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Agricultural productivity in the COMESA, EAC and IGAD: status, trends and drivers

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Abbreviations and Acronyms

AAMP	African Agricultural Marketing Programme
CAADP	Comprehensive Africa Agriculture Development Programme
COMESA	Common Market for Eastern and Southern Africa
COMSTAT	COMESA Statistical Database
DRC	Democratic Republic of Congo
DSID	Development Strategy and Investment Plan
ESA	East and Southern Africa
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	FAO Statistical Database
FAO-TA	FAO-Technical Assistance
FDI	Foreign direct investment
GAFSP	Global Agriculture and Food Security Programme
GDP	Gross domestic product
GHI	Global hunger index
GNI	Gross national income
MDG	Millennium Development Goal
M&E	Monitoring and evaluation
MAAIF	Ministry of Agriculture, Animal Industries and Fisheries, Uganda
MAcMAP	Market access map
MINIAGRI	Ministry of Agriculture and Livestock, Rwanda
NEPAD	New Partnership for Africa's Development
NGOs	Non-governmental organisations
NTB	Non-tariff barrier
OECD	Organisation for Economic Co-operation and Development
RECs	Regional economic communities
SADC	Southern African Development Community
SAKKSS	Strategic Analysis and Knowledge Support System
TWG	Thematic Working Groups
UNCTAD	United Nations Conference on Trade and Development
EDPRS	Economic Development and Poverty Reduction Strategy
FIEs	Foreign Investors and Entrepreneurs
KSCL	Kilombero Sugar Company Limited, Tanzania
MAAIF	Ministry of Agriculture, Animal Industries and Fisheries
MAFC	Ministry of Agriculture, Food Security and Cooperatives
MoFPED	Ministry of Finance, Planning and Economic Development
NAIP	National Agricultural Investment Programmes
NARO	National Agriculture Research Organization, Uganda
ODA	Official Development Assistance
SPTA	Strategic Plan for the Transformation of Agriculture
SME	Small and Medium Enterprise
WDI	World Development Indicators

Executive Summary

The Comprehensive Africa Agriculture Development Programme (CAADP) is a framework that provides for an agriculture-led development strategy. CAADP aims to help African countries alleviate poverty and achieve food security by attaining an average annual agricultural growth rate of 6% through allocating at least 10% of their total annual budgets to the sector.

Low agricultural productivity is one of the major challenges facing the agriculture sector on the continent. Agricultural productivity in Africa is significantly lower than in other parts of the world. To achieve the goals and aspirations of CAADP, agricultural productivity must be raised significantly. Generally, productivity is low but information on productivity performance in the Common Market for Eastern and Southern Africa (COMESA) region and other sub-regional groupings in Eastern and Central Africa is not synthesized and compiled for decision making. This report is one of the annual monitoring and evaluation (M&E) reports for CAADP generated by the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) network. It focuses on agricultural productivity with the overall aim of reviewing and comparing trends in agricultural productivity to shed light on the progress being made in addressing agricultural productivity constraints. The report covers COMESA, the East African Community (EAC), and the Intergovernmental Authority for Development (IGAD) and the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) member countries. The information provided can help identify possible policy actions and options to address the low agricultural productivity.

Major findings and their implications

PRODUCTIVITY OF CEREALS AND OTHER CROPS IS MUCH LOWER THAN THE GLOBAL AVERAGE. Increased production has only been achieved by increasing area under crop land. Productivity growth has been only modest over the last two decades. Governments must therefore make concerted efforts to address the constraints that underlie the low productivity.

THERE IS HIGH VARIABILITY IN CROP YIELDS. Year-on-year yield variations are high mainly because of dependence on rainfed agriculture. Weather variability coupled with phenomena like pest/disease outbreaks and political instability increase yield variability. Governments must therefore establish and maintain effective mechanisms for early warning, and disaster mitigation and management. Furthermore, investment in irrigation and crop protection can lower the magnitude of yield variability.

PRODUCTIVITY IN THE LIVESTOCK SECTOR IS LOW. Average beef and milk productivity is low compared to that of the rest of the world. Increase in production is driven by growth in cattle population rather than by productivity gains.

PRODUCTIVITY DIFFERENCES EXIST BETWEEN COUNTRIES AND SUB-REGIONS IN COMESA. The observed differences can be explained by differences in biophysical conditions, technological advancement, socio-economic conditions and policy and institutional factors.

TRENDS IN KEY AGRICULTURAL AND RURAL DEVELOPMENT INDICATORS. Agricultural growth is observed, but the CAADP growth target of 6% remains elusive in COMESA. Only a few countries have achieved or surpassed it. Budgetary allocation to agriculture remains low; Ethiopia and Malawi are the only countries that have achieved the 10% CAADP target. Modest progress has been made in reducing poverty and hunger since the 1990s, but levels remain high.

