**	**Gambia**	**Guinea Bissau**	**Mali**	**Mauritania**	**Niger**	**Senegal**
	3.38	3.01	2.52	2.67	3.27	2.38	2.52	3.01
Pulses & oilseeds	**Burkina Faso**	**Chad**	**Gambia**	**Guinea Bissau**	**Mali**	**Mauritania**	**Niger**	**Senegal**
	2.86	3.17	2.59	2.60	3.79	2.88	2.53	2.52
Cotton & cocoa	**Burkina Faso**	**Chad**	**Gambia**	**Guinea Bissau**	**Mali**	**Mauritania**	**Niger**	**Senegal**
	4.62	2.52	3.50	3.91	4.57	0.00	2.52	4.16
Other high value	**Burkina Faso**	**Chad**	**Gambia**	**Guinea Bissau**	**Mali**	**Mauritania**	**Niger**	**Senegal**
	3.49	2.57	3.19	2.74	3.61	2.19	2.64	5.91
Livestock	**Burkina Faso**	**Chad**	**Gambia**	**Guinea Bissau**	**Mali**	**Mauritania**	**Niger**	**Senegal**
	3.29	2.89	7.79	2.39	3.81	2.04	3.67	2.01

Table 5.1.1 (b) Production growth rate employed in the base-run – Coastal region (Based on the trends of 1998-04)

Cereals	Guinea	Sierra Leone	Cote d'Ivoire	Ghana	Togo	Benin	Nigeria
	2.20	1.72	1.57	2.85	2.89	3.15	2.78
Roots	Guinea	Sierra Leone	Cote d'Ivoire	Ghana	Togo	Benin	Nigeria
	3.44	3.61	2.55	3.66	2.81	3.02	3.50
Pulses & oilseeds	Guinea	Sierra Leone	Cote d'Ivoire	Ghana	Togo	Benin	Nigeria
	3.83	3.36	3.27	3.06	4.10	3.04	2.75
Cotton & cocoa	Guinea	Sierra Leone	Cote d'Ivoire	Ghana	Togo	Benin	Nigeria
	2.63	2.51	2.67	3.39	3.09	4.33	3.35
Other high value	Guinea	Sierra Leone	Cote d'Ivoire	Ghana	Togo	Benin	Nigeria
	2.32	5.68	3.12	4.31	2.88	4.94	2.62
Livestock	Guinea	Sierra Leone	Cote d'Ivoire	Ghana	Togo	Benin	Nigeria
	4.52	2.07	2.18	3.58	2.50	2.73	3.09

Table 5.1.1 (c) Production growth rate employed in the base-run – Central region (Based on the trends of 1998-04)

Cereals	Cameroon	CAR	Gabon	CongoR	DRC
	2.94	3.56	2.57	2.26	2.25
Roots	Cameroon	CAR	Gabon	CongoR	DRC
	3.18	2.51	2.67	2.55	2.64
Pulses & oilseeds	Cameroon	CAR	Gabon	CongoR	DRC
	2.75	5.40	2.52	2.82	2.79
Cotton/cocoa	Cameroon	CAR	Gabon	CongoR	DRC
	3.31	2.52	3.71	2.52	2.60
Other high value	Cameroon	CAR	Gabon	CongoR	DRC
	3.33	2.52	2.52	2.52	2.83
Livestock	Cameroon	CAR	Gabon	CongoR	DRC
	2.81	2.01	2.29	2.00	2.00

Table 5.1.2 (a) Targeted crop yield level by 2015 in yield-loss recovering scenario, irrigated (ton/ha)

	Maize	Rice	Wheat	Sorghum	Millet
Burkina Faso		3.99			
Chad		3.32	1.81		
Gambia		3.79			
Guinea Bissau		3.28			
Mali		3.27	3.18	2.30	2.24
Mauritania		5.62		1.14	
Niger	2.26	7.05	2.09		
Senegal		4.14			
Guinea		2.92			
Sierra Leone		7.07			
Cote dIvoire		4.19			
Ghana		4.28			
Togo		3.20			
Benin		3.48			
Nigeria		4.14	1.41		
Cameroon		5.02			
CAR					
Gabon					
CongoR					
DRC		3.20			

Table 5.1.2 (b) Targeted crop yield level by 2015 in yield-loss recovering scenario, irrigated

	Potato	Sweet potato	Groundnut	Vegetable Do.	Vegetable Ex.
Burkina Faso				10.30	26.06
Chad				12.68	32.19
Gambia					16.50
Guinea Bissau					15.90
Mali			1.00	8.04	20.45
Mauritania					10.27
Niger	17.77			15.33	
Senegal				17.89	55.36
Guinea					9.37
Sierra Leone					20.42
Cote dIvoire				7.17	25.82
Ghana					14.31
Togo					41.30
Benin				5.00	11.84
Nigeria		7.93	2.61	7.30	20.80
Cameroon					13.94
CAR					25.12
Gabon			2.17		
CongoR				8.04	
DRC					33.17

Table 5.1.2 (c) Targeted crop yield level by 2015 in yield-loss recovering scenario, irrigated

	Fruit Do.	Fruit Ex.	Sugar Raw	Tree nuts	Rubber	Tea
Burkina Faso	6.47	49.13	122.85	0.51		
Chad	5.01		121.95			
Gambia		13.49				
Guinea Bissau		15.58				
Mali	15.16	52.89	88.58	0.81		0.71
Mauritania		9.36				
Niger	6.10		77.35			
Senegal	8.60	17.58	133.32	0.46		
Guinea		8.44				
Sierra Leone		10.56				
Cote dIvoire	8.42	52.50	38.22	0.87	2.22	
Ghana		15.56				
Togo		14.25				
Benin	8.49	17.37	49.34	0.27		
Nigeria	6.84	16.70	26.16	0.79	0.45	
Cameroon		22.31				
CAR						
Gabon						
CongoR	8.03		68.48			
DRC						

Table 5.1.2 (d) Targeted crop yield level by 2015 in yield-loss recovering scenario, rainfed

	Maize	Rice	Wheat	Sorghum	Barley	Millet
Burkina Faso	1.81	1.10		0.99		0.80
Chad	0.80	1.04		0.75		0.55
Gambia	1.58	2.02		1.29		1.19
Guinea Bissau	1.47	1.18		0.92		0.89
Mali	1.20	0.97		0.77		0.69
Mauritania	0.94		1.02	0.40	2.04	0.25
Niger	0.77	2.95	0.89	0.25		0.45
Senegal	1.70	1.19		0.82		0.64
Guinea	1.24	1.53		0.85		0.95
Sierra Leone	1.05	1.28		1.18		1.18
Cote dIvoire	1.02	2.33		0.56		0.86
Ghana	1.69	2.17		1.11		0.87
Togo	1.33	2.10		0.89		0.59
Benin	1.24	1.97		1.06		0.91
Nigeria	1.21	0.69		1.25		1.15
Cameroon	1.50	1.73	1.42	0.96		0.78
CAR	1.16	2.12		0.92		1.03
Gabon	1.67	2.23				
CongoR	0.91	0.80				
DRC	0.89	0.81	1.05	0.75	0.69	0.75

Table 5.1.2 (e) Targeted crop yield level by 2015 in yield-loss recovering scenario, rainfed

	Cereal Other	Cassava	Potato	Sweet potato	yams	Root Other
Burkina Faso	0.83	6.00	4.00	8.19	11.88	
Chad	0.97	11.66	5.63	2.56	9.58	3.04
Gambia		6.00				
Guinea Bissau	0.50	15.30				6.73
Mali	0.62	11.02		13.91	12.65	
Mauritania			5.10	1.00	6.25	
Niger	0.85	21.03	9.51	15.43		
Senegal	0.50	5.59	18.75	5.04		
Guinea	0.99	5.57		3.04	11.68	6.24
Sierra Leone	1.22	5.75		2.49		2.55
Cote dIvoire	0.59	5.53		2.15	10.49	1.41
Ghana	0.68	10.38		1.38	13.61	7.13
Togo	1.00	6.48		1.11	11.38	1.39
Benin	0.57	9.52	2.82	5.09	12.62	3.53
Nigeria	0.55	12.42	4.50	4.15	10.72	5.34
Cameroon		10.01	4.06	4.97	8.25	6.64
CAR		3.32	2.56		7.11	2.82
Gabon		5.75		1.75	7.97	6.67
CongoR		10.29	9.16	6.84	6.53	8.02
DRC		9.13	4.62	5.01	5.23	5.31

Table 5.1.2 (f) Targeted crop yield level by 2015 in yield-loss recovering scenario, rainfed

	Beans	Pulse Other	Groundnut	Soybean	Oilcrop Other	Vegetable Do.
Burkina Faso		0.53	0.97	1.27	0.51	8.43
Chad	0.60	0.79	1.04		0.38	10.24
Gambia		0.26	1.16		0.31	5.39
Guinea Bissau		0.67	1.36		5.30	5.39
Mali		0.35	0.84		0.35	6.60
Mauritania	0.98	0.38	0.87			1.33
Niger	0.56	0.14	0.68		0.39	12.68
Senegal		0.22	0.91		0.80	14.90
Guinea		0.91	1.44		2.98	3.11
Sierra Leone		0.76	0.88		0.83	6.55
Cote dIvoire		0.72	1.18	1.38	3.34	5.89
Ghana		0.97	1.19		2.98	4.80
Togo	0.32	0.70	0.62		1.75	5.11
Benin	0.82	0.87	0.96	0.92	1.12	4.13
Nigeria		0.44	0.95	0.83	1.19	6.01
Cameroon	1.00	2.08	0.78	0.68	0.32	3.99
CAR		0.93	1.27		1.35	8.08
Gabon		0.73	1.05	1.21		6.65
CongoR	0.91	0.78	0.69		2.48	6.59
DRC	0.62	0.62	0.90	0.56	0.45	6.20

Table 5.1.2 (g) Targeted crop yield level by 2015 in yield-loss recovering scenario, rainfed

	Vegetable Ex.	Fruit Do.	Fruit Ex.	Banana	Sugar Raw	Cocoa
Burkina Faso		5.30				
Chad		4.05				
Gambia	14.07	4.75	11.50			
Guinea Bissau		6.59		3.43	28.99	
Mali		12.45				
Mauritania	8.25	3.22	7.52			
Niger	43.12	5.04	18.69		37.74	
Senegal		7.16		19.20		
Guinea		3.57		5.23	54.35	0.41
Sierra Leone		4.44		6.26	77.45	0.40
Cote dIvoire		6.92		4.47		0.61
Ghana		6.14		8.94	26.75	0.54
Togo	34.40	5.37	11.87	7.87		0.33
Benin		7.01		5.77		0.33
Nigeria		5.63		5.97		0.18
Cameroon		5.99		7.20	10.37	0.46
CAR		4.79		4.66	7.21	0.35
Gabon		1.64		6.06	59.13	0.07
CongoR	58.03	6.58		8.61	37.19	0.31
DRC		14.98		4.80	43.48	0.32

Table 5.1.2 (h) Targeted crop yield level by 2015 in yield-loss recovering scenario, rainfed

	Coffee	Cotton Lint	Tree nuts	Rubber	Oil palm	Tea
Burkina Faso		0.41	0.42			
Chad		0.23				
Gambia		0.13			0.59	
Guinea Bissau		0.47	0.40		0.89	
Mali		0.50	0.67			
Mauritania						
Niger		0.37				
Senegal		0.56	0.39		0.86	
Guinea	0.43	0.55	0.72	0.56	0.18	
Sierra Leone	1.17				1.10	
Cote dIvoire	0.37	0.58	0.73		0.34	
Ghana	0.18	0.31	0.43	0.71	0.33	
Togo	0.28	0.40	0.99		0.80	
Benin	0.20	0.46	0.23		0.87	
Nigeria	0.94	0.27	0.66		0.19	
Cameroon	0.29	0.56		1.25	0.82	0.85
CAR	0.50	0.28		0.83	0.56	
Gabon	0.32			1.01		
CongoR	0.31			0.81	0.42	
DRC	0.39	0.25		0.23	0.32	0.70

Table 5.1.3 (a) Targeted annual growth rate (%) in crop yield in yield-loss recovering scenario, (2006 – 2015 average, irrigated)

	Maize	Rice	Wheat	Sorghum	Millet	Cereal Other
Burkina Faso		2.31				
Chad		2.31	1.29			
Gambia		2.31				
Guinea Bissau		2.31				
Mali		2.31	1.29	2.78	2.78	2.78
Mauritania		2.31		2.78		
Niger	2.62	2.31	1.29			
Senegal		2.31				
Guinea		2.31				
Sierra Leone		2.31				
Cote dIvoire		2.31				
Ghana		2.31				
Togo		2.31				
Benin		2.31				
Nigeria		2.31	1.29			
Cameroon		2.31				
CAR						
Gabon						
CongoR						
DRC		2.31				

Table 5.1.3 (b) Targeted annual growth rate (%) in crop yield in yield-loss recovering scenario, (2006 – 2015 average, irrigated)

	Potato	Sweet potato	Groundnut	Vegetable Do.	Vegetable Ex.
Burkina Faso				2.23	2.23
Chad				2.23	2.23
Gambia					2.23
Guinea Bissau					2.23
Mali			3.11	2.23	2.23
Mauritania					2.23
Niger				2.23	
Senegal				2.23	2.23
Guinea					2.23
Sierra Leone					2.23
Cote dIvoire				2.23	2.23
Ghana					2.23
Togo					2.23
Benin				2.23	2.23
Nigeria		1.78	3.11	2.23	2.23
Cameroon					2.23
CAR					2.23
Gabon			3.11		
CongoR				2.23	
DRC					2.23

Table 5.1.3 (c) Targeted annual growth rate (%) in crop yield in yield-loss recovering scenario, (2006 – 2015 average, irrigated)

	Fruit Do.	Fruit Ex.	Sugar Raw	Tree nuts	Rubber	Tea
Burkina Faso	2.23	2.23	2.08	2.08		
Chad	2.23		2.08			
Gambia		2.23				
Guinea Bissau		2.23				
Mali	2.23	2.23	2.08	2.08		2.08
Mauritania		2.23				
Niger	2.23		2.08			
Senegal	2.23	2.23	2.08	2.08		
Guinea		2.23				
Sierra Leone		2.23				
Cote dIvoire	2.23	2.23	2.08	2.08	2.08	
Ghana		2.23				
Togo		2.23				
Benin	2.23	2.23	2.08	2.08		
Nigeria	2.23	2.23	2.08	2.08	2.08	
Cameroon		2.23				
CAR						
Gabon						
CongoR	2.23		2.08			
DRC						

Table 5.1.3 (d) Targeted annual growth rate (%) in crop yield in yield-loss recovering scenario, (2006 – 2015 average, rainfed)

	Maize	Rice	Wheat	Sorghum	Barley	Millet
Burkina Faso	1.22	0.74		0.62		0.60
Chad	0.98	0.95		1.24		1.08
Gambia	1.22	0.98		1.29		1.29
Guinea Bissau	1.22	1.00		1.29		1.29
Mali	0.98	0.40		0.90		0.97
Mauritania	0.80		0.16	0.40	0.21	0.39
Niger	0.25	0.61	0.24	0.40		0.39
Senegal	1.21	0.65		0.46		0.46
Guinea	1.22	0.98		1.29		1.29
Sierra Leone	1.22	1.06		1.29		1.29
Cote dIvoire	1.22	1.04		1.29		1.29
Ghana	1.22	1.01		0.95		0.95
Togo	1.22	1.06		1.29		1.29
Benin	1.22	0.60		1.29		1.29
Nigeria	1.21	0.78		1.28		1.28
Cameroon	1.22	0.60	0.62	1.21		1.29
CAR	1.22	1.08		1.29		1.29
Gabon	1.22	1.08				
CongoR	1.22	1.08				
DRC	1.22	1.07	0.04	1.29	0.78	1.29

Table 5.1.3 (e) Targeted annual growth rate (%) in crop yield in yield-loss recovering scenario, (2006 – 2015 average, rainfed)

	Cereal Other	Cassava	Potato	Sweet potato	yams	Root Other
Burkina Faso	0.13					
Chad	0.10					
Gambia						
Guinea Bissau	0.85					0.85
Mali	0.17					
Mauritania						
Niger	0.15					
Senegal	0.18					
Guinea	0.43	0.85			0.20	
Sierra Leone	1.03	0.85				
Cote dIvoire	0.52	0.85			0.85	
Ghana	0.14	0.85			0.85	0.85
Togo	0.50	0.85			0.85	
Benin	0.04	0.85			0.85	
Nigeria	0.39	0.84			0.84	
Cameroon		1.44				1.44
CAR		1.22			1.22	
Gabon		1.24			1.24	1.24
CongoR		1.25				
DRC		1.18				

Table 5.1.3 (f) Targeted annual growth rate (%) in crop yield in yield-loss recovering scenario, (2006 – 2015 average, rainfed)

	Beans	Pulse Other	Groundnut	Soybean	Oilcrop Other	Vegetable Do.
Burkina Faso		0.32	1.43	1.43	0.18	0.20
Chad	1.38	0.12	1.25		0.10	0.07
Gambia		0.48	1.43		0.31	0.61
Guinea Bissau		0.73	1.43		0.46	0.56
Mali		0.18	1.07		0.23	0.23
Mauritania	0.30	0.30	0.80			0.02
Niger	1.23	0.32	1.22		0.39	0.31
Senegal		1.09	1.42		0.30	0.38
Guinea		0.62	1.43		0.39	0.33
Sierra Leone		1.09	1.43		0.71	0.75
Cote dIvoire		0.57	1.43	1.43	0.41	0.23
Ghana		0.19	1.43		0.39	0.53
Togo	1.43	0.35	1.43		0.22	0.38
Benin	1.43	0.56	1.43	1.43	0.37	0.30
Nigeria		0.41	1.27	1.41	0.28	0.26
Cameroon	1.43	0.87	1.43	1.43	0.29	0.39
CAR		0.05	1.43		0.03	0.02
Gabon		0.97	1.21	1.43		0.06
CongoR	1.43	0.20	1.43		0.04	0.22
DRC	1.43	0.17	1.43	1.43	0.03	0.06

Table 5.1.3 (g) Targeted annual growth rate (%) in crop yield in yield-loss recovering scenario, (2006 – 2015 average, rainfed)

	Vegetable Ex.	Fruit Do.	Fruit Ex.	Banana	Sugar Raw	Cocoa
Burkina Faso		0.20				
Chad		0.07				
Gambia	0.61	0.61	0.61			
Guinea Bissau		0.56		1.05	0.53	
Mali		0.23				
Mauritania	0.02	0.02	0.02			
Niger	0.24	0.31	0.24		0.23	
Senegal		0.38		1.05		
Guinea		0.33		1.05	0.31	0.34
Sierra Leone		0.75		1.05	0.71	0.86
Cote dIvoire		0.23		1.05		0.35
Ghana		0.53		1.05	0.50	0.36
Togo	0.38	0.38	0.38	1.05		0.69
Benin		0.30		1.05		0.00
Nigeria		0.26		1.03		0.41
Cameroon		0.39		1.05	0.37	0.24
CAR		0.02		1.05	0.02	0.00
Gabon		0.06		1.05	0.05	0.04
CongoR	0.15	0.22		1.05	0.14	0.30
DRC		0.06		1.05	0.05	0.67

Table 5.1.3 (h) Targeted annual growth rate (%) in crop yield in yield-loss recovering scenario, (2006 – 2015 average, rainfed)

	Coffee	Cotton Lint	Tree nuts	Rubber	Oil palm	Tea
Burkina Faso		0.98	0.19			
Chad		0.94				
Gambia		0.98			0.34	
Guinea Bissau		0.98	0.53		0.50	
Mali		0.80	0.22			
Mauritania						
Niger		0.84				
Senegal		0.97	0.35		0.31	
Guinea	0.42	0.98	0.31	0.31	0.42	
Sierra Leone	0.79				0.78	
Cote dIvoire	0.24	0.98	0.22		0.44	
Ghana	0.50	0.98	0.50	0.50	0.41	
Togo	0.11	0.35	0.35		0.25	
Benin	0.17	0.98	0.28		0.40	
Nigeria	0.27	0.98	0.24		0.30	
Cameroon	0.45	0.96		0.37	0.34	0.37
CAR	0.02	0.98		0.02	0.04	
Gabon	0.03			0.05		
CongoR	0.12			0.14	0.07	
DRC	0.09	0.98		0.05	0.03	0.05

Table 5.1.4 (a) Potential yield level (ton/ha) by 2015 in catch up to potential yield scenario, (irrigated)

	Maize	Rice	Wheat	Sorghum	Millet	Cereal Other
Burkina Faso		6.05				
Chad		7.37	1.43			
Gambia		7.39				
Guinea Bissau		6.26				
Mali		4.30	2.36	5.39	5.71	1.51
Mauritania		5.52		5.15		
Niger	3.08	6.78	2.96			
Senegal		7.26				
Guinea		6.05				
Sierra Leone		4.47				
Cote dIvoire		4.95				
Ghana		8.71				
Togo		5.23				
Benin		6.12				
Nigeria		5.22	2.06			
Cameroon		6.07				
CAR						
Gabon						
CongoR						
DRC		5.00				

Table 5.1.4 (b) Potential yield level (ton/ha) by 2015 catch up to potential yield scenario, (irrigated)

	Potato	Sweet potato	Groundnut	Vegetable Do.	Vegetable Ex.
Burkina Faso				8.26	20.90
Chad				10.17	25.82
Gambia					13.24
Guinea Bissau					12.75
Mali			2.22	6.45	16.40
Mauritania					8.24
Niger	17.77			15.37	
Senegal				14.35	44.40
Guinea					7.51
Sierra Leone					16.38
Cote dIvoire				5.75	20.71
Ghana					11.47
Togo					33.12
Benin				4.01	9.49
Nigeria		7.93	2.57	5.86	16.68
Cameroon					11.18
CAR					20.15
Gabon			2.48		
CongoR				6.45	
DRC					26.60

Table 5.1.4 (c) Potential yield level (ton/ha) by 2015 in catch up to potential yield scenario, (irrigated)

	Fruit Do.	Fruit Ex.	Sugar Raw	Tree nuts	Rubber	Tea
Burkina Faso	5.19	39.41	100.00	0.41		
Chad	4.02		99.27			
Gambia		10.82				
Guinea Bissau		12.49				
Mali	12.16	42.42	72.11	0.66		0.58
Mauritania		7.50				
Niger	6.11		62.97			
Senegal	6.89	14.10	108.52	0.38		
Guinea		6.77				
Sierra Leone		8.47				
Cote dIvoire	6.76	42.10	31.11	0.71	1.81	
Ghana		12.48				
Togo		11.43				
Benin	6.81	13.93	40.16	0.22		
Nigeria	5.49	13.40	21.29	0.64	0.36	
Cameroon		17.90				
CAR						
Gabon						
CongoR	6.44		55.74			
DRC						

Table 5.1.4 (d) Potential yield level (ton/ha) by 2015 in catch up to potential yield scenario, (rainfed)

	Maize	Rice	Wheat	Sorghum	Barley	Millet
Burkina Faso	4.19	2.05		3.18		3.11
Chad	4.13	2.65		3.53		3.07
Gambia	5.15	2.64		3.57		3.57
Guinea Bissau	3.34	2.15		2.54		2.57
Mali	3.24	2.01		2.24		2.40
Mauritania	2.38		1.06	0.78	0.96	0.58
Niger	1.11	2.99	1.43	1.25		1.36
Senegal	3.77	2.17		2.69		2.69
Guinea	3.20	2.90		2.34		2.34
Sierra Leone	1.75	3.15		1.81		1.79
Cote dIvoire	1.50	2.81		1.07		1.73
Ghana	2.72	2.81		3.05		3.08
Togo	3.68	3.13		2.69		2.97
Benin	4.02	2.56		3.32		3.27
Nigeria	3.87	2.29		2.88		2.88
Cameroon	3.92	2.66	2.07	3.09		3.05
CAR	3.41	2.75		2.59		2.36
Gabon	1.83	3.39				
CongoR	1.95	2.91				
DRC	2.10	3.42	1.05	1.15	1.16	1.22

Table 5.1.4 (e) Potential yield level (ton/ha) by 2015 in catch up to potential yield scenario, (rainfed)

	Cereal Other	Cassava	Potato	Sweet potato	yams	Root Other
Burkina Faso	0.82	6.00	4.00	8.19	11.88	
Chad	0.96	11.66	5.63	2.56	9.58	3.04
Gambia		6.00				
Guinea Bissau	0.46	15.30				8.63
Mali	0.61	11.02		13.91	12.65	
Mauritania			5.10	1.00	6.25	
Niger	0.84	21.03	9.51	15.43		
Senegal	0.49	5.59	18.75	5.04		
Guinea	0.95	9.77		3.04	11.68	6.24
Sierra Leone	1.10	7.34		2.49		2.55
Cote dIvoire	0.56	7.93		2.15	14.46	1.41
Ghana	0.67	18.42		1.38	18.75	9.83
Togo	0.95	10.53		1.11	15.07	1.39
Benin	0.57	16.54	2.82	5.09	17.20	3.53
Nigeria	0.53	13.44	4.50	4.15	12.54	5.34
Cameroon		16.20	4.06	4.97	8.25	8.60
CAR		4.71	2.56		8.74	2.82
Gabon		7.59		1.75	10.57	8.84
CongoR		13.50	9.16	6.84	6.53	8.02
DRC		14.61	4.62	5.01	5.23	5.31

Table 5.1.4 (f) Potential yield level (ton/ha) by 2015 in catch up to potential yield scenario, (rainfed)

	Beans	Pulse Other	Groundnut	Soybean	Oilcrop Other	Vegetable Do.
Burkina Faso		0.51	1.31	1.30	0.75	12.40
Chad	1.72	1.17	1.65		0.56	15.26
Gambia		0.25	1.32		0.38	6.34
Guinea Bissau		0.62	1.48		7.58	7.65
Mali		0.34	1.12		0.51	9.67
Mauritania	0.95	0.37	1.07			1.66
Niger	0.85	0.17	0.84		0.47	15.37
Senegal		0.20	1.06		0.98	18.35
Guinea		0.86	1.80		4.29	4.51
Sierra Leone		0.68	1.25		1.16	9.12
Cote dIvoire		0.68	1.45	2.08	4.81	8.63
Ghana		0.95	3.01		4.30	6.83
Togo	1.35	1.02	1.16		2.56	7.38
Benin	1.38	1.03	1.34	1.21	1.34	5.01
Nigeria		0.43	1.35	1.07	1.74	8.79
Cameroon	1.25	2.86	1.14	0.96	0.47	5.76
CAR		0.93	2.16		2.02	12.10
Gabon		0.67	1.46	2.22		9.91
CongoR	1.03	1.15	0.90		3.71	9.67
DRC	1.33	0.91	0.89	0.91	0.68	9.24

Table 5.1.4 (g) Potential yield level (ton/ha) by 2015 in catch up to potential yield scenario, (rainfed)

	Vegetable Ex.	Fruit Do.	Fruit Ex.	Banana	Sugar Raw	Cocoa
Burkina Faso		7.79				
Chad		6.03				
Gambia	16.55	5.65	13.80			
Guinea Bissau		9.34		4.62	41.25	
Mali		18.24				
Mauritania	10.30	4.01	9.50			
Niger	52.60	6.20	23.10		36.89	
Senegal		8.80		21.70		
Guinea		5.18		7.08	79.04	0.59
Sierra Leone		6.17		7.92	108.29	0.55
Cote dIvoire		10.14		6.12		0.88
Ghana		8.73		12.61	38.18	0.78
Togo	33.12	7.75	17.14	16.00		0.46
Benin		8.60		7.76		0.33
Nigeria		8.23		9.36		0.26
Cameroon		8.63		10.34	15.00	0.67
CAR		7.17		6.29	10.80	0.53
Gabon		2.45		8.15	88.24	0.10
CongoR	57.18	9.66		11.57	55.01	0.45
DRC		22.34		8.85	64.86	0.45

Table 5.1.4 (h) Potential yield level (ton/ha) by 2015 in catch up to potential yield scenario, (rainfed)

	Coffee	Cotton Lint	Tree nuts	Rubber	Oil palm	Tea
Burkina Faso		1.46	0.41			
Chad		0.96				
Gambia		0.57			0.57	
Guinea Bissau		1.81	0.57		1.26	
Mali		1.68	0.66			
Mauritania						
Niger		0.64				
Senegal		3.00	0.48		1.05	
Guinea	0.62	1.95	1.14	0.55	0.50	
Sierra Leone	1.62				1.52	
Cote dIvoire	0.55	1.97	1.07		0.48	
Ghana	0.26	1.03	0.61	0.67	0.47	
Togo	0.42	0.39	1.43		1.17	
Benin	0.25	1.60	0.27		1.05	
Nigeria	1.37	1.17	0.96		0.50	
Cameroon	0.42	1.69		1.20	1.19	0.82
CAR	0.74	0.69		0.83	0.84	
Gabon	0.47			1.00		
CongoR	0.45			0.80	0.63	
DRC	0.58	0.61		0.23	0.48	0.69

Table 5.1.5 Agricultural area distribution according to agro-climatic condition

	With best agr. suitability		With modest agr. suitability		With less agr. suitability	
	with irrigation	without irrigation	with irrigation	without irrigation	with irrigation	without irrigation
Burkina Faso	0.0	2.6	0.4	79.8	0.0	17.2
Chad	0.0	2.1	0.4	80.8	0.1	16.6
Gambia	0.0	0.0	0.5	94.3	0.0	5.2
Guinea Bissau	0.5	37.5	1.9	57.7	0.0	2.5
Mali	0.4	3.3	3.7	57.1	3.2	32.2
Mauritania	0.0	0.0	5.3	18.7	4.0	72.0
Niger	0.0	0.0	0.0	62.0	0.0	37.9
Senegal	0.0	0.0	0.7	91.0	1.0	7.3
Guinea	0.2	18.8	3.0	67.7	0.0	10.4
Sierra Leone	0.3	5.0	2.2	77.2	0.0	15.3
Cote dIvoire	0.1	90.7	0.4	6.9	0.0	1.9
Ghana	0.1	60.8	0.1	26.1	0.0	12.8
Togo	0.0	1.9	0.1	57.2	0.0	40.8
Benin	0.0	0.0	0.5	62.9	0.2	36.5
Nigeria	0.3	4.3	1.0	16.0	2.8	75.7
Cameroon	0.1	40.0	0.1	15.5	0.1	44.2
CAR	0.0	39.1	0.0	23.4	0.0	37.5
Gabon	1.6	91.8	0.0	1.0	0.0	5.6
CongoR	0.0	98.6	0.0	0.6	0.0	0.7
DRC	0.1	87.1	0.0	12.1	0.0	0.7

Table 5.1.6 (a) Targeted annual growth rate (%) in crop yield in catch up to potential yield scenario, (2006 – 2015 average, irrigated)

	Maize	Rice	Wheat	Sorghum	Millet	Cereal Other
Burkina Faso		9.38				
Chad		8.34	5.48			
Gambia		8.61				
Guinea Bissau		10.03				
Mali		7.55	5.48	9.18	10.28	7.04
Mauritania		6.54		7.79		
Niger	7.96	11.17	8.57			
Senegal		6.54				
Guinea		8.44				
Sierra Leone		9.38				
Cote dIvoire		9.18				
Ghana		9.05				
Togo		7.72				
Benin		6.54				
Nigeria		9.34	5.48			
Cameroon		7.23				
CAR						
Gabon						
CongoR						
DRC		13.54				

Table 5.1.6 (b) Targeted annual growth rate (%) in crop yield in catch up to potential yield scenario, (2006 – 2015 average, irrigated)

	Potato	Sweet potato	Groundnut	Vegetable Do.	Vegetable Ex.
Burkina Faso				6.46	6.46
Chad				6.46	6.46
Gambia					6.46
Guinea Bissau					6.46
Mali			7.38	6.46	6.46
Mauritania					6.46
Niger				7.96	
Senegal				6.46	6.46
Guinea					6.46
Sierra Leone					6.46
Cote dIvoire				6.46	6.46
Ghana					6.46
Togo					6.46
Benin				6.46	6.46
Nigeria			11.03	6.46	6.46
Cameroon					6.46
CAR					6.46
Gabon			8.59		
CongoR				6.46	
DRC					6.46

Table 5.1.6 (c) Targeted annual growth rate (%) in crop yield in catch up to potential yield scenario, (2006 – 2015 average, irrigated)

	Fruit Do.	Fruit Ex.	Sugar Raw	Tree nuts	Rubber	Tea
Burkina Faso	6.46	6.46	6.30	6.30		
Chad	6.46		6.30			
Gambia		6.46				
Guinea Bissau		6.46				
Mali	6.46	6.46	6.30	6.30		6.30
Mauritania		6.46				
Niger	7.96		6.30			
Senegal	6.46	6.46	6.30	6.30		
Guinea		6.46				
Sierra Leone		6.46				
Cote dIvoire	6.46	6.46	6.30	6.30	6.30	
Ghana		6.46				
Togo		6.46				
Benin	6.46	6.46	6.30	6.30		
Nigeria	6.46	6.46	6.30	6.30	6.30	
Cameroon		6.46				
CAR						
Gabon						
CongoR	6.46		6.30			
DRC						

Table 5.1.6 (d) Annual growth rate (%) in crop yield in catch up to potential yield scenario, (2006 – 2015 average, rainfed)

	Maize	Rice	Wheat	Sorghum	Barley	Millet
Burkina Faso	2.27	1.89		1.58		1.48
Chad	1.29	1.31		1.62		1.30
Gambia	1.90	2.35		1.84		3.19
Guinea Bissau	1.22	1.00		1.29		1.29
Mali	1.90	0.82		1.55		2.05
Mauritania	0.86		0.25	0.61	0.35	1.08
Niger	0.25	1.61	1.14	1.58		1.44
Senegal	3.54	1.62		2.54		3.71
Guinea	2.50	2.26		2.91		2.94
Sierra Leone	4.64	4.28		5.27		5.26
Cote dIvoire	3.37	3.14		3.29		3.07
Ghana	3.58	2.64		1.30		1.27
Togo	2.24	3.33		3.16		1.85
Benin	2.87	1.82		0.49		0.37
Nigeria	2.10	1.93		2.14		2.17
Cameroon	2.99	2.41	2.47	2.48		2.55
CAR	2.66	2.94		4.44		3.15
Gabon	3.08	2.94				
CongoR	3.08	2.94				
DRC	3.95	2.92	1.88	3.15	3.12	3.15

Table 5.1.6 (e) Annual growth rate (%) in crop yield in catch up to potential yield scenario, (2006 – 2015 average, rainfed)

	Cereal Other	Cassava	Potato	Sweet potato	yams	Root Other
Burkina Faso	1.14					
Chad	0.52					
Gambia						
Guinea Bissau	0.85					0.85
Mali	0.87					
Mauritania						
Niger	1.36					
Senegal	2.30					
Guinea	2.19	2.00				
Sierra Leone	5.09	4.49				
Cote dIvoire	2.66	2.97			2.97	
Ghana	0.93	3.21			3.21	3.21
Togo	2.73	5.01			5.01	
Benin	0.25	3.22			3.22	
Nigeria	1.93	2.34			2.34	
Cameroon		1.44				1.44
CAR		1.22			1.22	
Gabon		1.24			1.24	1.24
CongoR		1.25				
DRC		1.18				

Table 5.1.6 (f) Targeted annual growth rate (%) in crop yield in catch up to potential yield scenario, (2006 – 2015 average, rainfed)

	Beans	Pulse Other	Groundnut	Soybean	Oilcrop Other	Vegetable Do.
Burkina Faso		1.46	2.42	2.50	1.83	1.95
Chad	1.59	1.80	1.56		1.35	1.15
Gambia		2.45	3.33		2.73	4.07
Guinea Bissau		0.73	1.43		0.91	1.05
Mali		0.82	1.59		2.19	2.09
Mauritania	1.58	1.58	0.90			0.78
Niger	2.22	2.27	3.25		2.72	1.88
Senegal		5.06	4.42		2.70	2.98
Guinea		2.88	2.82		3.31	2.58
Sierra Leone		4.94	4.46		4.76	4.56
Cote dIvoire		2.70	3.35	3.03	3.14	2.15
Ghana		0.88	2.14		4.02	3.67
Togo	3.17	2.48	3.19		2.11	2.76
Benin	2.74	3.29	2.53	3.07	2.92	2.38
Nigeria		1.84	2.28	2.18	1.91	1.71
Cameroon	2.75	2.87	3.04	2.71	2.54	2.82
CAR		1.89	3.01		2.97	2.53
Gabon		2.83	3.07	5.32		2.91
CongoR	3.29	3.29	3.29		2.77	2.91
DRC	3.29	3.29	3.29	3.88	2.77	3.94

Table 5.1.6 (g) Targeted annual growth rate (%) in crop yield in catch up to potential yield scenario, (2006 – 2015 average, rainfed)

	Vegetable Ex.	Fruit Do.	Fruit Ex.	Banana	Sugar Raw	Cocoa
Burkina Faso		1.95				
Chad		1.15				
Gambia	4.07	4.07	4.07			
Guinea Bissau		1.05		1.05	0.98	
Mali		2.09				
Mauritania	0.78	0.78	0.78			
Niger	1.55	1.88	1.55		1.38	
Senegal		2.98		2.21		
Guinea		2.58		2.43	2.52	2.63
Sierra Leone		4.56		4.70	4.49	4.63
Cote dIvoire		2.15		3.31		2.69
Ghana		3.67		3.39	3.63	2.78
Togo	2.76	2.76	2.76	4.33		4.81
Benin		2.38		4.60		1.24
Nigeria		1.71		2.00		2.21
Cameroon		2.82		2.57	2.52	2.56
CAR		2.53		2.91	2.84	3.15
Gabon		2.91		2.91	2.84	3.15
CongoR	2.91	2.91		2.91	2.84	3.15
DRC		3.94		2.91	2.84	3.15

Table 5.1.6 (h) Targeted annual growth rate (%) in crop yield in catch up to potential yield scenario, (2006 – 2015 average, rainfed)

	Coffee	Cotton Lint	Tree nuts	Rubber	Oil palm	Tea
Burkina Faso		1.74	1.15			
Chad		1.04				
Gambia		4.00		2.30		
Guinea Bissau		0.98	0.98	0.98		
Mali		1.89	1.31			
Mauritania						
Niger		1.82				
Senegal		5.53	2.91	2.71		
Guinea	3.10	2.62	2.52	1.94	3.09	
Sierra Leone	4.95				4.89	
Cote dIvoire	2.22	2.27	2.08		3.21	
Ghana	3.61	4.27	3.63	3.25	3.18	
Togo	1.79	2.40	3.58		2.86	
Benin	1.91	0.77	2.49		3.13	
Nigeria	1.85	1.90	1.70		1.99	
Cameroon	2.57	2.47		2.21	2.50	2.21
CAR	2.84	2.00		1.86	2.84	
Gabon	2.84			1.89		
CongoR	2.84			1.98	2.84	
DRC	2.84	2.84		1.89	2.84	1.89

Table 5.1.7 Projected total agricultural exports by 2015 (million $US)

	Base-run	Growth scenario 2: Catching-up yield potential	Growth scenario 2 with trade condition improvement
Burkina Faso	517	843	1,296
Chad	106	129	197
Gambia	23	69	138
Guinea Bissau	133	148	163
Mali	729	902	1,204
Mauritania	19	23	55
Niger	1,375	1,478	1,830
Senegal	37	222	318
Guinea	51	101	163
Sierra Leone	1	13	49
Cote d'Ivoire	3,762	5,102	5,667
Ghana	1,342	1,801	2,667
Togo	108	204	278
Benin	439	665	795
Nigeria	677	1,984	3,347
Cameroon	1,125	2,106	2,849
CAR	44	78	204
Gabon	5	16	42
Congo R	6	24	58
DRC	12	445	822
Sahelian	2,939	3,814	5,200
Coastal	6,378	9,871	12,966
Central	1,192	2,670	3,974
West Africa	10,510	16,354	22,140

Source: EMM model simulation results

Table 5.1.8 Projected total agricultural imports by 2015 (million $US)

	Base-run	Growth scenario 2: Catching-up yield potential	Growth scenario 2 with trade condition improvement
Burkina Faso	243	209	364
Chad	270	200	224
Gambia	176	202	239
Guinea Bissau	98	101	100
Mali	443	279	335
Mauritania	422	405	408
Niger	455	343	515
Senegal	1,594	1,538	1,578
Guinea	303	196	213
Sierra Leone	205	180	203
Cote d'Ivoire	931	831	984
Ghana	705	535	630
Togo	257	211	234
Benin	942	566	607
Nigeria	4,226	2,338	2,366
Cameroon	553	492	738
CAR	9	9	11
Gabon	207	192	193
Congo R	225	203	213
DRC	332	170	287
Sahelian	3,458	3,067	3,398
Coastal	7,569	4,857	5,237
Central	1,326	1,066	1,442
West Africa	12,353	8,990	10,077

Source: EMM model simulation results

Table 5.1.9 Projected cereal and livestock exports and imports by 2015 (million $US)

	Cereals		Livestock	
	Imports	Exports	Imports	Exports
Base-run				
Sahelian	1,571	9	1,433	1,632
Coastal	3,580	0	2,838	24
Central	599	0	557	19
West Africa	5,749	9	4,828	1,675
Growth scenario 2				
Sahelian	1,312	114	1,273	1,846
Coastal	1,878	0	2,215	35
Central	550	3	417	39
West Africa	3,740	118	3,905	1,920
Growth scenario with trade improvement				
Sahelian	1,383	279	1,525	2,650
Coastal	2,019	18	2,374	77
Central	613	22	656	36
West Africa	4,014	318	4,555	2,763

Source: EMM model simulation results

Table 5.1.10 (a) Agricultural export and import share in the base run (%, 2015)

Exports	Cereals	Roots	Pulse & oilseeds	Vegetable & fruit	O. high-value	Livestock	Process food	Cocoa	Cotton
Sahelian	0.3	0.0	1.0	3.1	4.4	55.5	0.0	0.0	35.6
Coastal	0.0	0.0	0.6	15.5	21.2	0.4	8.9	40.6	12.8
Central	0.0	0.0	0.1	25.6	24.8	1.6	0.0	25.6	22.4
West Africa	0.1	0.0	0.7	13.2	16.9	15.9	5.4	27.5	20.3
Imports									
Sahelian	42.4	0.8	0.4	0.2	8.0	38.7	9.4	0.1	0.0
Coastal	47.3	0.4	0.1	0.0	7.3	37.5	7.4	0.0	0.0
Central	45.2	0.9	0.2	0.0	1.4	42.0	9.7	0.0	0.6
West Africa	45.6	0.6	0.2	0.1	6.9	38.3	8.2	0.0	0.1

Source: EMM model simulation results

Table 5.1.10 (b) Agricultural export and import share in the growth scenario 2 (%, 2015)

Exports	Cereals	Roots	Pulse & oilseeds	Vegetable & fruit	O. high-value	Livestock	Process food	Cocoa	Cotton
Sahelian	3.0	0.0	5.4	4.3	3.9	48.4	0.0	0.0	34.9
Coastal	0.0	0.0	2.8	22.7	29.1	0.4	6.5	26.5	12.0
Central	0.1	14.4	4.9	31.7	16.8	1.5	0.3	16.1	14.3
West Africa	0.7	2.3	3.8	19.9	21.2	11.7	3.9	18.6	17.7
Imports									
Sahelian	40.0	0.7	0.1	0.2	8.4	38.9	11.5	0.1	0.0
Coastal	38.7	0.2	0.2	0.0	10.5	45.6	4.8	0.0	0.0
Central	51.6	0.1	0.0	0.0	0.7	39.1	8.1	0.0	0.3
West Africa	40.7	0.4	0.1	0.1	8.6	42.4	7.6	0.0	0.0