1. Introduction

1.1 Overview

The Comprehensive Africa Agriculture Development Programme (CAADP) provides an integrated agriculture-led framework of development priorities aimed at reducing poverty and increasing food security. It aims to achieve this by targeting an average annual agricultural growth rate of 6%. African countries aim to achieve this by increasing the amount of resources allocated to the agriculture sector to at least 10% of total annual government expenditure. This commitment was made by the African Heads of State under the Maputo Declaration in 2003. In many cases, the agricultural investments required are in excess of the 10% of total government expenditure. Higher investments are likely to be required by some countries that face productivity constraints and where agricultural investments are currently very low.[1]

1 This mostly applies to the agriculture-based economies that will be discussed in Section 1.3.

1.2 About this report

This report is one of the annual monitoring and evaluation (M&E) reports for CAADP generated by the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) network. The report focuses on agricultural productivity which was a feature topic in 2011. The overall objective is to review and compare trends in agricultural productivity to shed light on the progress being made in addressing constraints to agricultural productivity in Africa. Various alliances have been developed in Eastern, Southern and Central Africa to enhance regional cooperation or harness other benefits of regional integration. These alliances address a common agenda in the following aspects: the economy, trade, politics, human and livestock health and environment among others. Some of the regional alliances in Eastern, Southern and Central Africa include the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC), and the Intergovernmental Authority for Development

TABLE 1: COUNTRIES BY GEOGRAPHIC REGION AND OTHER GROUPINGS; COUNTRY'S SHARE (%) IN REGION'S TOTAL AGRICULTURE VALUE ADDED

COMESA	ASARECA	EAC	IGAD
Burundi (0.8)	Burundi (1.2)	Burundi (3.3)	Djibouti (0.1)
Comoros (0.3)	DRC (9.5)	Kenya (39.7)	Eritrea (0.8)
DRC (6.5)	Eritrea (0.6)	Rwanda (7.9)	Ethiopia (29.7)
Djibouti (0.03)	Ethiopia (20.9)	Tanzania (31.6)	Kenya (21)
Egypt (29.9)	Kenya (14.8)	Uganda (17.6)	Somalia (no data)
Ethiopia (14.3)	Madagascar (4.4)		Sudan (39)
Eritrea (0.4)	Rwanda (2.9)		Uganda (9.3)
Kenya (10.1)	Sudan (27.4)		
Libya (1.7)	Tanzania (11.8)		
Madagascar (3.0)	Uganda (6.6)		
Malawi (1.8)			
Mauritius (0.6)			
Rwanda (2.0)			
Seychelles (0.03)			
Swaziland (0.4)			
Sudan (18.8)			
Uganda (4.5)			
Zambia (3.1)			
Zimbabwe (1.7)			

Notes: Figures in parentheses are country's share in the region's total agriculture value added (2003–2010 annual average). Sudan includes South Sudan because the data are not disaggregated for the two countries.
Those highlighted are the largest agricultural economies in the sub-group.

Source: Agriculture GDP share calculated by the authors based on data from World Bank (2011), group membership from the respective regional alliances.

(IGAD). Agricultural productivity status and trends vary across these sub-regions due to differences in biophysical (geographic), socio-economic and political conditions of the member states. In this report we analyse trends in agricultural productivity in these regional groupings to generate information to facilitate learning. We also present productivity information aggregated for the region covered by the Association for Strengthening Agricultural Research in Eastern and Southern Africa (ASARECA). This regional grouping comprises 10 countries that work together to chart a common agricultural research agenda. Table 1 lists country membership to each of these regional blocs. In addition to the regionally aggregated figures, the report also presents country level information to enable cross-country comparison.

The rest of the report is organized as follows: Sub-section 1.3 of chapter 1 presents information on the importance of the agriculture sector in the region and discusses trends of the contribution of agriculture to the economies of the sub-regions and member countries. Sub-section 1.4 presents the methodology used in collecting and analysing data for this report. Chapter 2 provides a detailed discussion on the status and trends of agricultural productivity in the region. Chapter 3 synthesizes key messages derived from the observed trends and reviewed literature. Chapter 4 presents an overview of the status and trends of selected CAADP indicators. Chapter 5 concludes.

1.3 The importance of agriculture: national economies and sub-regions

Agriculture remains a key sector in COMESA, ASARECA and EAC sub-regions. At country level, the relative importance of agriculture differs among countries in the region: some countries depend heavily on agriculture while others do not. The economic importance of the sector is especially critical in low-income agriculture-based economies (including Burundi, Comoros, Eritrea, Rwanda, Ethiopia, Kenya, Madagascar, Malawi, Tanzania, Uganda, Zimbabwe, Democratic Republic of Congo (DRC) and Zambia as indicated in Table 2).