Source: EMM model simulation results

Table 5.1.10 (c) Agricultural export and import share in the growth scenario 2 with trade condition improvement (%, 2015)

Exports	Cereals	Roots	Pulse & oilseeds	Vegetable & fruit	O. high-value	Livestock	Process food	Cocoa	Cotton
Sehelian	5.4	0.0	6.6	3.7	3.2	51.0	0.0	0.0	30.2
Coastal	0.1	5.4	6.4	23.1	26.7	0.6	6.5	20.7	10.5
Central	0.5	23.7	7.5	32.5	13.6	0.9	0.0	11.1	10.1
West Africa	1.4	7.4	6.6	20.2	18.8	12.5	3.8	14.1	15.1
Imports									
Sehelian	36.8	0.7	1.0	0.2	8.1	40.5	12.6	0.1	0.0
Coastal	38.5	0.2	0.2	0.0	10.1	45.3	5.7	0.0	0.0
Central	42.5	0.1	0.0	0.0	1.5	45.5	10.0	0.0	0.4
West Africa	38.4	0.4	0.4	0.1	8.2	43.6	8.8	0.0	0.1

Source: EMM model simulation results

Table 5.2.1 Projected annual growth rate in two growth scenarios (2006 – 2015 average)

	GDP			AgGDP		
	Base-run	Growth scenario 1: Yield-recovering	Growth scenario 2: Catching-up yield potential	Base-run	Growth scenario 1: Yield-recovering	Growth scenario 2: Catching-up yield potential
Burkina Faso	3.72	4.56	5.08	4.03	4.89	5.55
Chad	4.00	4.84	5.01	2.56	3.44	3.66
Gambia	3.84	4.82	5.75	2.99	4.23	5.29
Guinea Bissau	4.16	5.44	5.77	3.45	4.55	5.05
Mali	4.78	5.80	6.37	3.47	4.87	5.88
Mauritania	4.35	4.72	4.96	2.47	3.25	3.58
Niger	3.31	4.28	4.77	3.31	4.49	5.14
Senegal	5.08	5.43	6.30	2.59	3.51	4.73
Guinea	3.09	3.85	4.66	3.54	4.61	5.89
Sierra Leone	3.00	3.94	5.62	2.93	4.01	6.41
Cote d'Ivoire	2.86	3.50	4.49	3.22	4.43	6.13
Ghana	4.39	5.09	6.03	4.31	5.24	6.61
Togo	3.17	3.99	4.96	2.98	3.92	5.42
Benin	4.87	5.61	6.12	4.79	5.81	6.75
Nigeria	4.50	5.46	6.33	4.46	5.50	6.70
Cameroon	3.58	4.33	5.23	3.63	4.84	6.05
CAR	3.08	3.91	4.66	3.10	4.12	4.97
Gabon	2.63	2.76	3.10	2.90	4.10	5.15
CongoR	2.35	2.49	2.67	2.69	3.74	4.76
DRC	2.98	3.79	4.75	2.86	3.81	5.02
Sahelian	4.32	5.05	5.63	3.26	4.31	5.1
Coastal	4.23	5.11	5.99	4.29	5.33	6.6
Central	3.09	3.66	4.38	3.26	4.36	5.5

Source: EMM model simulation results

Table 5.2.2 Sub-sector's contributions to agricultural growth in the catch up to potential yield scenario (2006 – 2015 agricultural average annual growth is 100)

	Cereals	Roots	Pulse and oilseeds	Vegetable and fruit	Cocoa	Cotton	O. high-value	Livestock	Process food
Burkina Faso	27.9	0.3	9.1	4.9	0.0	9.7	1.5	31.0	15.2
Chad	29.9	7.5	11.4	3.2	0.0	2.1	3.3	19.7	13.8
Gambia	27.7	0.3	27.0	3.3	0.0	0.1	0.0	13.5	26.5
Guinea Bissau	29.5	5.4	3.5	5.3	0.0	0.7	14.7	28.3	9.0
Mali	41.1	0.2	1.7	1.5	0.0	8.7	1.1	39.8	4.5
Mauritania	23.9	0.1	4.4	0.6	0.0	0.0	0.0	48.8	10.8
Niger	13.1	0.2	12.6	3.0	0.0	0.0	0.7	57.6	10.5
Senegal	28.6	0.6	11.3	13.9	0.0	2.9	4.4	12.6	16.5
Guinea	34.5	7.3	15.8	7.7	0.2	2.9	1.5	16.3	12.8
Sierra Leone	33.6	10.0	10.4	14.5	2.7	0.0	2.9	14.2	10.0
Cote d'Ivoire	15.0	9.3	3.7	35.1	12.7	5.0	0.0	6.2	20.3
Ghana	6.9	23.1	4.6	17.8	11.0	0.3	0.5	8.2	26.3
Togo	22.4	29.5	7.8	2.6	1.9	8.5	1.3	7.2	17.1
Benin	12.9	24.4	5.0	9.6	0.0	6.6	0.0	8.2	34.9
Nigeria	26.3	28.7	8.3	4.5	0.3	0.6	1.3	10.1	21.4
Cameroon	7.3	10.2	6.0	17.3	6.0	2.6	4.7	22.9	21.8
CAR	8.5	12.7	19.4	7.4	0.1	2.1	2.2	22.5	20.9
Gabon	2.8	17.5	6.8	15.6	0.4	0.0	6.4	21.0	25.4
CongoR	1.4	29.8	9.3	19.3	1.0	0.0	7.6	19.3	11.0
DRC	11.5	34.6	8.6	16.7	0.3	1.0	4.3	9.2	13.0

Source: EMM model simulation results

Table 5.3.1 (a) Accumulative producer benefits of growth option through yield-loss recovery (million $US, 2006-2015)

	Rice	Maize	Millet	Sorghum	Cassava	Yams
Burkina Faso	36.4	25.4	57.8	37.0		
Chad	16.5	2.9	49.1	85.6		
Gambia	3.7	1.5	22.0	4.9		
Guinea Bissau	15.1	1.6	4.3	2.8		
Mali	137.2	12.0	75.1	11.6		
Mauritania	24.1	0.0	0.1	6.6		
Niger	3.6	0.0	7.2	26.3		
Senegal	65.1	55.1	19.3	7.3		
Guinea	120.1	5.9	0.8	0.6	14.5	0.4
Sierra Leone	33.2	0.7	0.7	1.9	4.4	0.0
Cote d'Ivoire	121.2	32.2	5.3	4.4	19.0	34.9
Ghana	27.4	53.8	7.2	25.4	125.7	52.4
Togo	6.4	22.8	4.1	19.5	13.9	0.8
Benin	15.1	141.5	3.3	20.0	63.7	28.8
Nigeria	723.1	310.4	328.4	716.6	516.6	1,023.2
Cameroon	18.5	129.8	6.0	79.1	111.3	29.0
CAR	6.5	13.4	1.1	6.3	3.4	4.7
Gabon	0.2	4.0	0.0	0.0	8.2	4.5
CongoR	0.2	0.7	0.0	0.0	31.0	0.2
DRC	34.2	114.0	2.3	6.1	436.0	-0.3
Sahelian	301.7	98.6	235.0	182.1	0.0	0.0
Coastal	1,046.5	567.3	349.9	788.4	757.7	1,140.4
Central	59.5	262.0	9.3	91.6	590.0	38.2
West Africa	1,407.7	927.9	594.2	1,062.1	1,347.7	1,178.6

Source: DREAM model results

Table 5.3.1 (b) Accumulative producer benefits of growth option through yield-loss recovery (million $US, 2006-2015)

	Groundnut	Oil Palm	Banana	Beans	Cocoa	Coffee	Cotton
Burkina Faso	46.1	0.0	0.0	0.0			81.8
Chad	4.8	0.0	0.0	24.0			25.9
Gambia	2.6	0.4	0.0	0.0			0.1
Guinea Bissau	0.4	0.3	2.6	0.0			1.0
Mali	17.3	0.0	0.0	0.0			81.6
Mauritania	0.2	0.0	0.0	0.0			0.0
Niger	29.6	0.0	0.0	2.2			1.2
Senegal	154.0	0.1	0.6	0.0			4.2
Guinea	30.5	1.2	9.8	0.0	1.7	1.8	13.7
Sierra Leone	1.3	1.0	1.3	0.0	4.7	1.8	0.0
Cote d'Ivoire	12.8	1.1	75.8	0.0	206.6	38.6	156.3
Ghana	34.3	1.0	94.1	0.0	19.9	0.2	5.4
Togo	5.7	0.3	0.7	11.0	2.9	0.4	0.0
Benin	2.5	0.3	1.8	22.9	0.0	0.0	124.5
Nigeria	416.4	4.7	77.2	0.0	61.9	0.2	63.7
Cameroon	47.7	1.8	149.1	66.4	29.9	12.6	71.4
CAR	36.0	0.0	14.7	0.0	0.0	0.0	5.1
Gabon	6.9	0.0	9.6	0.0	0.0	0.0	0.0
CongoR	2.8	0.0	5.9	1.1	0.3	0.1	0.0
DRC	38.3	0.1	44.7	32.2	5.9	1.0	3.4
Sahelian	255.0	0.9	3.2	26.2	0.0	0.0	195.8
Coastal	503.4	9.6	260.6	34.0	297.7	43.0	363.7
Central	131.6	2.0	223.9	99.8	36.1	13.6	79.8
West Africa	890.1	12.5	487.6	159.9	333.8	56.7	639.3

Source: DREAM model results

Table 5.3.2 (a) Per hectare accumulative producer benefits of growth option through yield-loss recovery ($US/Ha, 2006-2015)

	Rice	Maize	Millet	Sorghum	Cassava	Yams
Burkina Faso	749.6	71.9	44.7	25.4		
Chad	175.5	22.3	66.4	119.1		
Gambia	285.7	79.9	214.6	209.6		
Guinea Bissau	227.7	81.3	132.8	150.6		
Mali	336.5	38.4	58.0	13.4		
Mauritania	1,470.0	1.2	9.7	50.1		
Niger	147.7	68.7	1.4	10.7		
Senegal	773.5	467.1	24.0	40.3		
Guinea	235.9	66.0	68.7	87.0	65.1	69.9
Sierra Leone	167.8	68.0	88.8	124.0	70.0	0.0
Cote d'Ivoire	252.1	38.5	61.8	53.8	61.0	112.7
Ghana	224.6	69.4	36.6	79.5	166.6	176.8
Togo	189.4	54.8	46.3	93.1	117.6	14.7
Benin	592.9	210.6	71.6	110.2	268.2	174.4
Nigeria	294.8	53.6	38.1	85.2	147.0	345.1
Cameroon	1,040.8	327.4	117.6	191.8	533.9	874.3
CAR	456.3	125.1	100.4	127.6	18.2	82.8
Gabon	329.9	216.4	0.0	0.0	183.2	206.0
CongoR	77.8	85.2	0.0	0.0	327.4	141.6
DRC	80.3	77.1	42.4	70.6	232.1	18.0
Sahelian	399.9	100.9	25.0	31.1	276.1	112.4
Coastal	273.8	66.1	38.6	85.5	145.2	342.2
Central	129.2	130.4	80.8	166.9	244.3	291.8

Source: DREAM model results

Table 5.3.2 (b) Per hectare accumulative producer benefits of growth option through yield-loss recovery ($US/Ha, 2006-2015)

	Groundnut	Oil Palm	Banana	Beans	Cocoa	Coffee	Cotton
Burkina Faso	138.1	0.0	0.0	0.0			211.7
Chad	10.1	0.0	0.0	161.4			90.6
Gambia	22.3	124.7	0.0	0.0			55.1
Guinea Bissau	26.5	32.0	187.9	0.0			280.7
Mali	84.5	0.0	0.0	0.0			177.5
Mauritania	71.8	0.0	0.0	0.0			0.0
Niger	126.8	0.0	0.0	127.4			79.7
Senegal	184.1	16.5	1,572.5	0.0			116.2
Guinea	152.1	4.0	79.3	0.0	264.2	36.1	327.3
Sierra Leone	60.2	41.9	239.2	0.0	153.2	113.7	0.0
Cote d'Ivoire	88.1	7.5	185.7	0.0	116.4	68.7	546.1
Ghana	97.9	8.6	343.0	0.0	14.2	19.7	183.0
Togo	92.4	24.2	440.8	71.4	128.5	8.5	0.0
Benin	16.4	17.4	707.8	186.3	0.0	8.3	336.7
Nigeria	150.5	1.5	217.7	0.0	61.6	59.3	108.9
Cameroon	184.0	32.9	499.8	310.5	80.3	57.1	388.4
CAR	314.8	1.7	315.1	0.0	10.1	1.0	246.3
Gabon	381.3	0.0	185.0	0.0	2.1	7.9	0.0
CongoR	70.7	1.7	290.2	245.2	63.2	12.1	0.0
DRC	81.3	0.5	127.8	155.3	296.5	10.7	48.8
Sahelian	115.1	43.2	224.1	148.8	0.0	0.0	165.3
Coastal	136.0	2.5	222.8	122.4	70.1	62.4	245.7
Central	146.0	6.5	292.0	234.2	88.9	40.4	291.4

Source: DREAM model results

Table 5.3.3 (a) Accumulative producer benefits of growth option through catching-up yield potential (Million $US, 2006-2015)

	Rice	Maize	Millet	Sorghum	Cassava	Yams
Burkina Faso	210.4	38.5	130.1	105.1		
Chad	53.3	5.2	39.2	105.1		
Gambia	14.2	1.1	60.1	6.7		
Guinea Bissau	60.7	1.6	2.8	2.5		
Mali	589.3	26.0	226.9	26.4		
Mauritania	84.4	0.0	0.2	18.7		
Niger	7.4	1.4	60.8	126.6		
Senegal	222.6	208.4	251.8	48.5		
Guinea	388.7	11.7	2.3	1.6	19.1	2.7
Sierra Leone	162.8	4.3	5.2	11.0	52.6	0.0
Cote d'Ivoire	502.5	118.5	12.3	13.3	94.3	284.3
Ghana	107.9	238.8	10.6	44.1	738.6	449.4
Togo	26.9	50.9	7.2	67.1	-0.2	7.2
Benin	65.3	358.8	0.6	17.2	369.2	247.9
Nigeria	4,075.5	684.5	768.7	1,617.1	1,312.9	1,024.0
Cameroon	81.8	363.3	16.2	220.9	274.7	92.6
CAR	19.8	37.5	2.9	16.8	9.4	74.1
Gabon	0.5	11.2	0.0	0.0	22.7	44.4
CongoR	0.5	2.0	0.0	0.0	84.6	2.0
DRC	144.7	318.8	6.2	16.1	1,256.0	11.4
Sahelian	1,242.3	282.2	771.9	439.7	0.0	0.0
Coastal	5,329.7	1,467.7	806.9	1,771.3	2,586.6	2,015.5
Central	247.4	732.9	25.3	253.9	1,647.4	224.5
West Africa	6,819.4	2,482.8	1,604.1	2,464.9	4,234.0	2,240.1

Source: DREAM model results

Table 5.3.3 (b) Accumulative producer benefits of growth option through catching-up yield potential (Million $US, 2006-2015)

	Groundnut	Oil Palm	Banana	Beans	Cocoa	Coffee	Cotton
Burkina Faso	69.5	0.0	0.0	0.0			133.3
Chad	6.5	0.0	0.0	27.9			9.7
Gambia	8.1	3.3	0.0	0.0			0.4
Guinea Bissau	1.6	0.3	2.2	0.0			0.2
Mali	19.3	0.0	0.0	0.0			200.3
Mauritania	0.0	0.0	0.0	0.0			0.0
Niger	101.5	0.0	0.0	4.3			0.5
Senegal	600.2	0.8	1.7	0.0			70.5
Guinea	7.0	8.7	8.8	0.0	11.7	13.3	44.2
Sierra Leone	4.4	7.1	10.2	0.0	30.7	14.9	0.0
Cote d'Ivoire	11.9	7.5	298.2	0.0	1,251.6	271.4	398.4
Ghana	6.7	7.3	393.2	0.0	110.7	1.3	28.2
Togo	6.1	2.4	3.4	32.9	19.1	3.1	0.0
Benin	2.9	2.6	12.3	55.6	0.0	0.0	195.0
Nigeria	2,200.5	31.0	143.9	0.0	318.7	1.6	176.4
Cameroon	122.1	13.1	461.5	174.0	236.4	76.4	240.7
CAR	92.3	0.3	45.5	0.0	0.1	5.6	16.9
Gabon	24.7	0.0	29.5	0.0	1.0	0.1	0.0
CongoR	7.1	0.4	18.0	3.0	2.2	1.3	0.0
DRC	97.0	7.5	137.2	84.5	16.6	25.9	11.3
Sahelian	806.8	4.4	3.9	32.2	0.0	0.0	414.9
Coastal	2,239.6	66.6	870.0	88.5	1,742.5	305.6	842.2
Central	343.2	21.4	691.8	261.5	256.2	109.2	269.0
West Africa	3,389.6	92.4	1,565.7	382.1	1,998.7	414.9	1,526.0

Source: DREAM model results

Table 5.3.4 (a) Per hectare accumulative producer benefits of growth option through catching-up yield potential ($US/Ha, 2006-2015)

	Rice	Maize	Millet	Sorghum	Cassava	Yams
Burkina Faso	4,333.0	108.9	100.7	72.0		
Chad	568.0	39.3	53.1	146.3		
Gambia	1,084.5	56.3	585.5	288.3		
Guinea Bissau	915.1	79.1	84.9	131.6		
Mali	1,445.6	83.2	175.1	30.7		
Mauritania	5,151.6	86.5	24.7	142.3		
Niger	304.4	172.0	11.8	51.6		
Senegal	2,644.7	1,765.7	314.2	266.1		
Guinea	763.2	130.2	185.5	221.3	86.0	516.6
Sierra Leone	823.9	395.9	649.0	726.9	844.4	0.0
Cote d'Ivoire	1,045.6	141.8	143.5	161.5	303.2	916.8
Ghana	883.4	308.4	53.6	137.9	979.1	1,517.6
Togo	794.6	122.5	81.1	320.4	77.6	134.0
Benin	2,556.4	534.2	12.9	94.7	1,553.2	1,500.3
Nigeria	1,661.7	118.2	89.1	192.4	373.7	345.3
Cameroon	4,603.6	916.2	318.6	535.3	1,317.7	2,792.4
CAR	1,397.3	350.1	272.0	339.3	50.1	1,304.1
Gabon	1,011.1	605.7	0.0	0.0	504.2	2,019.5
CongoR	238.4	238.3	0.0	0.0	893.0	1,242.9
DRC	339.7	215.7	114.4	186.4	668.5	664.4
Sahelian	1,646.8	272.8	82.0	75.2	889.6	845.9
Coastal	1,388.8	170.9	89.0	192.1	503.1	458.3
Central	537.2	364.8	218.8	462.6	682.2	1,717.2

Source: DREAM model results

Table 5.3.4 (b) Per hectare accumulative producer benefits of growth option through catching-up yield potential ($US/Ha, 2006-2015)

	Groundnut	Oil Palm	Banana	Beans	Cocoa	Coffee	Cotton
Burkina Faso	208.5	0.0	0.0	0.0			344.9
Chad	77.5	0.0	0.0	187.5			33.9
Gambia	69.3	938.4	0.0	0.0			405.6
Guinea Bissau	97.9	32.0	162.4	0.0			65.7
Mali	94.0	0.0	0.0	0.0			435.6
Mauritania	5.5	0.0	0.0	0.0			0.0
Niger	434.1	0.0	0.0	250.5			166.0
Senegal	717.5	124.2	4,534.8	0.0			1,970.7
Guinea	35.0	28.1	71.5	0.0	1,834.8	265.9	1,054.3
Sierra Leone	206.9	314.1	1,868.2	0.0	1,002.9	943.3	0.0
Cote d'Ivoire	82.1	53.0	730.9	0.0	704.9	482.6	1,391.8
Ghana	170.4	63.8	1,433.4	0.0	78.6	155.5	950.0
Togo	99.7	181.2	2,086.0	213.1	841.8	65.0	0.0
Benin	147.0	130.7	4,929.8	451.5	0.0	62.8	527.3
Nigeria	795.2	9.7	378.8	0.0	317.0	400.5	301.5
Cameroon	470.8	233.6	1,547.1	813.9	635.4	347.2	1,309.7
CAR	808.5	86.4	976.1	0.0	74.0	289.7	821.5
Gabon	1,371.9	0.0	569.0	0.0	113.5	282.7	0.0
CongoR	179.7	51.0	893.2	642.4	515.2	231.5	0.0
DRC	206.3	31.8	392.4	407.1	834.1	280.9	162.9
Sahelian	343.2	224.4	277.0	182.9	0.0	0.0	352.1
Coastal	611.3	17.4	744.1	318.9	410.1	443.5	569.0
Central	380.8	69.5	902.3	613.8	631.7	323.9	981.7

Source: DREAM model results

Table 5.4.1 Poverty rate by region in Ghana

	1999	2003	2012	2015	% decline by 2015 from 1999	1991/92	% decline in 1999 from 91/92
ACCRA	5.2	3.8	2.2	1.6	-68.4	25.8	-79.8
ASHANTI	27.7	23.8	16.5	14.1	-49.1	41.2	-32.7
BRONG_AHAFO	35.8	27.4	14.5	12.0	-66.6	65.0	-44.9
CENTRAL	48.4	40.4	26.7	20.1	-58.4	44.3	9.4
EASTERN	43.7	40.6	33.7	32.5	-25.6	48.0	-9.0
NORTHERN	69.2	65.7	59.5	57.0	-17.6	63.4	9.1
UPPER_EAST	88.2	86.3	77.0	70.3	-20.3	66.9	31.8
UPPER_WEST	83.9	75.8	71.2	70.5	-16.0	88.4	-5.1
VOLTA	37.7	30.9	18.7	15.8	-58.1	57.0	-33.8
WESTERN	27.3	23.4	11.8	10.3	-62.0	59.6	-54.3
National, rural	**49.5**	**44.2**	**33.8**	**30.9**	**-37.5**	**63.6**	**-22.2**
National, urban	**19.4**	**16.0**	**10.9**	**9.1**	**-53.2**	**27.7**	**-30.0**
National, total	**39.5**	**34.8**	**26.2**	**23.7**	**-40.0**	**52.0**	**-24.1**

Source: GSS data and EMM model simulation results

Table 5.4.2 Broad-based agricultural growth helps reduce poverty in the poorest three regions in Ghana

Poverty rate	1999	Staple-led growth	Export-led growth
NORTHERN	69.2	34.2	56.4
UPPER_EAST	88.2	41.5	73.0
UPPER_WEST	83.9	48.7	69.5

Table 6.1 Comparison of Basic Indicators across key Regional Economic Communities (2003)

Indicator	**ECOWAS**	**UEMOA**	**SADC**	**COMESA**	**EAC**
Population (in millions)	250	75.5	209.1	370.5	91.8
GDP per capita (USD)	326.1	488.7	1175	520.6	337.7
GDP growth (%)	6.7	2	2.7	3.3	4.5
Inflation (CPI, %)	3.2	-0.5	9.5	10	6.9
Intra-community exports (%)	10.3	11.2	12.8	6.0	18.1
Life expectancy (years)	46	46	44	50	44
Literacy rate (%)	62	35	77	n/a	78

Sources: World Bank, African Regional Integration Project, http://www.worldbank.org, Economic Commission for Africa. 2004. *Assessing Regional Integration in Africa*. Addis Ababa, Ethiopia.