Based on the annual average levels for agriculture value added (2005–2010), agriculture contributes about 18.3% of the gross domestic product (GDP) in COMESA and about 31%, 28% and 31% in ASARECA, EAC and IGAD respectively (Table 3). The COMESA value is relatively lower than that of the other groupings because of the influence Djibouti, Egypt, Libya, Mauritius and Seychelles whose economies are less reliant on agriculture. When these countries are excluded from the analysis, the regional average of agricultural GDP for the remaining countries stands at about 28%. Burundi, Comoros, DRC, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania and Uganda are the key drivers for the higher figures observed in ASARECA, EAC and IGAD.[2] Agriculture comprises various sub-sectors. Contributions from these sub-sectors to agricultural GDP vary across countries (see examples in UBOS 2010; MAFC 2010; Rwanda National Institute of Statistics 2012).

TABLE 2: ECONOMIC CLASSIFICATION OF COUNTRIES IN THE COMESA, ASARECA, EAC AND IGAD REGIONAL ALLIANCES

		Low-income (13)	**Middle-income (7)**
More favourable agricultural conditions	Mineral rich (2)	DRC, Zambia	Djibouti, Egypt, Libya, Mauritius, Seychelles, Sudan, Swaziland
	Non-mineral rich (7)	Ethiopia, Kenya, Madagascar, Malawi, Tanzania, Uganda, Zimbabwe	
Less favourable agricultural conditions (4)		Burundi, Comoros, Eritrea, Rwanda	

Source: Benin et al. (2010).

2 Different combinations of these countries constitute member countries of these sub-regions.

TABLE 3: AGRICULTURE VALUE ADDED AS SHARE OF GDP (%)

Country/ region	2010–1990 .annual avg	2010–1990 annual avg. point change	an- 1995–1990 nual avg. level .4	1995–1990 annual avg. point change	2000–1995 annual avg. level .5	2000–1995 annual avg. point change	2005–2000 annual avg. level .6	2005–2000 annual avg. point change	2010 –2005 annual avg. level	2010–2005 annual avg. point change
COMESA	**20.7**	**-0.3**	**22.7**	**-0.3**	**21.2**	**-0.5**	**20.2**	**0.0**	**18.3**	**-0.3**
EAC	**34.0**	**-0.7**	**40.4**	**0.2**	**37.2**	**-1.7**	**30.8**	**-0.6**	**27.8**	**-0.6**
ASARECA	**38.1**	**-0.8**	**44.7**	**0.5**	**41.0**	**-1.1**	**35.7**	**-0.9**	**31.0**	**-1.6**
IGAD	**37.9**	**-0.8**	**45.1**	**-0.4**	**40.6**	**-0.8**	**34.7**	**-1.1**	**30.7**	**-0.7**
Burundi	45.8	-1.0	51.9	-1.5	48.4	-0.4	44.6	-0.3	38.6	-1.9
Comoros	44.3	-2.1	39.7	-0.1	42.2	1.5	50.2	0.5	46.7	-10.2
DRC	47.3	-1.5	48.0	5.2	48.1	-1.4	50.8	-0.9	43.4	-9.1
Djibouti	3.5	-0.2	3.3	0.0	3.5	0.1	3.6	0.0	3.6	-0.7
Egypt	16.1	-0.3	17.3	-0.5	17.0	0.0	16.0	-0.4	14.0	-0.2
Eritrea	20.3	0.0	24.6	4.2	20.2	-1.2	16.3	1.8	21.5	-4.8
Ethiopia	52.1	-0.3	61.3	0.6	54.0	-1.5	45.6	-0.6	47.2	0.2
Kenya	29.3	-0.2	30.4	0.3	31.5	0.2	29.5	-1.0	26.2	-0.4
Libya	3.0	0.0		0.0		0.0	3.7	0.5	2.1	-0.5
Madagascar	28.4	-1.4	27.8	-0.4	29.2	0.5	29.2	-0.2	27.1	-5.7
Malawi	35.6	-2.3	38.7	-2.9	35.1	1.8	36.3	-1.4	30.9	-6.5
Mauritius	7.8	-0.5	11.2	-0.5	8.7	-0.7	6.6	-0.2	4.6	-0.5
Rwanda	38.2	0.0	37.6	2.3	43.6	-1.4	37.3	0.2	35.2	-1.2
Seychelles	3.2	-0.2	4.3	-0.1	3.4	-0.2	2.9	-0.1	2.1	-0.5
Sudan	37.7	-0.8	39.7	-0.4	43.8	0.6	38.8	-1.9	28.3	-1.7
Swaziland	10.5	-0.1	11.1	0.3	13.0	0.0	10.0	-0.7	8.2	-0.2
Tanzania	37.5	-0.9	47.1	0.2	40.6	-2.7	32.7	-0.3	29.8	-0.7
Uganda	36.2	-1.6	51.9	-1.4	41.1	-4.0	26.6	-0.5	24.6	-0.5
Zambia	21.0	-0.6	21.6	-0.4	20.4	0.8	22.6	0.2	19.5	-2.8
Zimbabwe	17.6	0.0	14.7	-0.2	19.2	0.6	17.4	0.1	18.8	-0.5