Table 6.2: Comparison between UEMOA's and ECOWAS' Institutional Structure

ORGAN	UEMOA[1]	ECOWAS[2]
Executing Agency	**Commission**	**Executive Secretariat**
Other responsibilities	Day-to-day functioning of the institution, harmonizing texts, conveys opinions and recommendations to the Council of Ministers	Day-to-day functioning of the institution
Liaison between Organs	**Council of Ministers**	**Council of Ministers**
Other responsibilities	Defines the monetary and credit policy of UEMOA	Makes recommendations to the supreme authority, issues directives on matters concerning coordination and harmonization of economic integration policies, exercise all power delegated to it by the supreme authority
Members	Member states' finance ministers + relevant minister for the discussed policy	Member states' minister of ECOWAS affairs + relevant minister for the discussed policy
Decision-making authority?	Yes; if no decision made via unanimity, passed to the supreme authority	No
Meeting frequency	Twice per year	Twice per year
Supreme authority	**Conference of Heads of State**	**Authority of Heads of State and Governments**
Members	Presidents of the eight member states	Presidents of the 15 members states
Decision Rule	Unanimity	Unanimity, consensus, or two-thirds majority depending on the issue at hand
Meeting frequency	Once per year	Once per year
Consultative organs	**Inter-parliamentary Committee**	**Parliament**
Responsibilities	Plays a consultative role in debates over regional integration; it is a precursor to the democratic UEMOA Parliament	Plays an advisory role on all regional integration issues but no decision-making authority
Members	40 members	115 seats (each member receives 5 + additional seats based on population size); members will ultimately be elected for a 5-year term by citizens of their country but this is not yet effective
Meeting frequency	Once per year	Twice per year for a minimum of two weeks
Finance Mechanisms	*Community Solidarity Levy:* 1 percent levy on imports from non-member states (fully effective)	*Community Levy:* 0.5 percent levy on imports from non-member states (partially effective)

Sources: [1] Interview with official from UEMOA, June 30, 2006; UEMOA website, http://www.uemo.int, accessed July 20, 2006. [2] Asante, S.K.B. 2004. "The Travails of Integration," chapter 3 in Adekeye Adebajo and Ismail Rashid (eds.), *West Africa's Security Challenges: Building Peace in a Troubled Region*, Lynne Rienner Publishers: Boulder, CO; ECOWAS Treaty of 1993; ECOWAS website, http://www.ecowas.int, accessed July 20, 2006.

Table 7.1: Summary and Implications for Agricultural R&D Strategies in West and Central Africa

	Contribution to total agricultural growth and ranking	Research benefits and ranking	Other considerations	Implications for policy and R&D
Rice	✓ Contribute to 15.2% of projected WCA total ag growth (ranks 3rd) ✓ Contribute to 16.3% and 17.0% of projected Sahel and Coast total ag growth (ranks 2nd) ✓ Large contribution to total ag growth in 8 countries (share in country's AgGDP growth): Sierra Leone: 35.5% Guinea: 32.9% Mali: 21.8% Guinea Bissau: 19.5% Mauritania: 18.6% Nigeria: 12.8% Senegal : 12.0% Cote d'Ivoire: 9.9%	✓ Highest total research benefits in WCA (US$6.8 billion in 10 yrs) ✓ Total producer benefits rank 1st in Sahel (US$1.2 billion) and Coast (US$5.3 billion) ✓ Rank 1st in 7 countries: Nigeria: US$4.1 bil Mali: US$590 mil Guinea: US$390 Burkina Faso: US$210 mil Sierra Leone: US$160 mil Guinea Bissau: US$60 mil Mauritania: US$24 mil ✓ Consumers in all WCA countries would benefits from lowered price and less import	✓ Markets for rice is not a constraint ✓ Areas of low-acc/low-dens show greatest potential for production growth ✓ Main constraint is high cost of production inputs	✓ Need adaptation R&D at regional level ✓ Complementary investments needed ✓ Improving productivity through lowered production costs

Traditional grains	✓ Contribute to 5.8% of projected WCA total ag growth (ranks 6th) ✓ Contribute to 1.1% of projected Sahel total ag growth (ranks 3rd) ✓ Large contribution to total ag growth in 8 countries (share in country's AgGDP growth): Gambia: 19.2% Burkina Faso: 17.8% Mali: 11.7% Senegal: 11.7% Niger: 11.3% Chad: 7.3% Nigeria: 7.1% Togo: 5.4%	✓ Total research benefits of maize rank 4th (US$2.5 billion), sorghum ranks 5th (US$2.4 billion), and millet ranks 8th (US$1.6 billion) in WCA ✓ Maize ranks 2nd in Central (US$730 million), millet 3rd in Sahel (US$770 million), and sorghum 4th in Sahel (US$440 million) ✓ Maize ranks 2st in 4 countries: Guinea: US$390 Benin: US$360 mil Cameron: US$360 mil DRC: US$320 mil Togo: US$50 mil ✓ Millet ranks 1st in Gambia (US$60 million), ranks 2nd in 3 countries (Guinea Bissau, Mali, Senegal) ✓ Sorghum ranks 1st in 3 countries (Chad, Niger and Togo), ranks 2nd in Mauritania	✓ Higher growth potential will come from areas with low market access & low population density ✓ With high urban demand, the linkages with processing is important ✓ Linkages with livestock	✓ In low mkt acc/low pod dens areas, processing technologies. ✓ Improved varieties that are more suitable for feed ✓ In high market access areas, high-input technologies are a better option

Livestock	✓ Contribute to 15.5% of projected WCA total ag growth (ranks 2nd) ✓ Contribute to 19.9% and 35.5% of projected Central and Sahel total (ranks 1st)	*Not covered by the study*	✓ In WCA, supply of certain livestock (e.g. beef, sheep, and goats) are concentrated far from major urban markets ✓ Major growth of livestock in WCA (such as poultry) is likely to occur near the major urban markets ✓ Urban demand for livestock will continue to grow rapidly. Can the region take advantage of this opportunity?	✓ Need region-wide strategy that considers both R&D and reduction in market transaction costs and barriers for intraregional trade ✓ There are huge implications between choosing whether investing in intensive systems within coastal areas is more important than investing in the Sahel

Roots and tubers	✓ Contribute to 17% of projected WCA total ag growth (ranks 1st) ✓ Contribute to 17% and 20% of projected Coast and Sahel total growth (ranks 2nd in Central and 1st in Coast) ✓ More than 15% of contribution to total ag growth in 9 countries (share in country's AgGDP growth): Togo: 34.1% DRC: 30.4% Benin: 28.1% CongoR: 27.0% Ghana: 22.1% Nigeria: 21.1% Gabon: 17.9% CAR: 16.7% Cameroon: 9.7%	✓ Cassava total producer benefits rank 2nd in WCA (US$4.7 billion) ✓ Cassava ranks 1st in Central (US$2.1 billion) and 2nd in Coast (US$2.6 billion) ✓ Cassava ranks 1st in 4 countries (Ghana, Benin, CongR, DRC, ranks 2nd in Sierra Leone ✓ Yam total benefits rank 7th in WCA (US$1.8 billion), rank 5th in Nigeria (US$1.0 billoin)	✓ Demand opportunities exist in both regional and export markets – especially for processed cassava products and agro-industry ✓ Due to the short shelf life of cassava, complementary linkages between improved production and processing technologies are important in both low and high markets access areas.	✓ Target emerging market demand (e.g., China) ✓ Improvements in processing technologies will be critical to improve overall productivity and competitive in regional an international markets ✓ Improve varieties for agro-industry and bio-fuel

Pulse & oilseeds	✓ Contribute to 8.7% of projected WCA total ag growth (ranks 5th) ✓ Contribute to 11.6% of projected Sahel total growth (ranks 4th) ✓ Larger than 9% of contribution to total ag growth in 11 countries (share in country's AgGDP growth): Gambia: 37.3% Niger: 16.4% Senegal : 14.7% Chad: 14.0% Burkina Faso: 13.6% Guinea: 13.0% Sierra Leone: 9.6% CAR: 9.6% Nigeria: 9.5% CongoR: 9.4% DRC: 9.3%	✓ Beans rank 12th in WCA ($US380 million) ✓ Groundnuts rank 3rd in WCA ($US3.4 billion) ✓ Groundnuts rank 2nd in Sahel (US$810 million), 3rd in Coast (US$2.3 billion) 4th in Central (US$340 million) ✓ Groundnuts rank 1st in 2 countries (Senegal and CAR), rank 2nd in 2 countries (Niger and Nigeria)	✓ Large opportunities in both regional & export mkts ✓ Multi-use crop (human consumption and feed) ✓ Loss of market share to imports for certain products (e.g. groundnut oil) ✓ Changing consumer preferences (groundnut v. soybean oils)	✓ Improve import and export competitiveness (e.g., groundnut oil, groundnuts, beans) ✓ Processing technologies ✓ Targeted varieties

Cocoa/cotton	✓ Contribute to 2.1% (cotton) and 2.8% (cocoa) of projected WCA total ag growth ✓ Contribute to 4.8% (cotton) of projected Sahel total ag growth and more than 2% (cocoa) of project Coast and Central total ag growth	✓ Cocoa total producer benefits rank 6th (US$2.0 billion) and 10th for cotton (US$1.5 billion) in WCA ✓ Cocoa ranks 1st in Cote d'Ivoire (US$1.3 billion) ✓ Cotton ranks 2nd in Burkina Faso and Guinea, 3rd in 3 countries (Mali, Cote d'Ivoire and Benin)	✓ Difficult global markets for bulk commodities – often saturated, volatile, and distorted (tariffs) ✓ Key question is the extent to which there are large potentials for farm level productivity gains? Or alternatively, focusing on product differentiation (cocoa)? ✓	✓ Diversify into emerging markets (e.g. East Asia and East Europe) ✓ Issues more related to access to markets. Increased competitiveness, product differentiation, varieties, niche markets?
Vegetable & fruits	✓ Contribute to 10.5% of projected WCA total ag growth (ranks 4th) ✓ Contribute to 10.4% and 17.3% of projected Coast and Central total ag growth (ranks 4th and 3rd)		✓ Very diverse in both commodities and countries ✓ Driven by private sector ✓ Highly affected by policies outside of agricultural sector	✓ Strong regulatory and well functioning institutions are important at the country level ✓ ✓ Given higher incentives for private sector investments,

Other high value	✓ Contribute to 3.6% of projected WCA total ag growth ✓ Contribute to 3.7% and 4.4% of projected Coast and Central total ag growth		✓ Generally no demand constraints ✓ Poses challenges at the country level since it requires well developed institutions (for certification, grading & standards, sanitation, etc.) ✓ Smallholder entry is limited due to the demand for quality standards and certification.	what role for public sector ✓ ✓ Issues more related to access to markets. Increased competitiveness, product differentiation, varieties in niche marketsb ✓
Crosscutting: Institutionalizing the regional strategic priority options	Very Important	Extremely important	Close collaboration, consultation and coordination with NEPAD/CADDP, ECOWAS, UEMOA, CILLS, NARS, Farmers' organizations, and donors	In addition to commodity research, analysis on how to institutionalize the research priorities is also key
Cross cutting: Building regional analytical capacity in research priority setting	Important	Very Important	Strong support from universities, donors, and IFPRI	Capacity in social economic research needs to be strengthened to assess strategic options in a constant basis.

Table C1. Estimation results of the gravity model [Appendix C]

Variables	Estimated coefficients	t-ratio	p-value
Variables explaining demand from importer			
Urban population	4.51	194.50	0.00
GDP/capita	0.73	24.25	0.00
Crop output/Livestock	1.64	84.55	0.00
Livestock/population	-0.93	-70.80	0.00
FMD importer	-3.32	-54.97	0.00
Variables explaining supply from exporter			
Animal stock	0.16	18.84	0.00
Yield =Livestock output/animal stock	0.27	12.78	0.00
GDP/capita	-0.18	-5.31	0.00
Urban population	-3.42	-62.06	0.00
Crop output/Livestock	-0.74	-40.84	0.00
Cost of diesel fuel	-1.76	-80.50	0.00
Meat exports from the EU	-0.65	-84.87	0.00
FMD exporter	1.93	30.48	0.00
Bilateral variables			
Distance	-0.69	-86.84	0.00
Common language	2.76	68.88	0.00
Common border	-1.9	-65.14	0.00
Other			
Regional trade agreement (ECOWAS)	-0.32	-3.80	0.00
Border effect West Africa	7.62	127.00	0.00

Note: Buse $R^2 = 0.99$

Figures for Report

(Figures are numbered by the chapters and sections they appear)

Figure 2.1 Required government agricultural spending for achieving MDG1 in West Africa

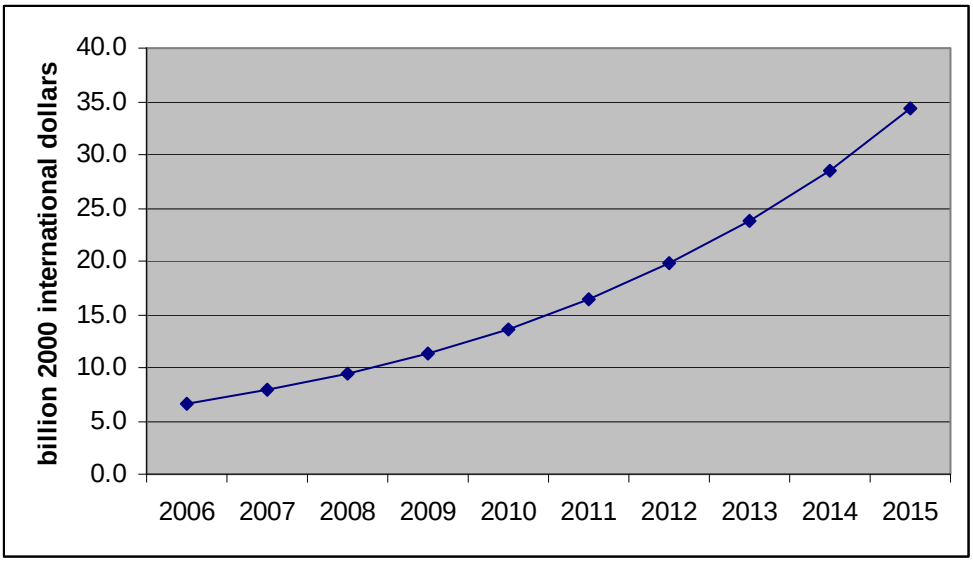
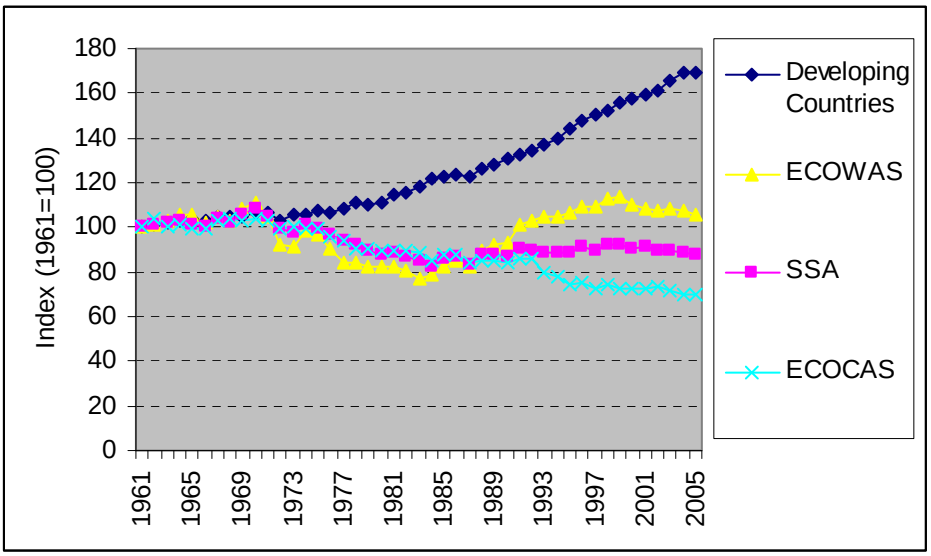
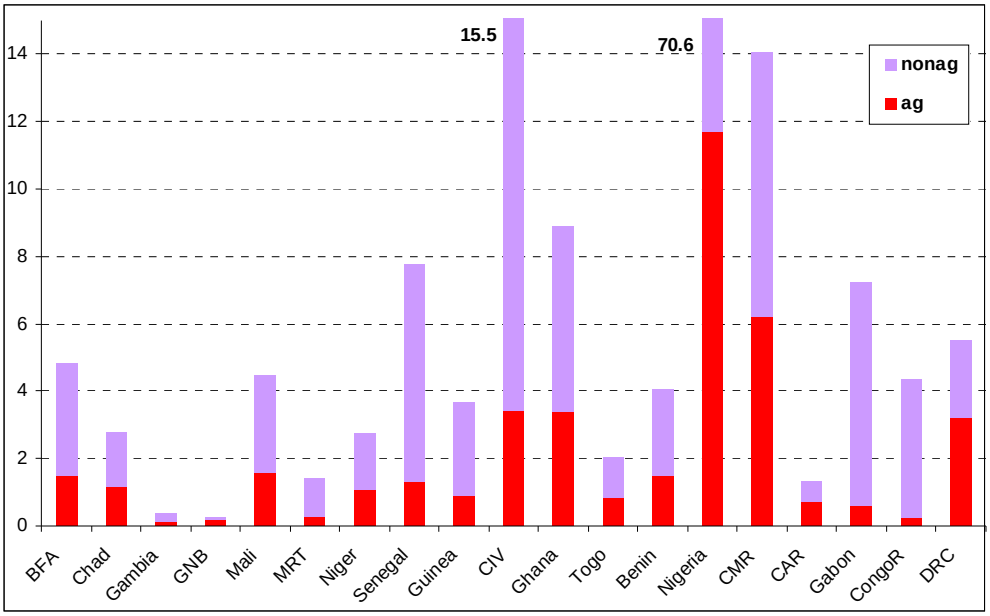


Figure 3.0 Net per capita agricultural production (1961-2005)



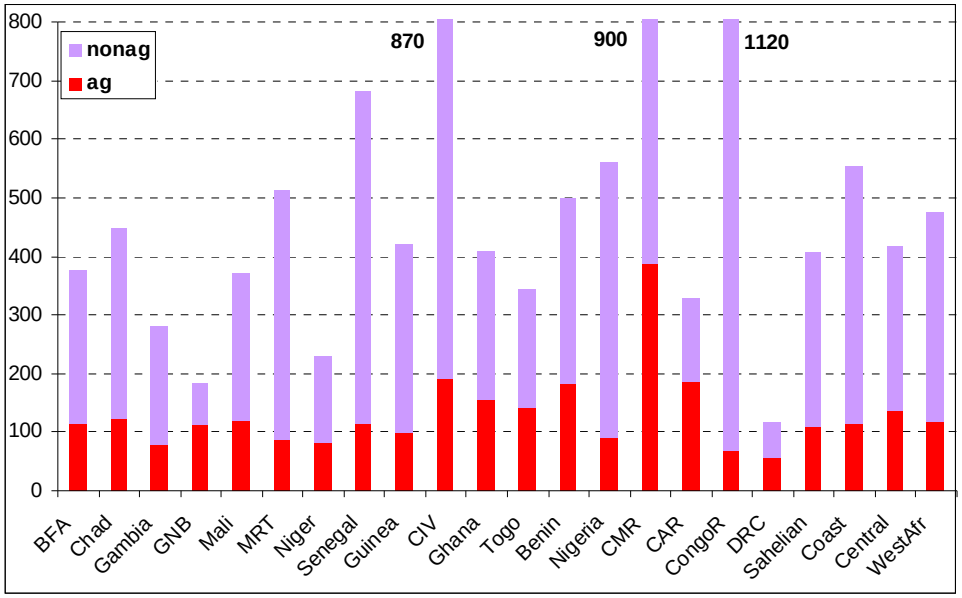
Source: FAOSTAT, 2006

Figure 3.1.1 Total GDP and AgGDP in West Africa (2004, billions $US)



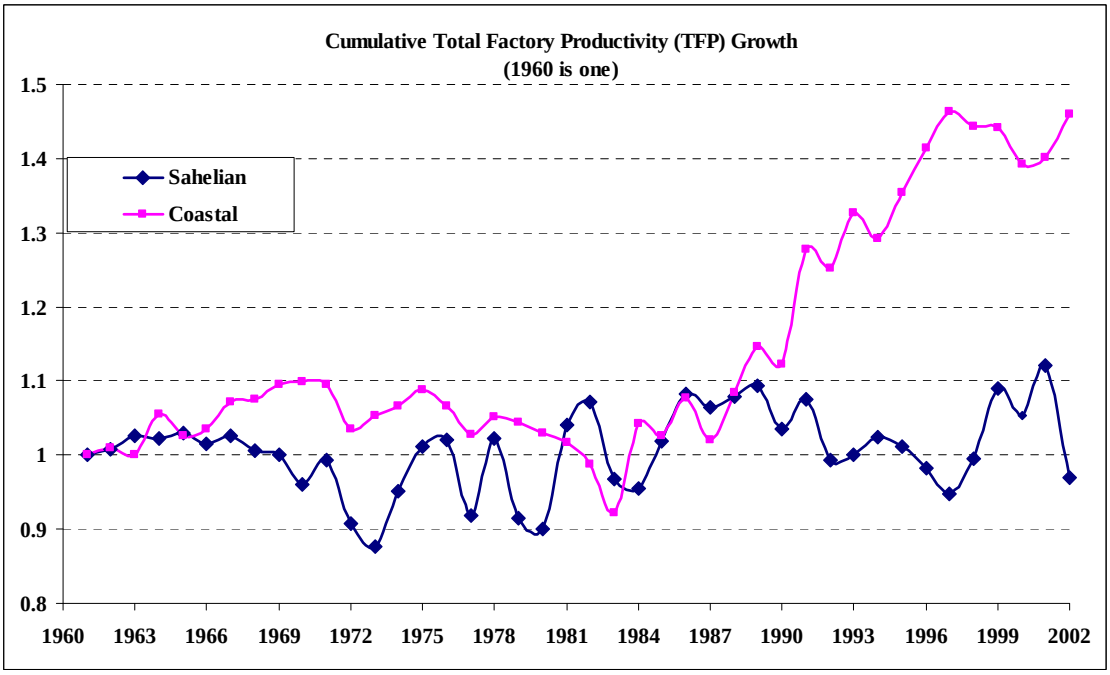
Source: World Development Indicator (World Bank, 2006).