Notes: Blank cells indicate missing values. Regional aggregate values are calculated as weighted summations. The weights are computed using country's GDP as a share of regional GDP.
** IGAD values exclude Somalia because of data limitations.
Sudan includes South Sudan because the data for the two countries are not disaggregated.
Avg. is an abbreviated form of average; this word has been used in all tables in this report.

Source: Authors' calculation based on data from World Bank (2011).

At regional level, the contribution of agriculture to GDP is declining in COMESA, ASARECA, EAC and IGAD (see Table 3). Recent statistics (average for 2005–2010) indicate that the current contribution of the sector to total GDP is much lower than the average levels for early 1990s. A comparison of average levels for 1990–1995 compared with that of 2005–2010 indicates that decline in the contribution of agriculture to regional GDP were: COMESA (from 22.7% to 18.3% reflecting a 19% decline); ASARECA (from 44.7–31% which is about 31% decline); EAC (from 40.4–27.8% indicating a decline of about 31%); and IGAD (from 45.1% to 30.7% amounting to a decline of about 32%).

At country level, declines in the size of agriculture relative to total GDP were much more prominent in some of the countries presented in Table 3 than in others. For example, Mauritius, Tanzania, Seychelles, Uganda, Sudan, Swaziland and Burundi experienced more than 25% decline for the periods (1990–1995 vs. 2005–2010). Trends in these countries are in by and large responsible for the declines observed in the regional groupings where these countries belong. The contribution of agriculture to GDP in Madagascar has been almost stagnant, with a marginal decline of about 3% since the early 1990s. Increased contribution of agriculture to GDP was observed in Djibouti and Comoros.

However, the decline in agricultural contribution to GDP is not necessarily a bad outcome, as it does not automatically reflect poor performance of the agriculture sector or its diminished importance (Benin et al. 2010). The decline in the share of agriculture to the economies of these countries is a result of progress in the development of other sectors, especially industry and services, which could imply a transformation of the economy (see Timmer 1988). Such change is good as it could enhance the performance of the agriculture sector through forward and backward linkages.

1.4 Data and methodology

The report was produced based on available national and international data and information sources. No primary data were collected for the analysis reported. Collaborative activities between ReSAKSS and national technical experts involved in M&E of agriculture and rural development facilitated access to national data and information. The national sources used include ministries of agriculture (and agriculture line ministries), national statistics agencies, ministries of planning and economic development, and ministries of finance and economic affairs. The following international data sources were used: the International Monetary Fund (IMF), the Organisation for Economic Cooperation and Development (OECD), the United Nations Food and Agriculture Organization database (FAOSTAT), the United Nations Millennium Development Goals (MDG) statistics, the World Bank world development indicators and the COMESA statistics database (COMSTAT).

To supplement the collated information and data, a detailed review of literature was conducted to ascertain factors that explain the observed trends in agricultural productivity. A wide range of published and unpublished literature sources were reviewed. Key references used were government publications, technical reports and research reports.

To support progress reviews at the regional and national levels and learning across countries and regions, the data analyses are presented at different levels and compositions of aggregations of countries. Since the country CAADP processes are facilitated by RECs, the main indicators in this report are presented according to the REC groupings. Three RECs that operate in East and Central Africa, namely COMESA, EAC and IGAD, are included (see Table 1). However, the main characteristic of these RECs is overlap of country membership. This has implications on cross-region comparisons.

To estimate regional level values, we adopted a method for regional aggregation used by Benin et al. 2010. Regional values were estimated using the weighted sum approach; the weighting factor for each country was the share of that country's value in the total value of the indicator for all countries in the region or sub-region. Indicators such as GDP, agricultural GDP, population and land area were used as the weighting factors depending on the indicator of interest. Details for each weighting scheme are given in the technical notes in various tables. More detailed technical notes are available in Appendix 9.

To assess performance over time and progress towards achieving CAADP targets, annual average indicator levels and changes were calculated. Data were averaged across four periods: 1990–1995, 1995–2000, 2000–2005 and 2005–2010, using overlapping years to smooth the range. Using multiple years is more reliable for analysing trends than year-to-year changes that are often fraught with large variations (Benin et al. 2010).

2. Agricultural Productivity

2.1 Defining agricultural productivity: Concepts and measurements

Agricultural productivity measures are categorized into partial or total measures. Total factor productivity (TFP) is a method for calculating agricultural productivity by comparing an index of agricultural inputs to an index of outputs. It is defined as the ratio of the value of output to the value of all inputs used (Nyoro and Jayne 1999). TFP trends over time are often used to assess net gains from technological change (Pingali and Heisey 1999). Although TFP measures are the most appropriate measures of productivity, they are used less often than the partial factor productivity (PFP) measures especially in Africa. This is because TFP measures are difficult to construct in the absence of data on prices and costs of key inputs (Nyoro and Jayne 1999).

PFP measures refer to the amount of output per unit of a particular input such as yield (output per unit of land or output per animal) and labour productivity (output per economically active person or output per agricultural person-hour). Output and yield growth rates remain the most commonly used indicators of productivity growth in developing-country agriculture (Pingali and Heisey 1999; Chilonda et al. 2007). The main weakness of PFP indices is they do not account for all the inputs used in production/marketing systems. This study focused on selected PFP measures. Two commonly used measures of PFP are labour and land productivity; these are discussed further in subsequent sub-sections.

2.2 *Labour productivity*

Labour productivity is the ratio of output to total number of hours worked. This productivity measure provides a useful initial overview of the level and growth rate of agricultural productivity. Value added per worker in agriculture is a measure of labour productivity.

Labour productivity in COMESA, EAC, ASARECA and IGAD (average 2005–2010) was estimated at: COMESA (USD 509 per worker per annum), EAC (USD 234 per worker per annum), ASARECA (USD 267 per worker per annum) and IGAD (USD 224 per worker per annum). These figures are much lower than the world average of USD 1062 per worker per annum during the same period. The COMESA average is approximately half the world average and the situation is much worse for the other regional groupings discussed in this report. Labour productivity levels in EAC, ASARECA and IGAD are even lower than the average for sub-Saharan Africa whose average was USD 323 per person per annum for the period 2005–2010 (see Table 4).

At country level, agricultural labour productivity is lowest in Burundi (with USD 72 per worker per annum) and highest in Mauritius (with USD 5072 per worker per annum). Mauritius, Egypt, Swaziland, Seychelles and Sudan are the only countries with agricultural labour productivity higher than the regional average for COMESA (Table 4). These countries influence the relatively higher level of agricultural productivity in COMESA compared to the other sub-regions. Burundi, Ethiopia, Rwanda, Eritrea, Madagascar, DRC, Malawi and Tanzania whose agricultural productivity is less than USD 300 per worker per annum are the key drivers for the low productivity levels observed in the EAC, ASARECA and IGAD regions.

Agricultural labour productivity has changed little in COMESA, EAC, ASARECA and IGAD since the 1990s. Differences in the average levels of labour productivity in these sub-regions for1990–1995 and 2005–2010 were: COMESA (+3.1%), EAC (-0.8 %), ASARECA (+2.4 %) and IGAD (+2.3%). These figures indicate very little improvement in COMESA, ASARECA and IGAD and some decline in EAC. These statistics show that labour productivity is more or less stagnant in these sub-regions. The growth rates in agricultural productivity in Table 4 also depict the stagnation. For example, labour productivity increased on average by 0.1% per year in COMESA in the period 1990–2010.

Historical country level data (i.e. average for 2005–2010 compared average 1990–1995) indicate two categories of countries as far as the agriculture labour productivity indicator is concerned. For one group of countries agricultural labour productivity declined relative to the levels of the early 1990s. Observed reductions for agriculture labour productivity for countries in this category were: Burundi (from USD 110 to 71 per worker); DRC (from USD 212 to 167 per worker); Djibouti (from USD 92 to 79 per worker); Eritrea (from USD 120 to 97 per worker); Madagascar (from USD 205 to 180 per worker); and Zimbabwe (from USD 242 to 171 per worker). For the other group of countries agricultural labour productivity grew in Malawi, Egypt, Sudan, Mauritius, Ethiopia, Tanzania, Swaziland, Rwanda, Kenya, Uganda, Zambia, Rwanda, Seychelles and Comoros. Despite the observed upward trends for the countries in the second category, low agricultural labour productivity remains their key development challenge. This is because most of these countries (especially Ethiopia, Malawi, Tanzania and Uganda) are struggling to increase productivity from the very low levels witnessed in the 1980s and 1990s (see Chirwa et al. 2008; Skarstein, 2005).