Figure 3.1.2 Per capita GDP and AgGDP in West Africa (2004, $US)



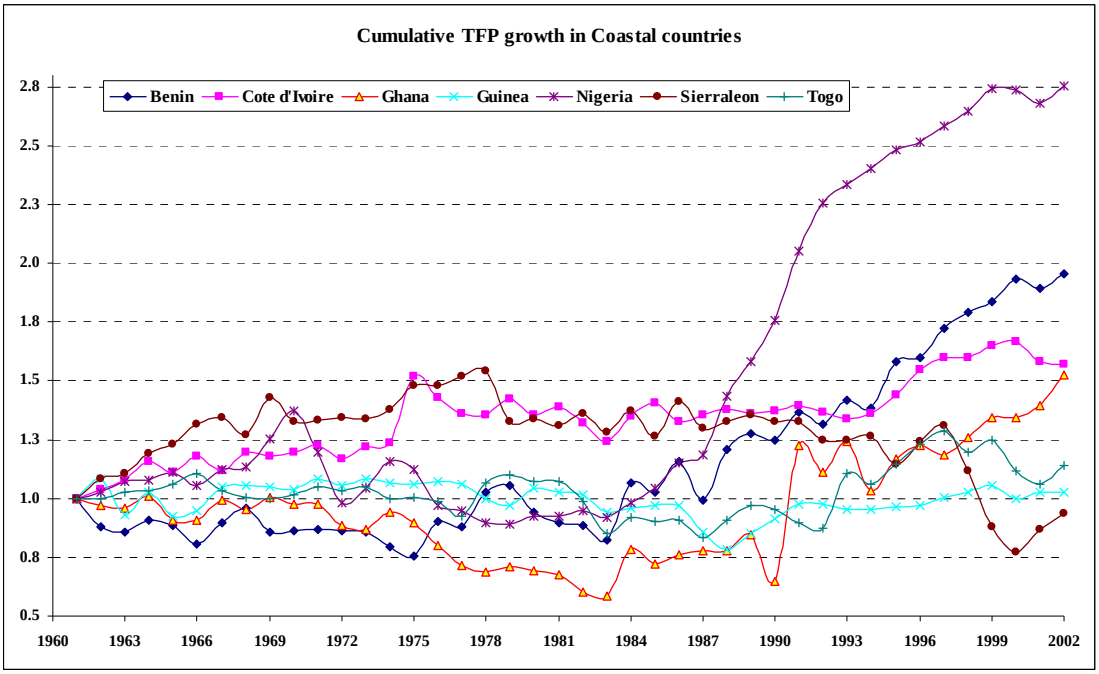
Source: World Development Indicator (World Bank, 2006)
Note: Gabon not included

Figure 3.2.1 Growth in total factor productivity: Sahelian and Coastal regional average (1961-2002)



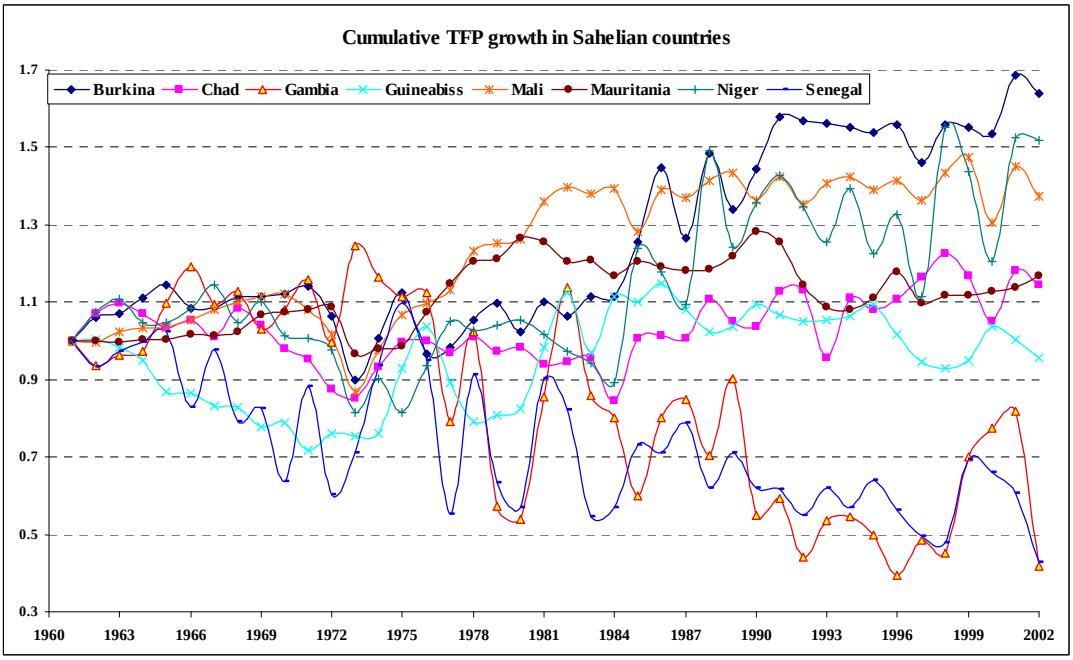
Source: Calculated based on FAO data

Figure 3.2.2 Growth in total factor productivity: Coastal countries (1961-2002)



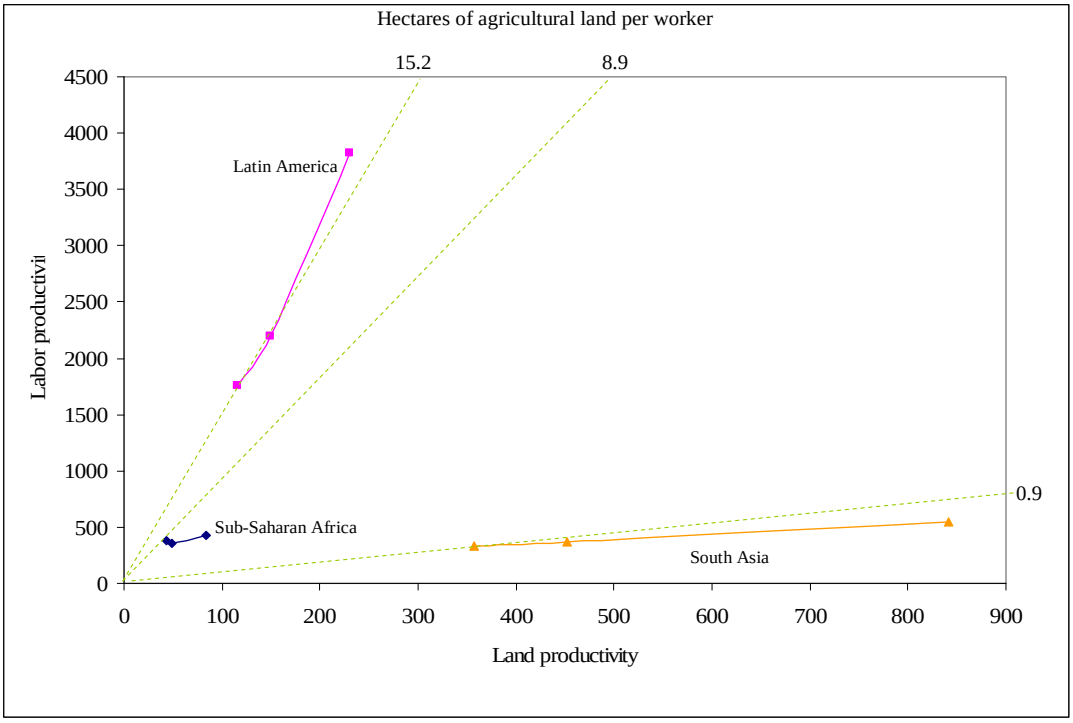
Source: Calculated based on FAO data

Figure 3.2.3 Growth in total factor productivity: Sahelian countries (1961-2002)



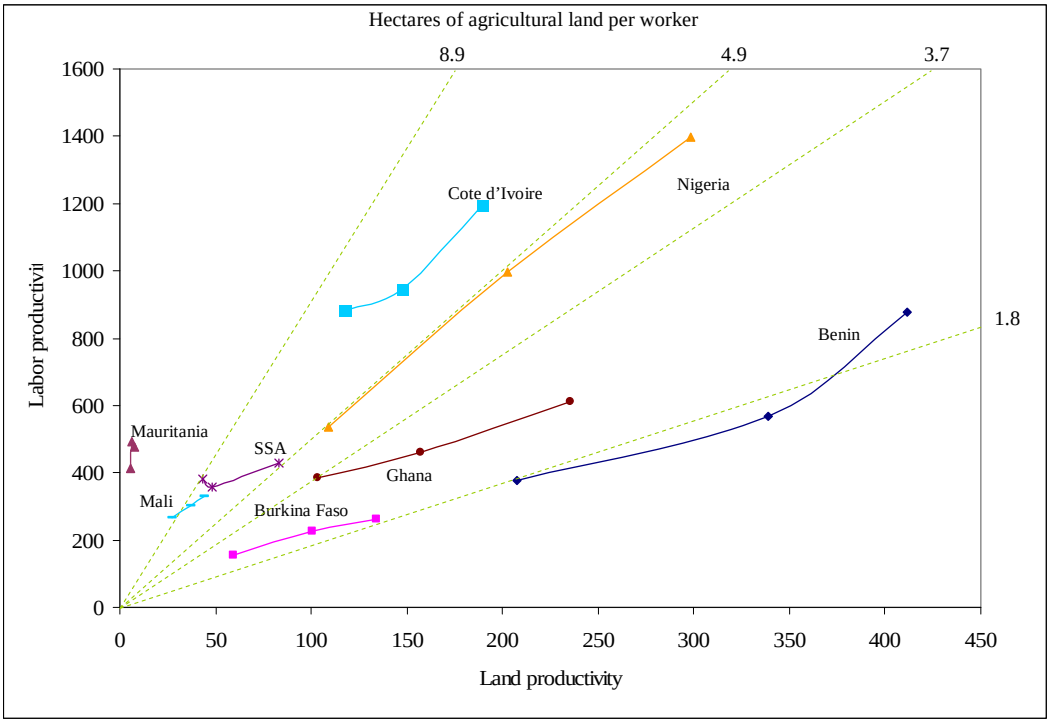
Source: Calculated based on FAO data

Figure 3.2.4 Comparison of land and labor productivities in Sub-Saharan Africa, Latin America and South Asia (1980, 1990 and 2002)



Source: Calculated based on FAO data

Figure 3.2.5 Comparison of land and labor productivities in selected West African countries (1980, 1990 and 2002)



Source: Calculated based on FAO data

Figure 3.4.1 Average and marginal budget shares for selected agricultural commodities in Mali, Ghana and Senegal (should this figure be moved to Annex B?)