TABLE 4: AGRICULTURAL LABOUR PRODUCTIVITY, USD PER WORKER (1990–2010)

Country/region	Annual avg. level 1990–2010	Annual avg. change (%) 1990–2010	Annual avg. level 1990–1995	Annual avg. change (%) 1990–1995	Annual avg. level 1995–2000	Annual avg. change (%)1995–2000	Annual avg. level 2000–2005	Annual avg. change (%) 2000–2005	Annual avg. level 2005–2010	Annual avg. change (%) 2005–2010
COMESA	**499.9**	**0.1**	**493.2**	**-4.1**	**488.8**	**1.3**	**501.0**	**-0.2**	**508.5**	**0.1**
EAC	**239.0**	**-0.1**	**235.5**	**-1.5**	**239.0**	**0.6**	**247.1**	**-0.7**	**233.7**	**-1.1**
ASARECA	**266.0**	**0.0**	**260.9**	**-3.2**	**265.1**	**1.0**	**266.1**	**-0.5**	**267.2**	**-0.9**
IGAD	**213.1**	**-0.2**	**219.2**	**-6.9**	**201.6**	**-0.5**	**202.9**	**1.3**	**224.3**	**1.2**
Burundi	96.5	-2.9	110.0	-4.5	97.1	0.0	83.7	-4.6	71.7	0.0
Comoros	552.6	0.4	526.4	-1.6	538.9	1.5	596.7	0.9	552.3	-1.6
DRC	189.8	-1.7	211.9	0.1	208.7	-3.3	169.9	-1.7	168.7	1.1
Djibouti	81.2	-1.6	92.0	-2.6	76.7	-2.0	75.4	1.4	79.1	2.7
Egypt	2501.0	3.0	1975.2	3.0	2275.6	3.2	2621.1	2.4	3012.5	3.2
Eritrea	105.8	-3.0	119.6	9.8	123.9	-1.9	88.3	1.1	96.5	-15.6
Ethiopia	176.8	1.7	164.9	-3.2	166.8	-1.8	159.9	0.4	203.6	5.2
Kenya	349.1	0.0	347.0	-3.9	336.7	0.6	352.6	0.5	358.0	-1.5
Madagascar	193.6	-0.9	205.4	-1.2	198.5	-0.4	189.0	-2.0	180.3	1.0
Malawi	136.1	3.3	93.7	2.0	138.5	7.1	152.3	-1.0	152.9	4.7
Mauritius	4303.1	2.4	3499.8	0.7	4001.8	0.7	4500.5	1.2	5072.1	4.1
Rwanda	199.4	1.4	185.4	-2.0	200.2	0.5	212.2	3.3	A.	B.
Seychelles	611.2	0.3	582.5	-6.0	596.6	4.4	617.3	-3.0	638.7	4.7
Sudan	769.0	3.0	571.1	3.1	742.6	6.1	833.3	0.5	879.8	2.4
Swaziland	1018.1	1.3	900.8	-5.3	956.9	3.7	1041.1	2.3	1143.6	1.3
Tanzania	245.2	1.7	217.5	-0.2	226.4	1.1	251.7	2.6	278.8	1.5
Uganda	204.6	0.6	191.3	1.2	202.5	0.4	215.7	1.2	207.5	-1.5
Zambia	223.6	0.6	206.0	2.3	235.2	-0.4	232.5	0.0	225.8	-1.8
Zimbabwe	241.8	-2.6	241.9	-1.3	289.3	5.7	272.3	-10.3	170.7	-8.0

- Value added in agriculture measures the output of the agriculture sector (ISIC divisions 1–5) less the value of intermediate inputs. Agriculture comprises value added from forestry, hunting and fishing as well as cultivation of crops and livestock production. Data are in constant 2000 US dollars.
- Regional aggregate values for COMESA, ASARECA and EAC are calculated as weighted summations. The weights are computed using country's agricultural population as a share of regional agricultural population.
- Somalia and Libya are not included because of data unavailability.
- Sudan includes South Sudan because the data are not disaggregated for the two countries.

Source: Authors' calculation based on data from World Bank (2011).

The higher agricultural labour productivity in Egypt, Libya, Sudan, Seychelles, Mauritius and Swaziland may be explained by a combination of factors including: advancement in land management; improved water management for irrigation; use of productivity-enhancing inputs (such as improved seeds, fertilisers animal breeds); and mechanization of agriculture. For example, the use of agricultural machinery such as tractors per 100 km^2 of arable land in these countries is as follows: Egypt (390 tractors), Libya (219 tractors), Swaziland (87 tractors) and Mauritius (28 tractors).[3] Using these inputs remains rather limited among small-scale farmers in the rest of the countries in Eastern and Central Africa. Although irrigation and mechanization of agriculture are known to be important factors in increasing productivity per worker, these are not used by most farmers in Eastern and Central Africa. Most farm activities are labour-intensive; the hand hoe is the main tool used in crop production (Bishop-Sambrook 2003). In Central Africa for example, an estimated 80% of cultivated land is worked manually and in Eastern and Southern Africa the figure stands at about 50% (FAO and UNIDO 2009). Non-mechanized cultivation is tedious and requires more time per unit of land resulting in very low returns to labour. Mechanization that involves animal or motor power offers several benefits in crop production including timeliness and efficiency in performing farm operations, reduced labour hours and increased productivity of labour. Mechanized agriculture provides farmers with more time to do other things. These include off-farm income-generating activities leading to increased income; leisure and recreational activities; and community development and education that can ultimately lead to an increase in agricultural productivity per farmer.