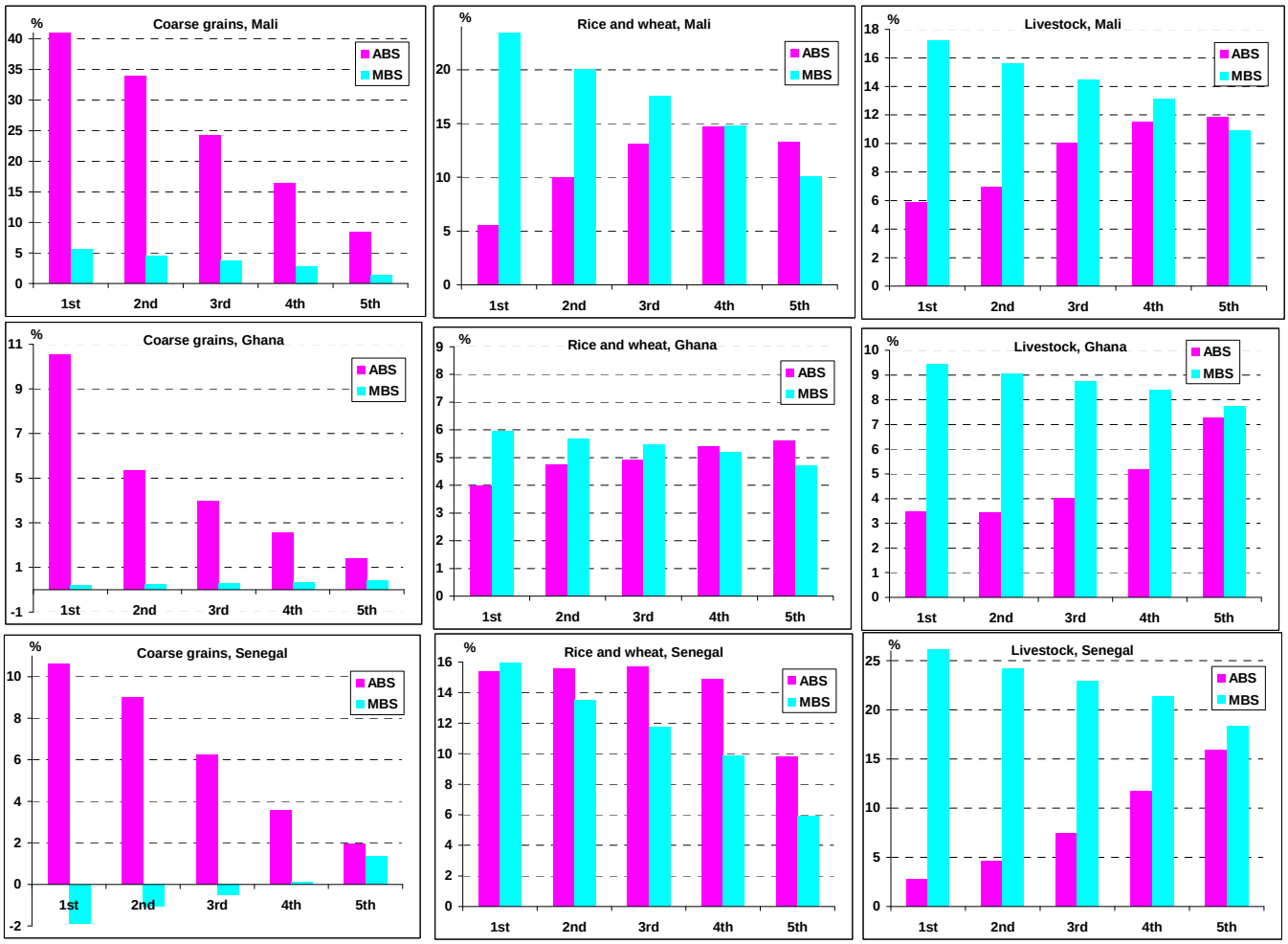


Figure 4.1.1 Population densities in West and Central Africa

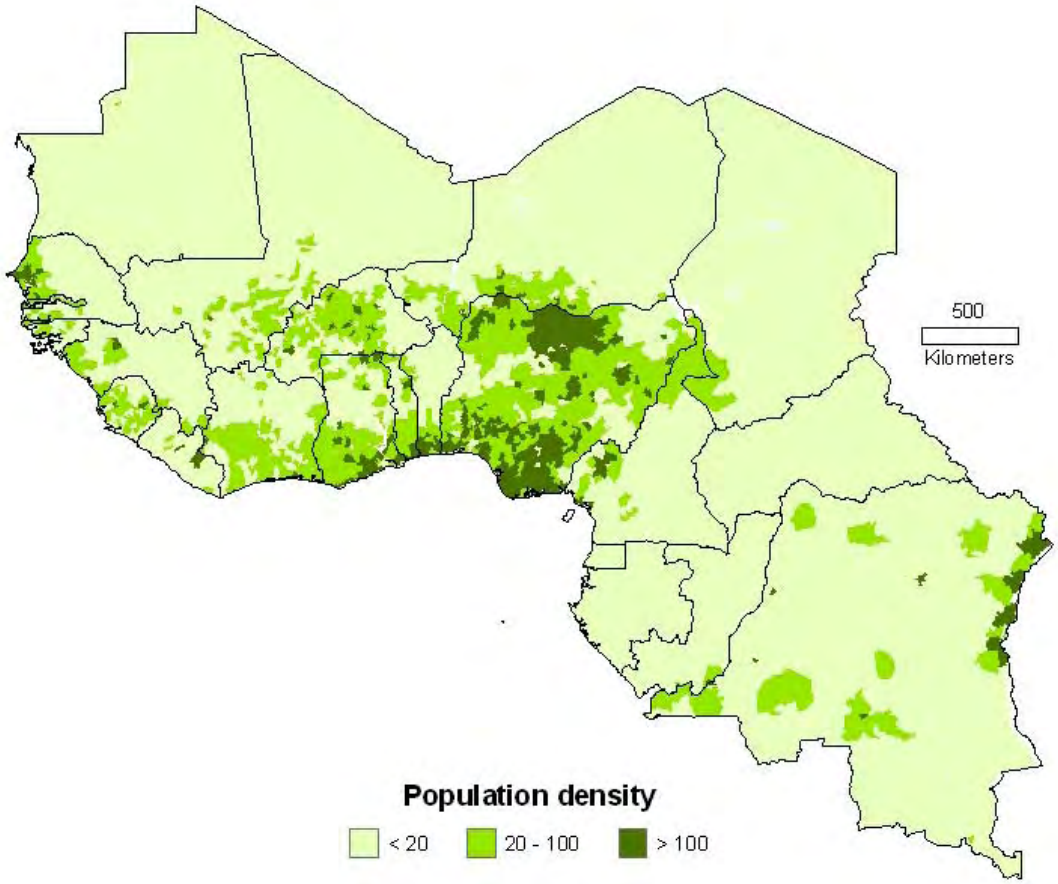


Figure 4.1.2 Distribution of agricultural lands in West and Central Africa

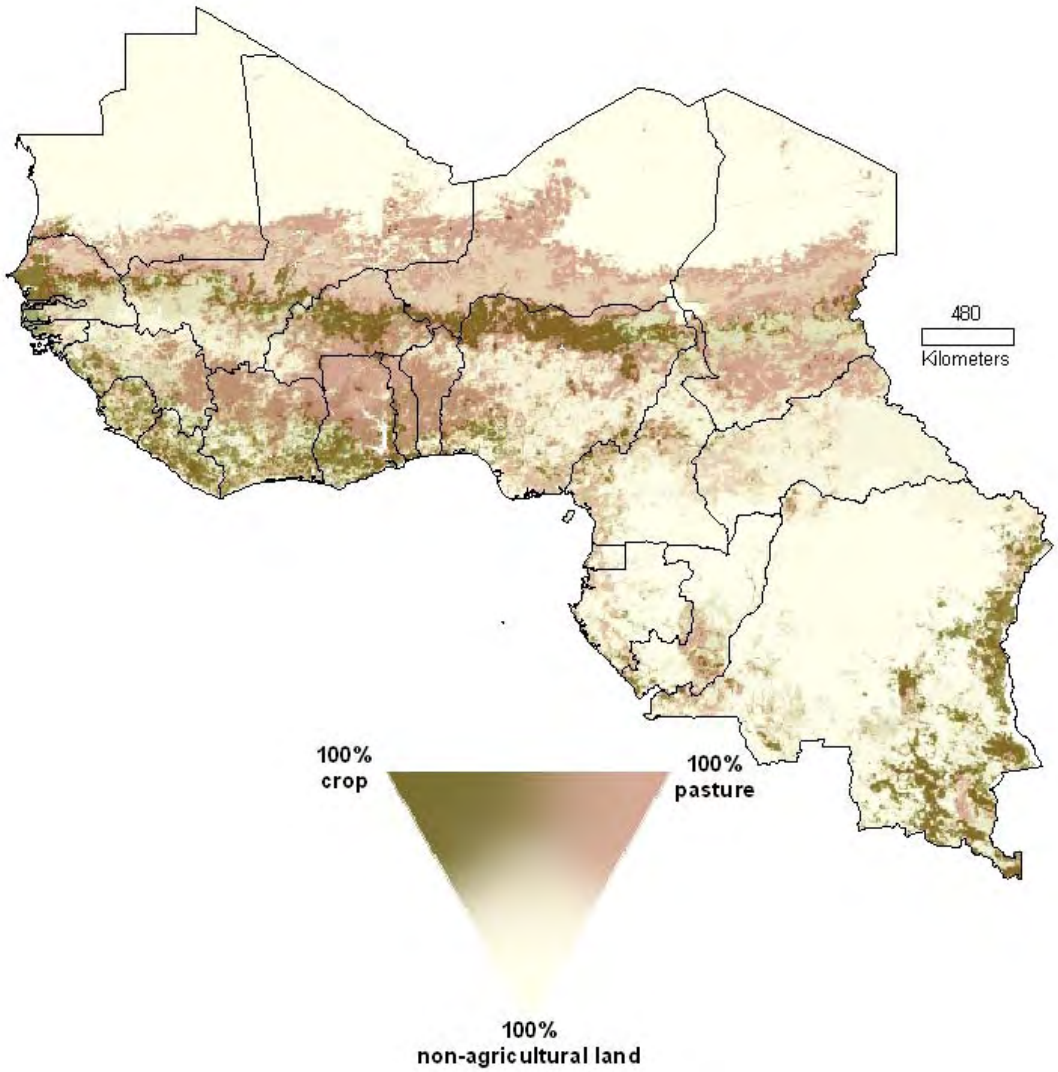


Figure 4.2 Length of growing period in West and Central Africa

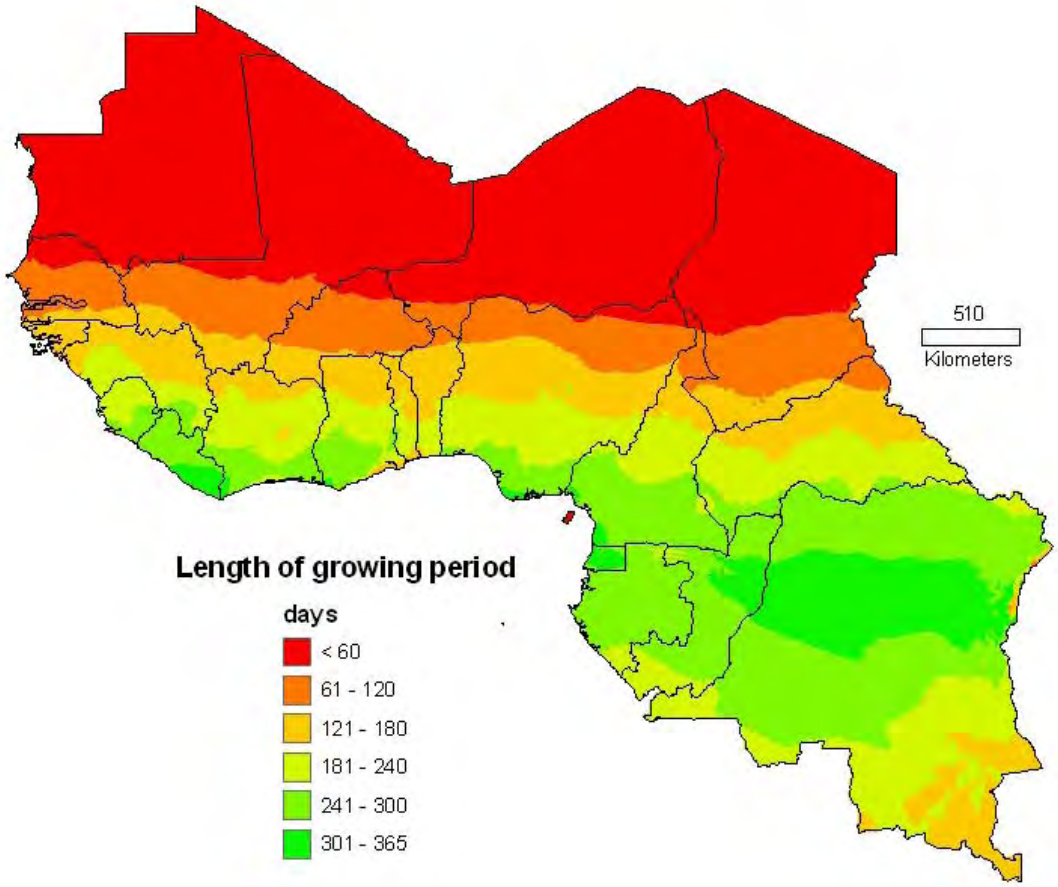


Figure 4.3.1 Market access in West and Central Africa

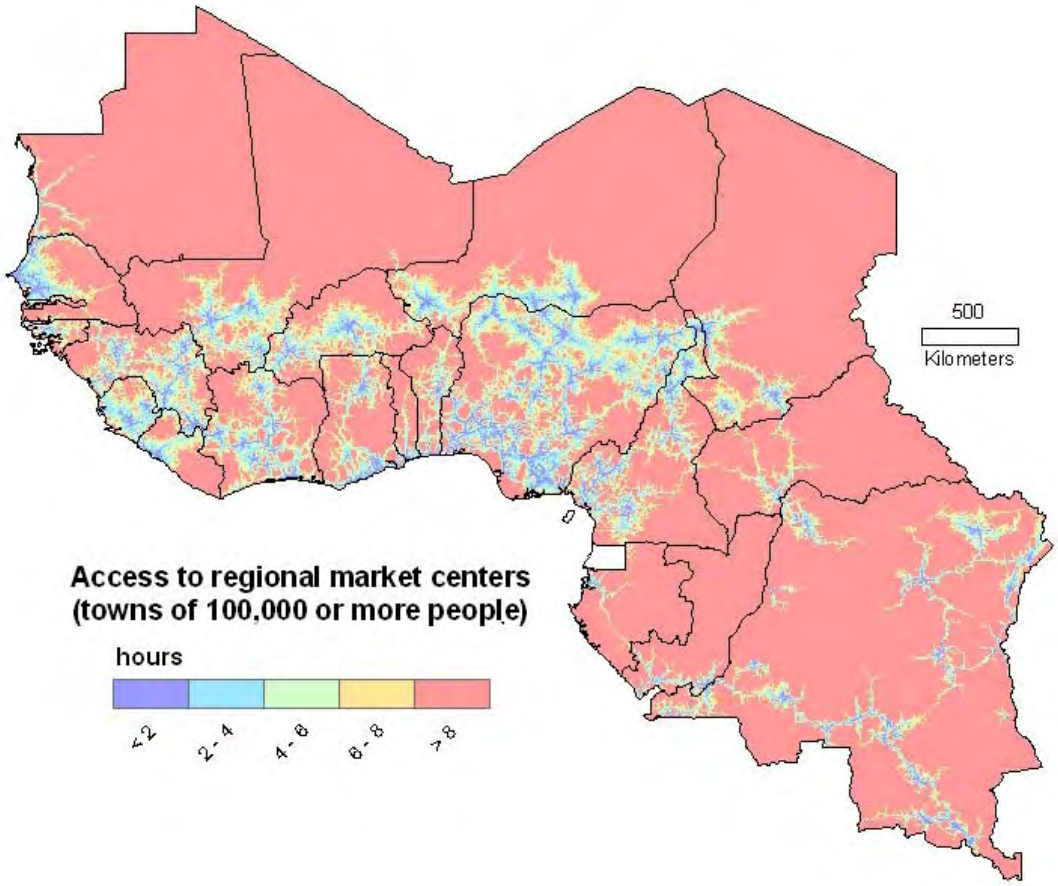


Figure 4.3.2 Market access in West and Central Africa

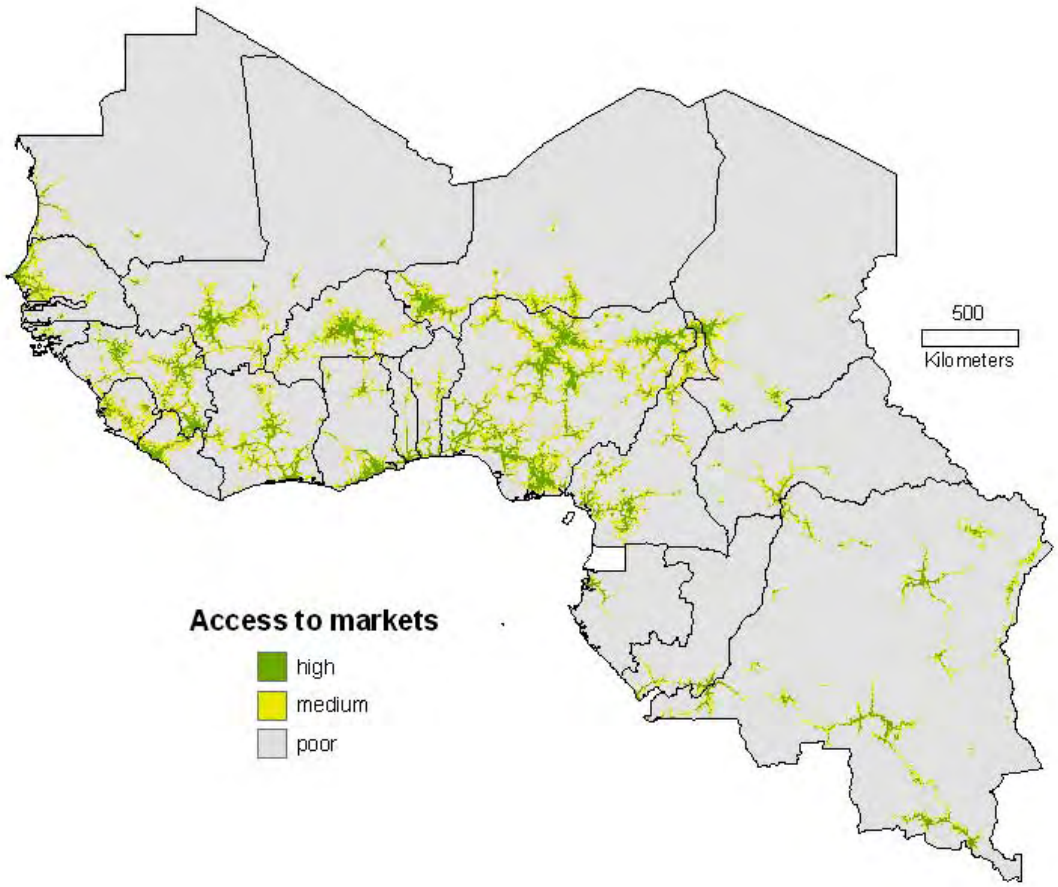


Figure 4.4 Development domains for West and Central Africa

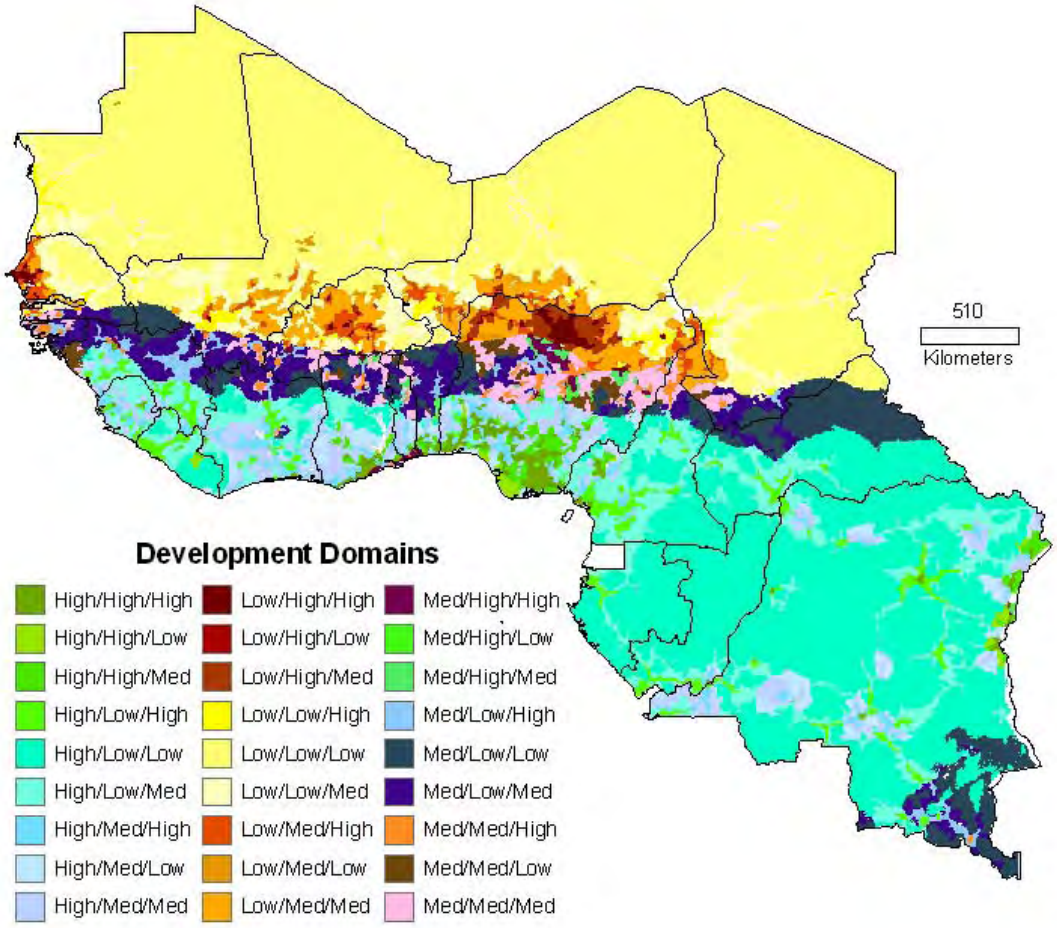
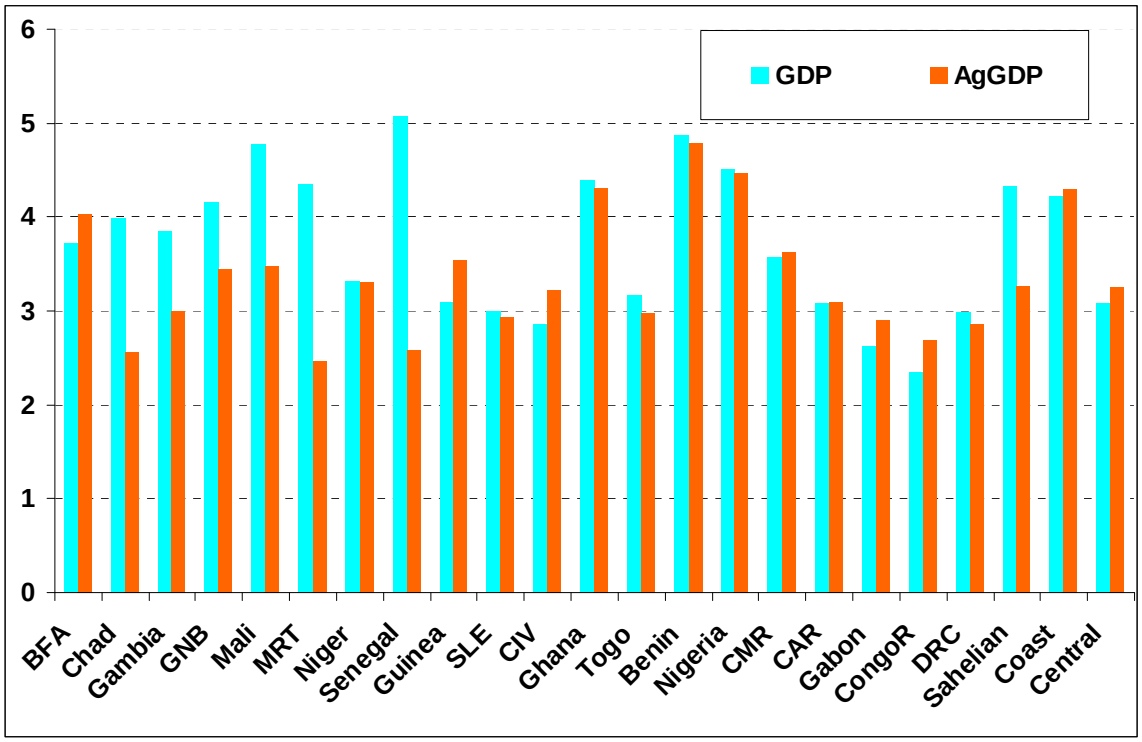
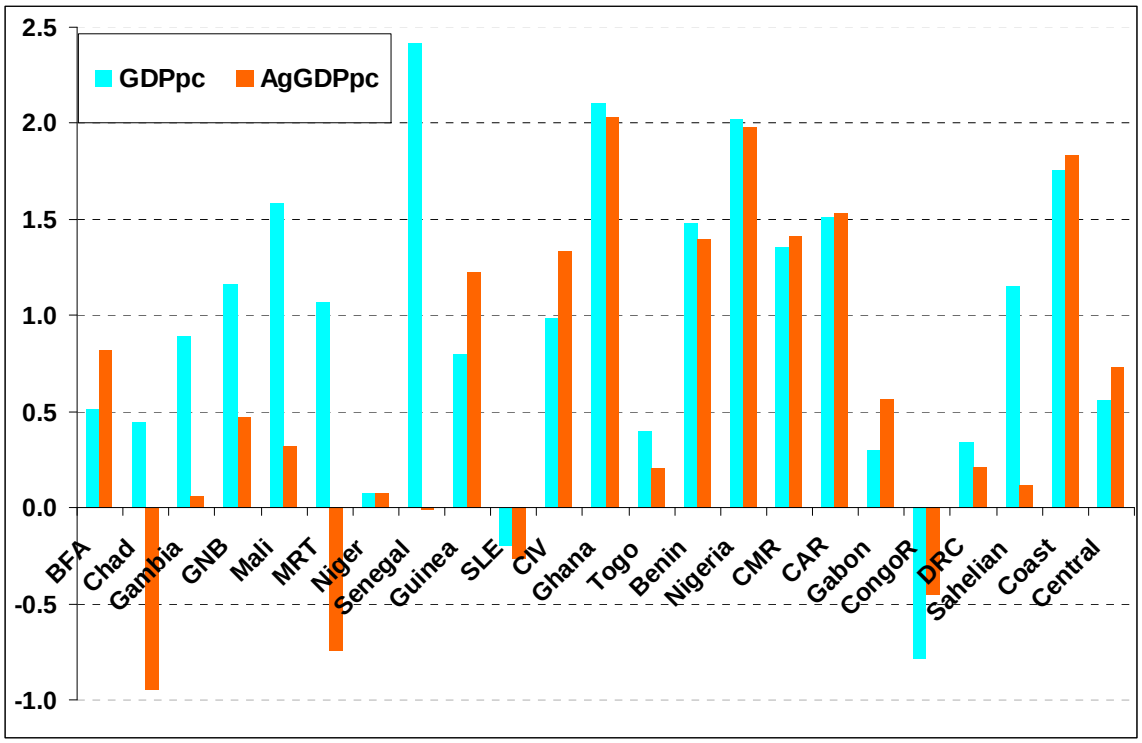


Figure 5.1.1 Projected AgGDP and overall economic growth in the base-run (2006-2015 average)



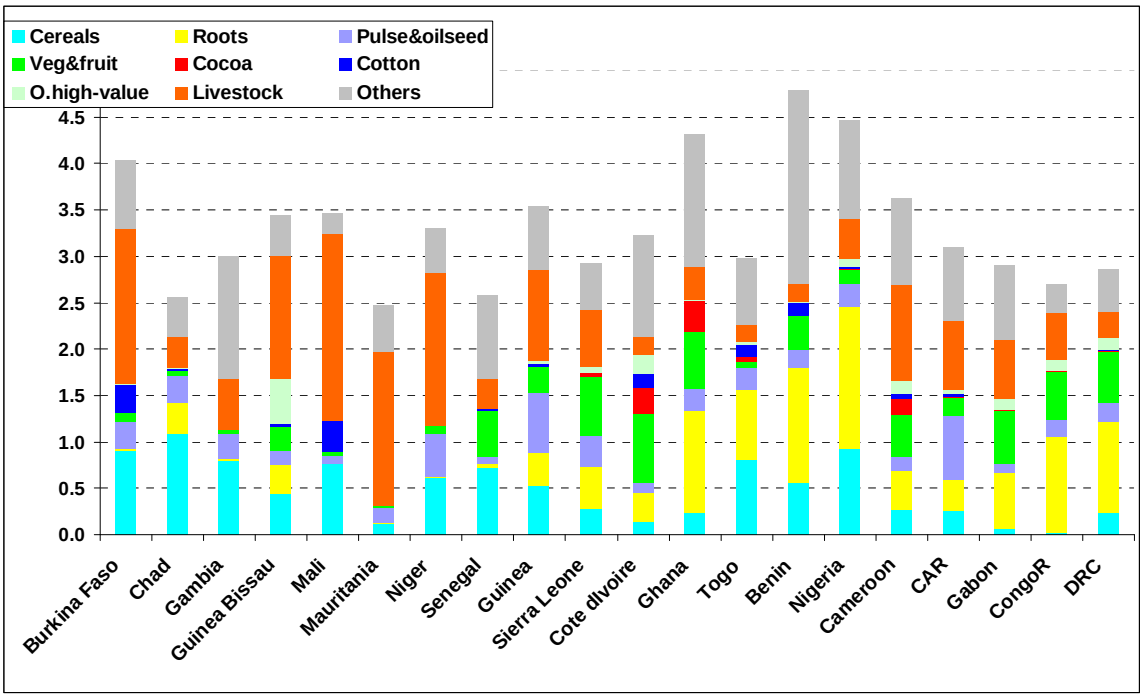
Source: EMM model simulation results

Figure 5.1.2 Projected per capita AgGDP and GDP growth in the base-run (2006-2015 average)