2.3 Land productivity

Land productivity can be measured as the ratio of total output harvested per area or value added per unit of agricultural land. This section presents status and trends of land productivity making reference to these measures.

2.3.1 Value added per unit of agricultural land

A comparison of data for the early 1990s (i.e. average 1990–1995) with the most recently available data (average for 2003–2008) shows that land productivity has increased in most countries discussed in this report, but in many cases only marginally (Table 5). Average levels for 2003–2009 indicate that land productivity increased on average by 2.3% per year; the sub-Saharan Africa average was similar at 2.4% (see Benin et al. 2010). Annual land productivity growth has been less than the average for sub-Saharan Africa in most countries presented in Table 5. Countries within this category are Burundi (at 2.1%), Comoros (at 1.5%), DRC (at 0.2%), Libya (at 1.5%), Mauritius (at less than 0.1%), Rwanda (at 2.0%) and Zambia (at 2.3%). Seychelles, Somalia, Sudan, Uganda and Zimbabwe experienced a decline in land productivity. Growth rates in land productivity above the average rate for sub-Saharan Africa were registered in Malawi (6.9%), Djibouti (6.3%), Eritrea (8.4%), Tanzania (4.6 %), Kenya (3.3%), Egypt (3.1%), Madagascar (2.9%) and Ethiopia (2.8%).

2.3.2 Status and trends in the productivity of selected crops

This section presents an analysis of the status and trends of the productivity (outputs per unit of land) of some of the key food staples in the region. These staples are maize, dry beans, rice and wheat.

3 World Bank (2011) page http://data.worldbank.org/indicator/AG.LND.TRAC.ZS

TABLE 5: LAND PRODUCTIVITY (IN USD PER UNIT OF AGRICULTURAL LAND) IN SELECTED COUNTRIES (1990–2008)

	Annual avg. level 1990–1995	Annual avg. Change (%) 1990–1995	Annual avg. level 1995–2003	Annual avg. change (%) 1995–2003	Annual avg. level 2003–2008	Annual avg. change (%) 2003–2008
Burundi	328.6	-2.4	291.7	-0.7	310.1	2.1
Comoros	265.3	1.6	280.8	0.8	295.9	1.5
Djibouti	23.4	4.7–	22.0	1.4	26.3	6.3
DRC	152.5	1.1–	127.6	1.4–	122.5	0.2
Eritrea	17.3	18.8	0.8–	16.7	8.4 21.2	8.4
Egypt	3271.1	1.5–	3881.2	3.0	4613.4	3.1
Ethiopia	89.4	15.5	144.0	3.2	174.7	2.8
Kenya	119.4	1.1	134.7	3.0	166.4	3.3
Libya	40.7	2.8	49.1	0.8	51.5	1.5
Madagascar	50.8	0.6	48.7	2.0–	51.5	2.9
Malawi	214.2	1.7	289.0	3.6	353.1	6.9
Mauritius	1468.8	0.3	1574.2	1.7	1756.6	0.0
Rwanda	553.3	6.0–	620.9	4.5	725.6	2.0
Seychelles	1037.6	5.8	1236.0	2.3–	900.4	5.2–
Somalia	23.4	0.3	26.7	0.9	28.2	0.2–
Sudan	29.6	6.4	39.0	3.6	45.1	0.2–
Tanzania	87.0	0.1	99.5	3.0	129.3	4.6
Uganda	308.8	2.2	359.8	3.1	384.2	0.6–
Zambia	28.8	-0.9	31.2	2.9	39.8	2.3
Zimbabwe	96.7	-2.2	107.6	-0.4	84.0	-3.1

Notes: The values are international dollars normalised to the base period 1999–2001.

Source: Adapted from Benin et al. (2010).