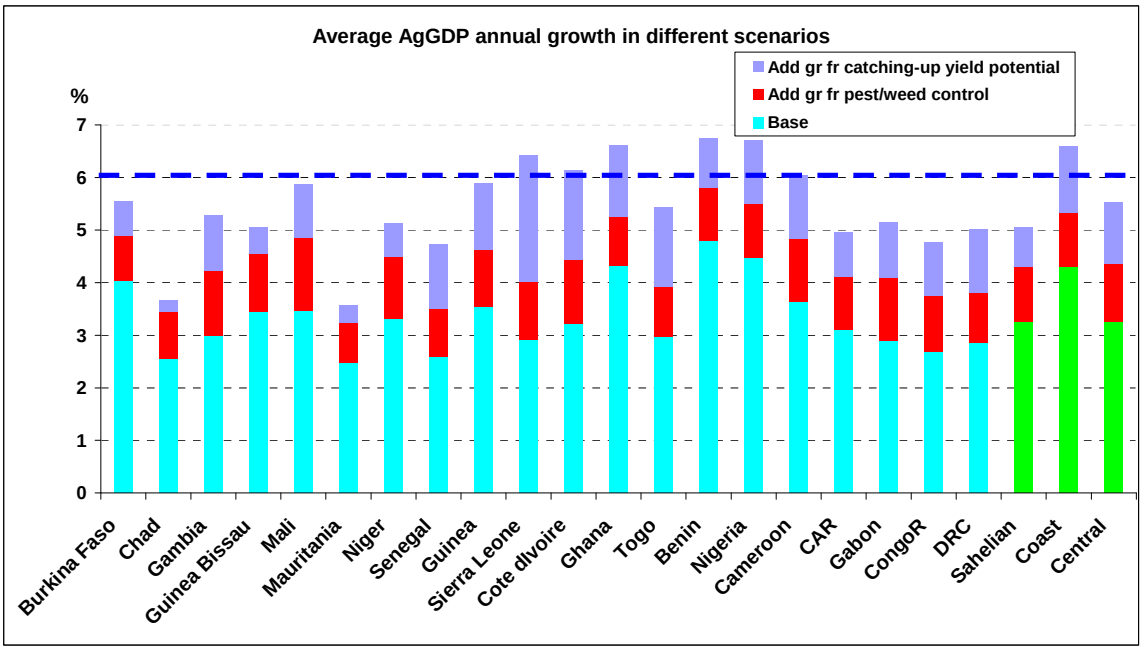
Source: EMM model simulation results

Figure 5.1.3 Sub-sector's contribution to AgGDP growth rate in the base-run (2006-2015 average)



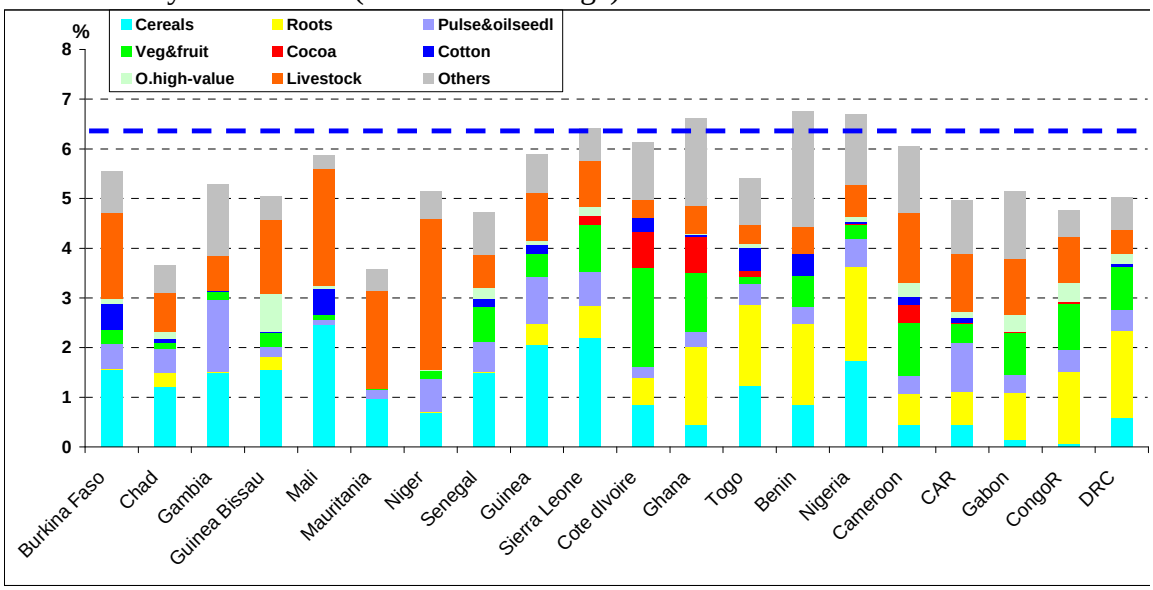
Source: EMM model simulation results

Figure 5.2.1 Six percent of AgGDP growth is reachable for most West African countries (% AgGDP annual growth rate, 2006-2015 average)



Source: EMM model simulation results

Figure 5.2.2 Sub-sector's contribution to AgGDP growth rate in the catch-up potential yield scenario (2006-2015 average)



Source: EMM model simulation results

Figure 5.3.1 Technology adoption profile in development domains

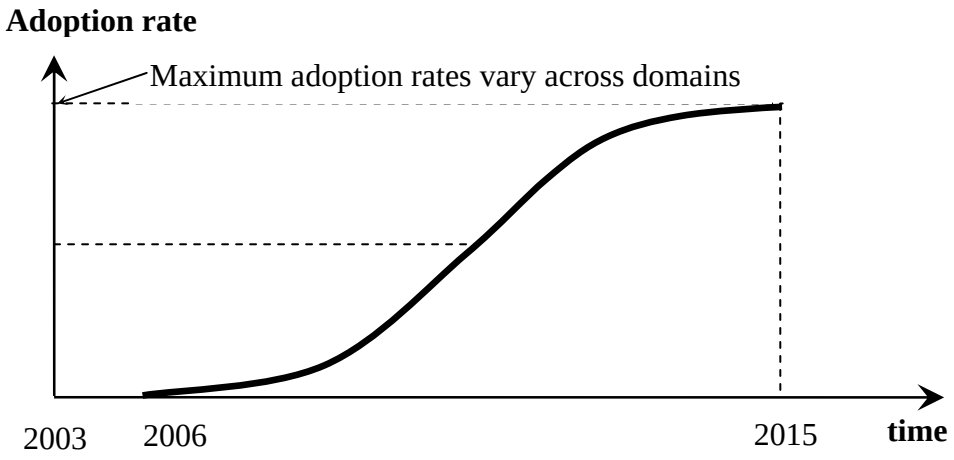
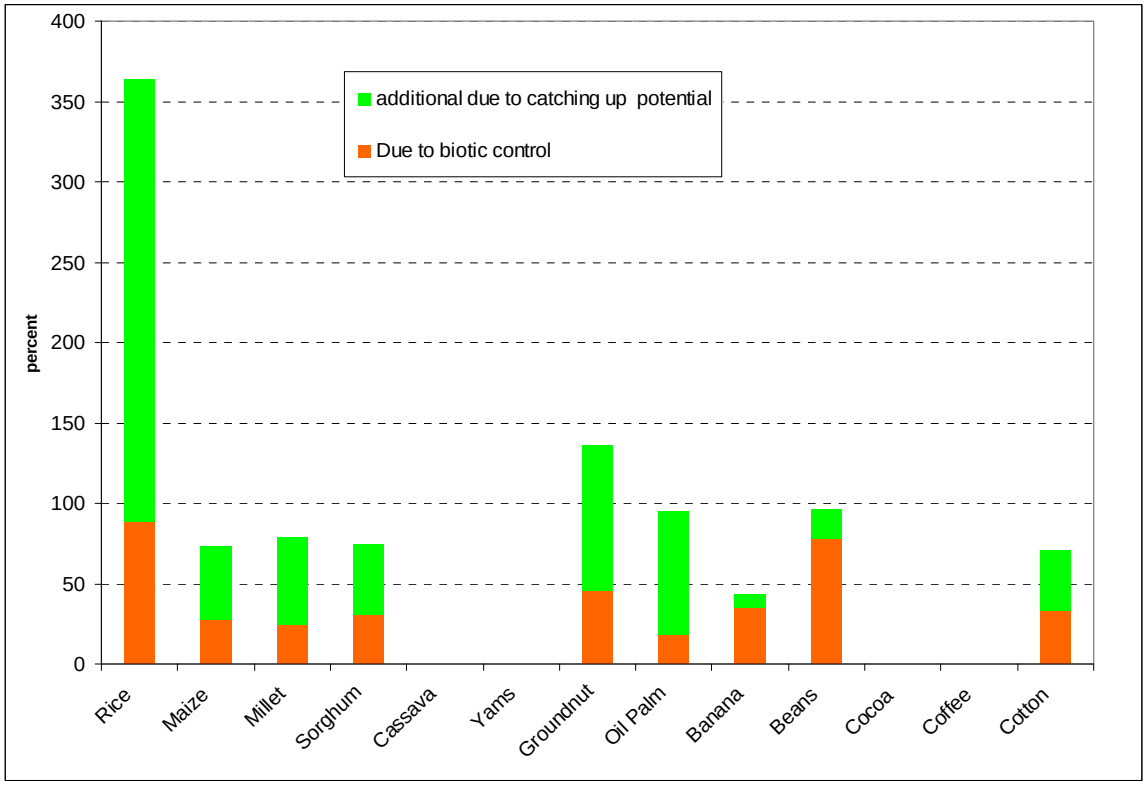


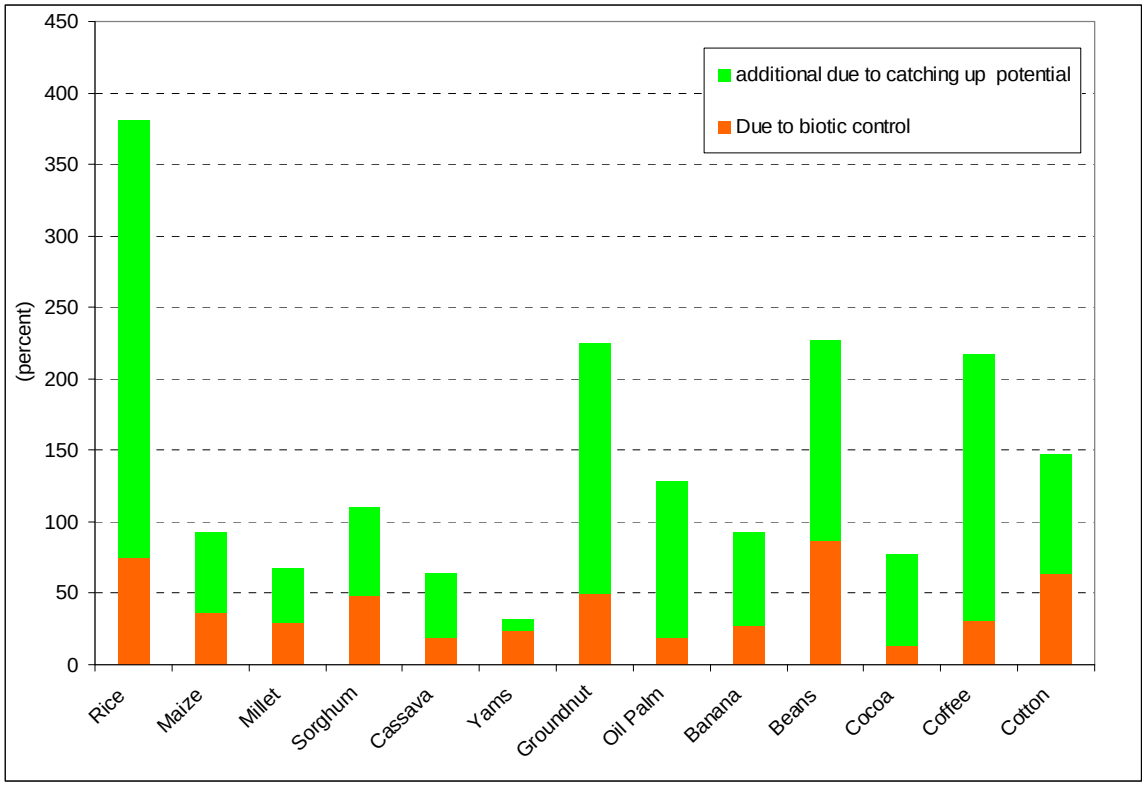
Figure 5.3.2 Producer benefits relative to base year value of production

(a) Sahelian



Source: DREAM model results

(b) Coastal


450
400
350
300
250
200
150
100
50
0
(percent)
additional due to catching up potential
Due to biotic control
Rice
Maize
Millet
Sorghum
Cassava
Yams
Groundnut
Oil Palm
Banana
Beans
Cocoa
Coffee
Cotton

(c) Central

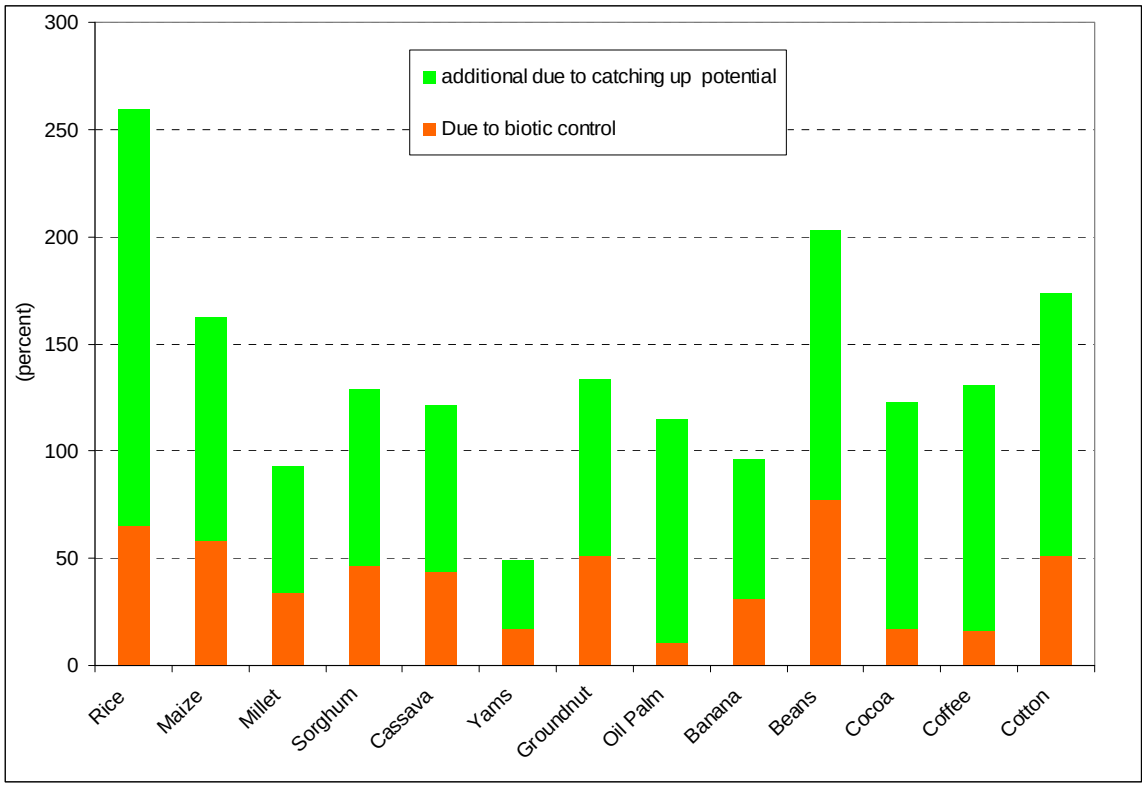
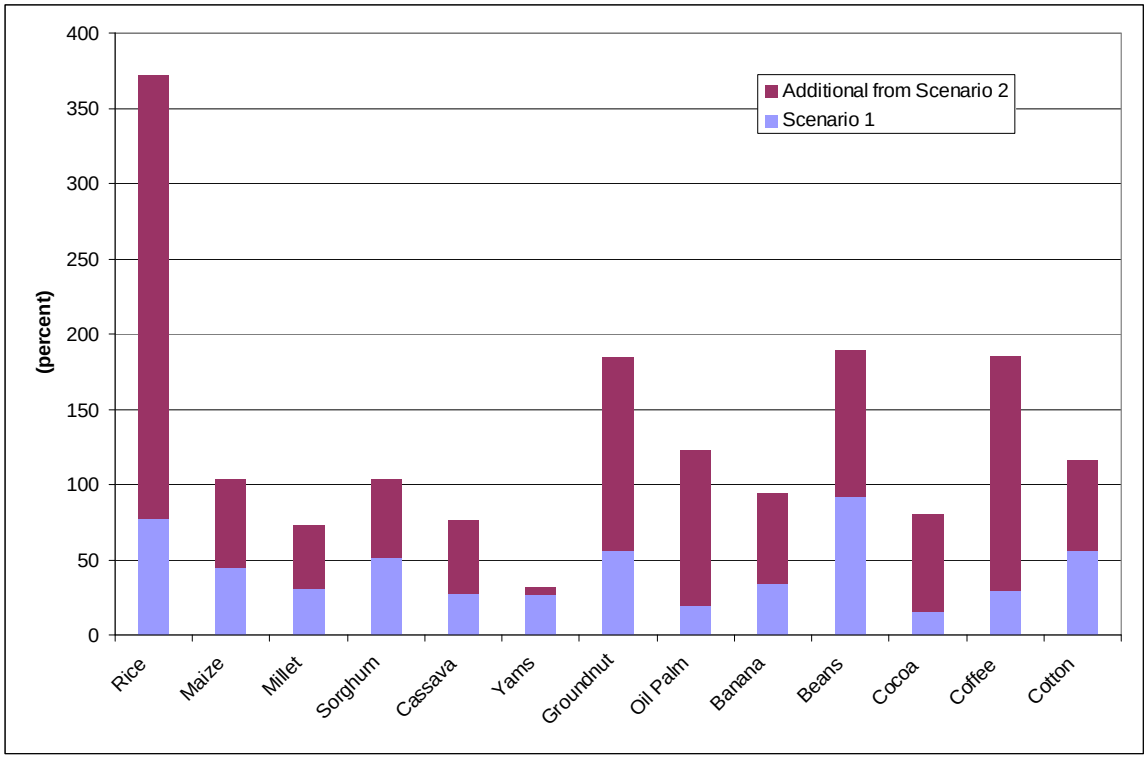
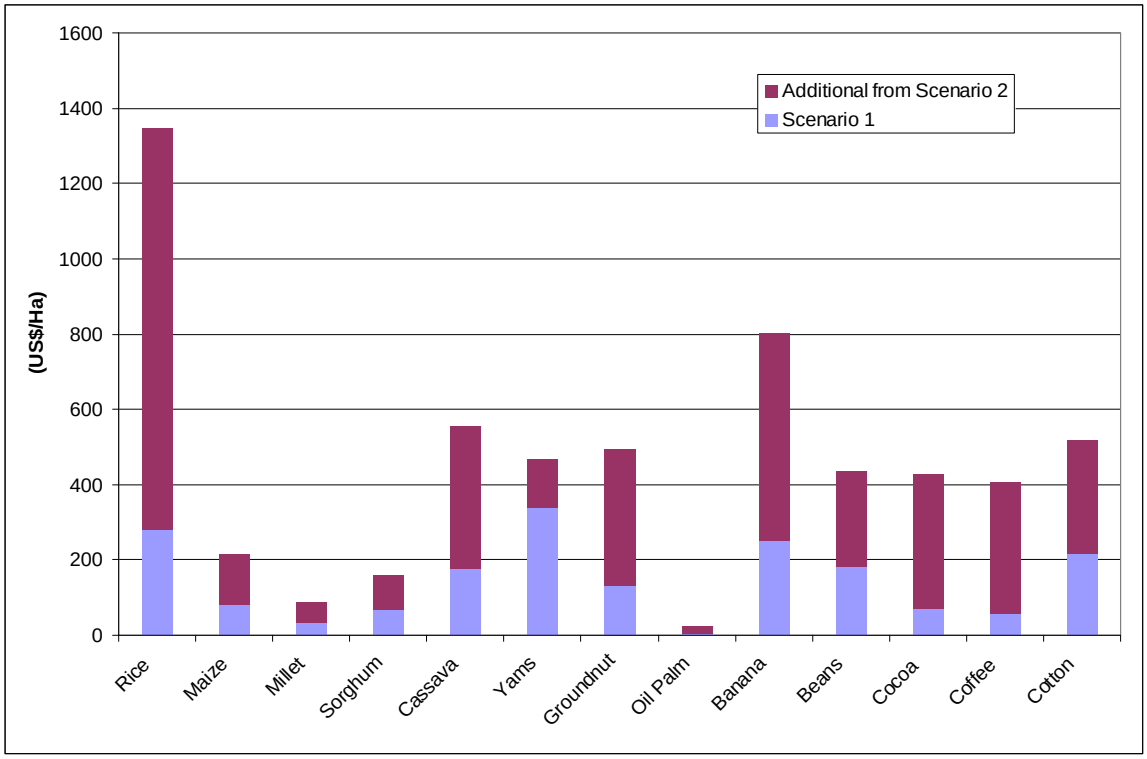

300
250
200
150
100
50
0
(percent)
additional due to catching up potential
Due to biotic control
Rice
Maize
Millet
Sorghum
Cassava
Yams
Groundnut
Oil Palm
Banana
Beans
Cocoa
Coffee
Cotton

Figure 5.3.3 Producer benefits relative to base year value of production in West Africa



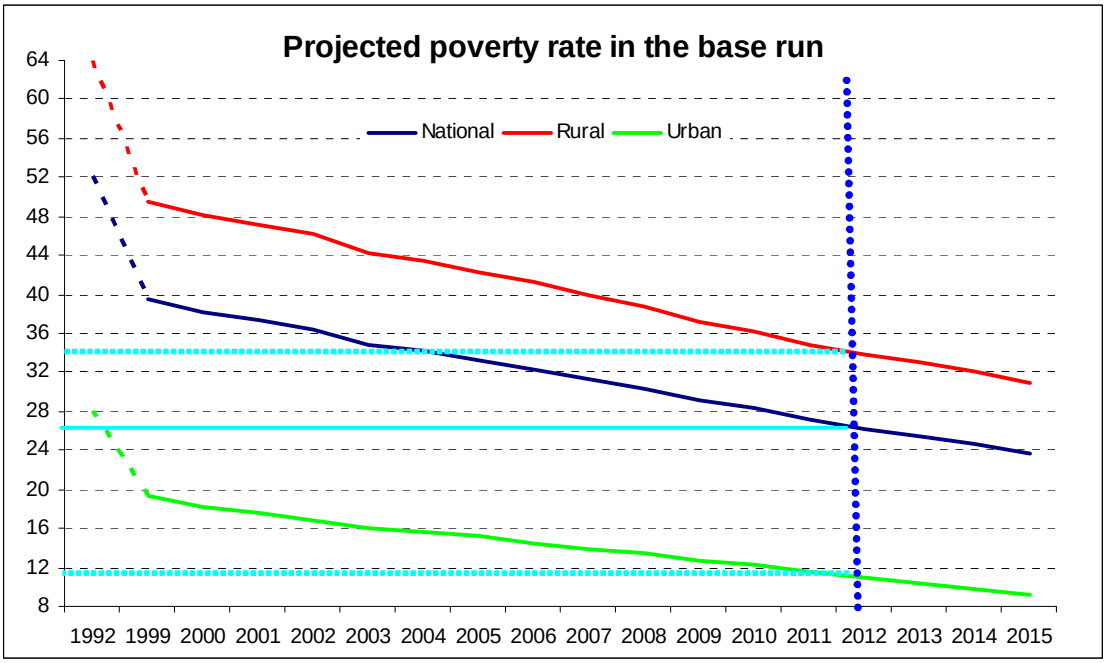
Source: DREAM model results

Figure 5.3.4 Producer benefit per harvested areas in West Africa



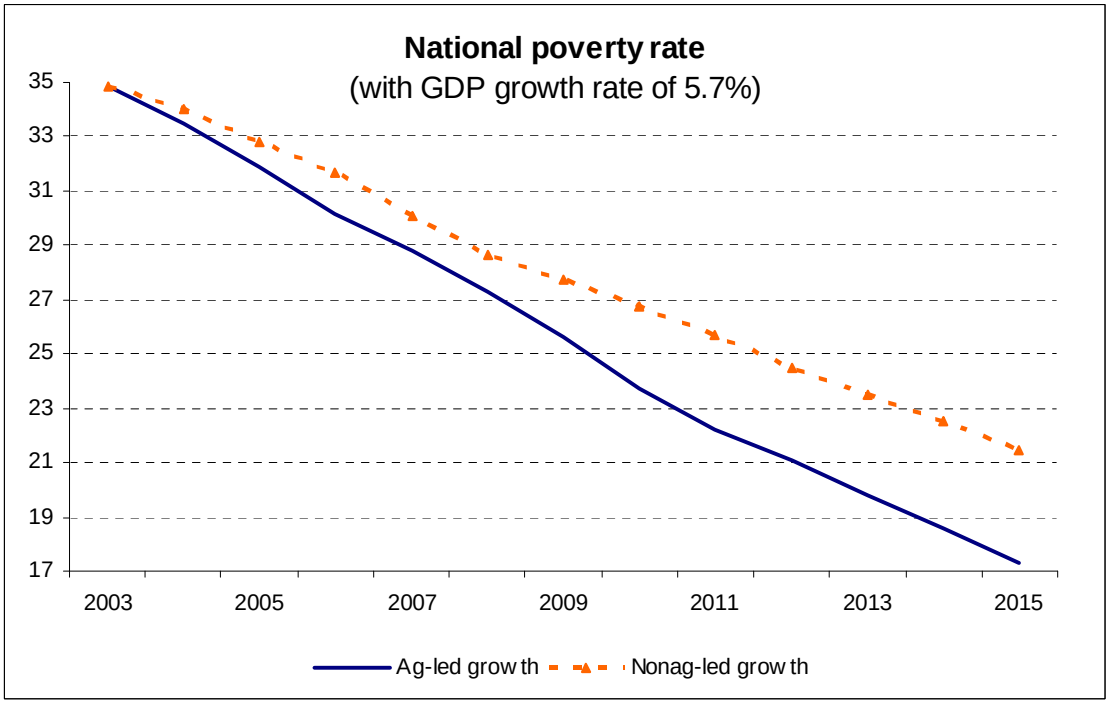
Source: DREAM model results

Figure 5.4.1 Projected poverty rate in Ghana along the business as usual growth path



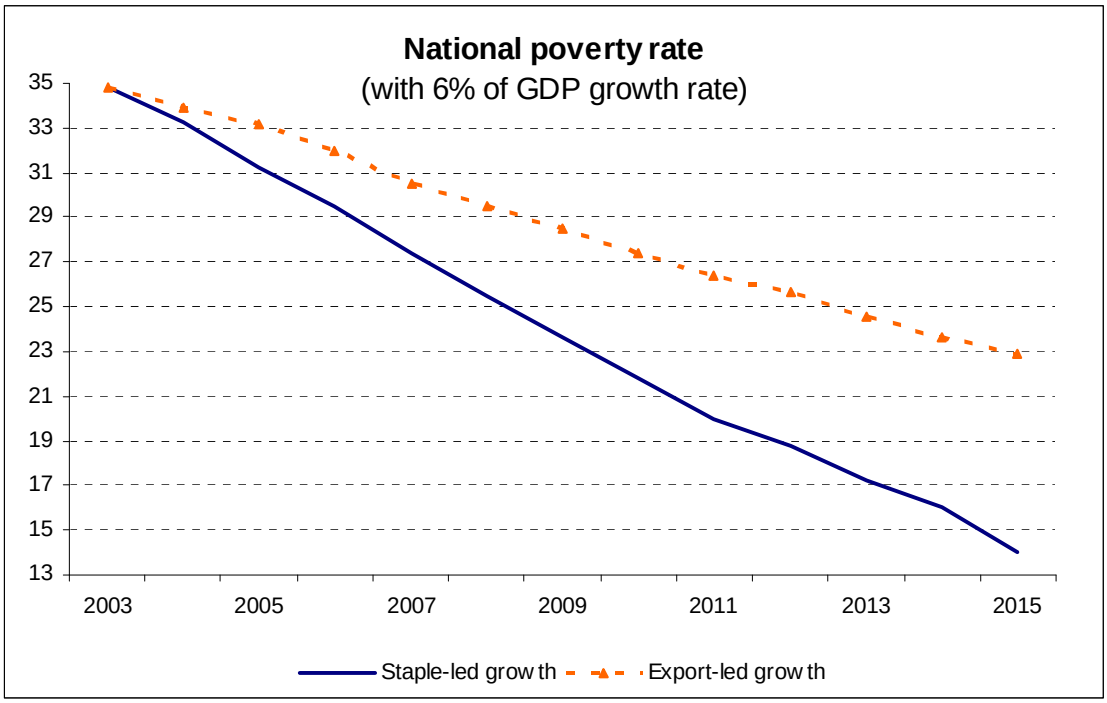
Source: EMM model simulation results

Figure 5.4.2 Agricultural growth is more pro-poor, the case of Ghana



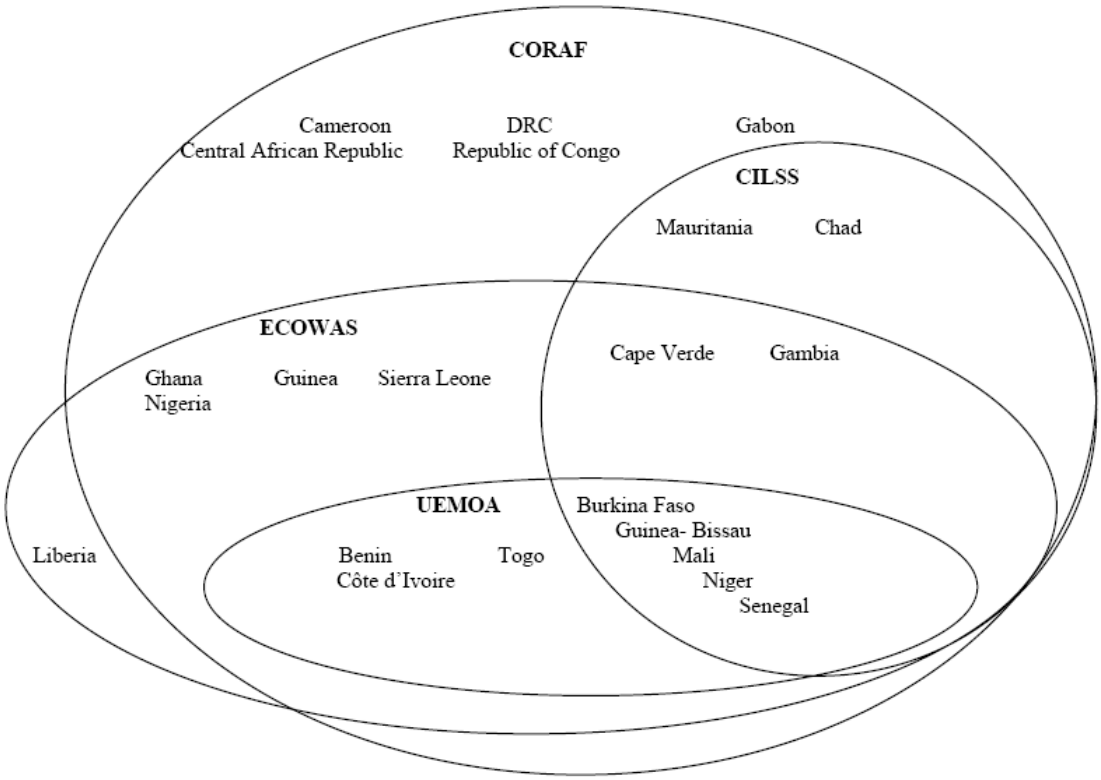
Source: EMM model simulation results

Figure 5.4.3 Broad-based agricultural growth is more pro-poor, the case of Ghana



Source: EMM model simulation results

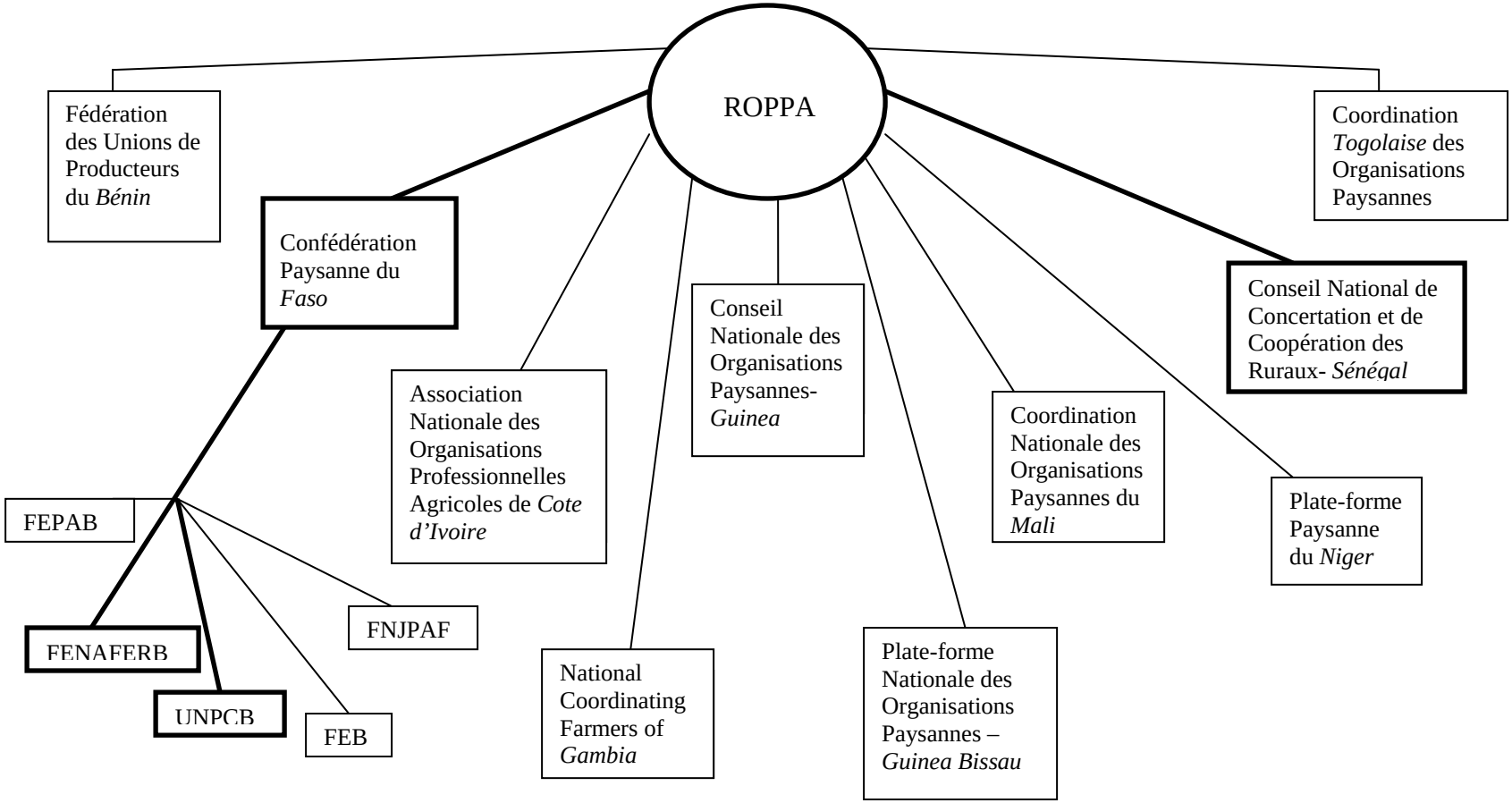
Figure 6.1 Membership in West Africa's Main Regional Economic and Agricultural Research Organizations



Abbreviations (French acronym in italics):

UEMOA / WAEMU:	West African Economic and Monetary Union
ECOWAS / *CEDEAO*:	Economic Community of West African States
CILSS:	Comité Inter-Etats pour la Lutte contre la Sécheresse dans le Sahel (Permanent Inter-State Committee on Drought Control)
CORAF / WECARD:	West and Central African Council for Agricultural Research and Development

Figure 6.2 National Producer Federations that are Members of ROPPA



Source: ROPPA's presentation pamphlet
Note: Figures in bold indicate that members of the given organization were interviewed for this study.

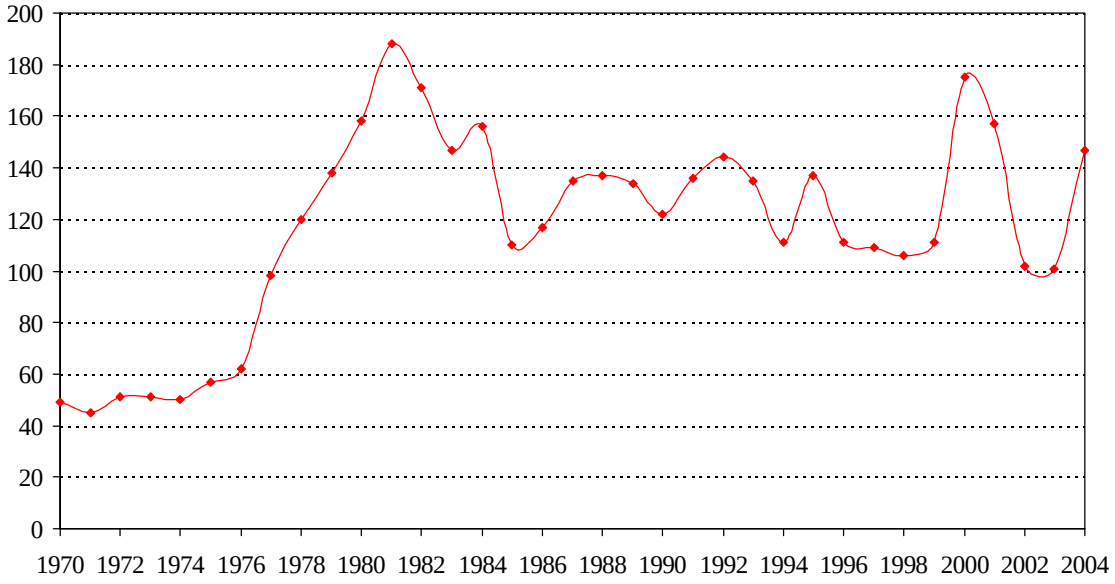


Figure C1. Exports of live animals (cattle, sheep and goats) from Burkina Faso, Mali and Niger (million US$) [Appendix C]
Source: COMTRADE and FAOSTAT

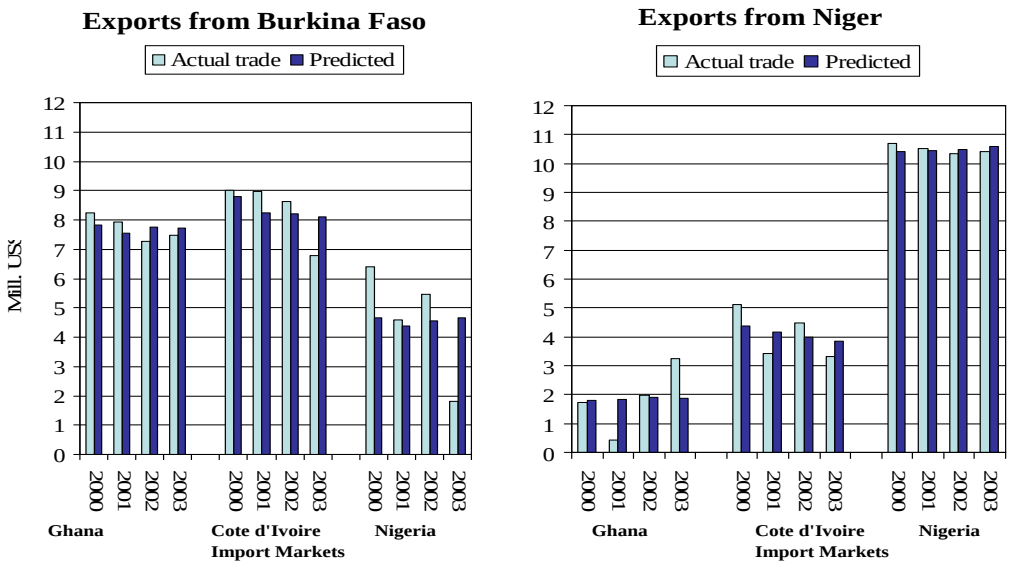


Figure C2. Actual and predicted exports from Burkina Faso and Niger to different import markets in West Africa. (million US$) [Appendix C]

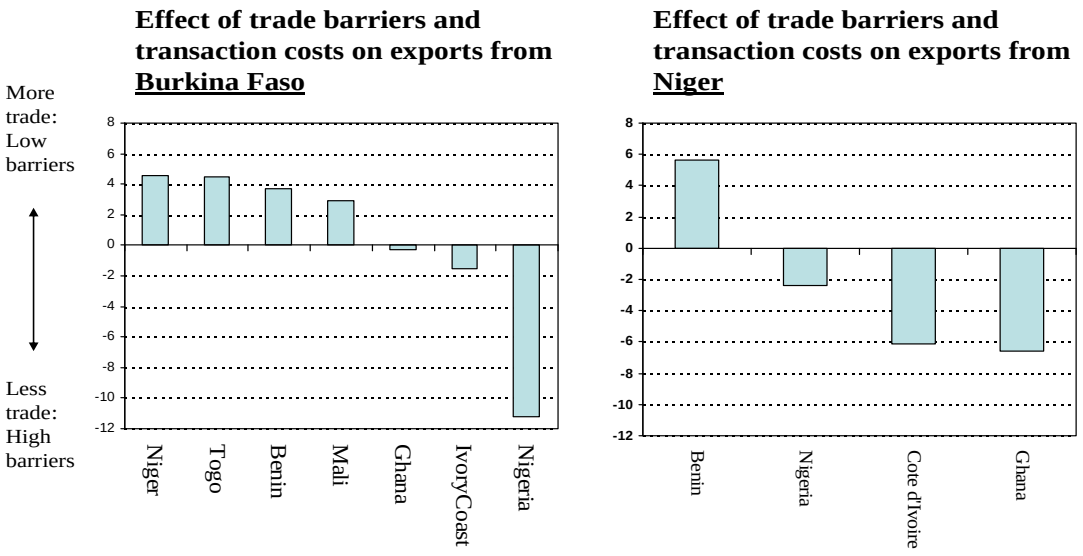


Figure C3.Estimated coefficient of dummy bilateral value measuring effect of trade barriers and transaction costs on exports from Burkina Faso and Niger to different countries. [Appendix C]

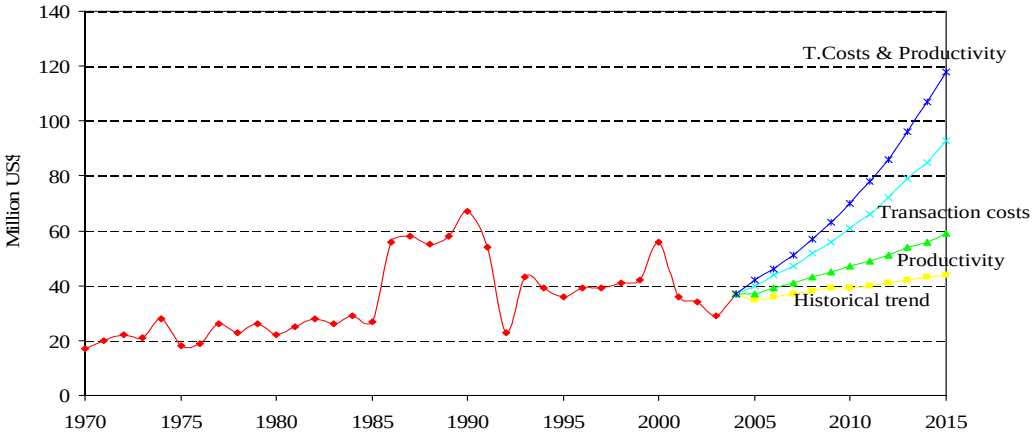


Figure C4. Historical and potential exports from Burkina Faso and Niger under different scenarios 2003-2015 [Appendix C]

ReSAKSS Africa Wide

Regional Strategic Analysis and Knowledge Support System

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