Maize

Annual average maize productivity (1990–2010) for COMESA, EAC, ASARECA and IGAD has been generally lower than the global average. Recent statistics (average 2005–2010) indicate that maize productivity levels (t/ha) in these regional groupings are: COMESA (2), EAC (1.4), ASARECA (1.5) and IGAD (1.8) (Table 6). Regional averages of maize yields conceal wide disparities in production potential and performance at national and sub-national levels. Agro-ecological conditions and characteristics are among the key factors that influence production and productivity of maize and other crops. Besides influencing the choice of crops grown and livestock reared, agro-ecological conditions are important in determining the level of production and productivity, and the extent to which they can fluctuate (Ehui and Pender 2005; Omamo et al. 2006). Differences in maize productivity across the provinces in Kenya exemplify geographical variation of maize productivity. The national average is around 1.6 t/ha, but provincial level productivity levels range from 0.2 t/ha in the North Eastern province to 1.8 t/ha in Rift Valley Province (see Ogada et al. 2011). Other factors contributing to variations in maize productivity across different geographical areas include: differences in irrigation application; use of improved inputs (such as improved seeds and fertilizers); and variation in land management and farm management techniques.

Comparing regional level productivity values for the early 1990s (average levels 1990–1995) with recent figures (average levels 2005–2010) we observed a slight increase in maize productivity in COMESA (+13%),

TABLE 6: TRENDS IN MAIZE PRODUCTIVITY (1990–2010)

Region/ country	Annual avg. level 1990–2010 (t/ha)	Annual avg. Change 1990–2010 (%)	Annual avg. level 1990–1995 (t/ha)	Annual avg. change 1990–1995 (%)	Annual avg. level 1995–2000 (t/ha)	Annual avg. change 1995–2000 (%)	Annual avg. level 2000–2005 (t/ha)	Annual avg. change 2000–2005 (%)	Annual avg. level 2005–2010 (t/ha)	Annual avg. change 2005–2010 (%)
COMESA	**1.9**	**0.7**	**1.8**	**-0.9**	**1.8**	**2.8**	**1.8**	**-1.1**	**2.0**	**2.7**
EAC	**1.5**	**-0.5**	**1.6**	**3.9**	**1.6**	**-0.7**	**1.6**	**-7.1**	**1.4**	**0.8**
ASARECA	**1.4**	**0.6**	**1.3**	**2.2**	**1.4**	**-0.4**	**1.4**	**-2.8**	**1.5**	**0.8**
IGAD**	**1.6**	**0.8**	**1.6**	**-0.6**	**1.5**	**0.4**	**1.6**	**0.8**	**1.8**	**-0.2**
Burundi	1.2	-1.7	1.4	-1.9	1.2	-4.3	1.1	1.5	1.1	-2.4
Comoros	2.3	-0.1	2.5	0.6	2.3	0.0	2.1	-4.5	2.1	4.6
DRC	0.8	-0.3	0.8	-0.3	0.8	0.3	0.8	-0.6	0.8	0.0
Djibouti	1.7	-0.9	1.6	3.8	1.8	1.1	1.7	-2.3	1.5	-8.0
Egypt	7.2	1.7	6.0	0.9	7.1	3.9	7.7	2.0	7.9	-2.3
Eritrea	0.5	3.4	0.2	20.8	0.5	4.1	0.4	1.7	0.7	5.7
Ethiopia	1.6	3.0	0.7	-11.5	1.6	2.5	1.7	1.8	2.2	1.8
Kenya	1.6	-0.6	1.8	2.4	1.6	-3.2	1.6	3.2	1.6	-3.5
Libya	1.7	5.3	1.0	-1.8	1.7	25.0	2.1	-1.1	2.2	-2.3
Madagascar	1.1	2.5	0.9	-0.2	0.9	-1.7	1.3	16.5	1.3	-5.1
Malawi	1.4	3.5	1.1	6.0	1.5	6.4	1.2	-10.9	1.9	18.6
Mauritius	6.3	4.9	4.0	-1.3	5.5	12.9	7.4	-3.7	8.5	4.2
Rwanda	1.1	-0.2	1.3	5.6	0.9	-10.2	0.8	3.0	1.3	25.6
Sudan	0.9	7.3	0.5	2.6	0.6	2.7	0.9	7.4	1.5	8.8
Swaziland	1.4	-1.8	1.4	10.4	1.9	-4.7	1.3	-4.1	1.1	-0.6
Uganda	1.5	0.3	1.5	2.1	1.5	4.3	1.7	-3.9	1.5	-0.2
Tanzania	1.6	-0.5	1.4	5.0	1.8	2.1	1.8	-17.6	1.3	3.4
Zambia	1.8	2.5	1.6	2.3	1.6	-0.9	1.7	4.2	2.2	5.5
Zimbabwe	1.0	-4.5	1.2	-9.5	1.2	8.9	0.9	-12.8	0.6	-0.5

Notes: Blank cells indicate missing values. Regional aggregate values are calculated as weighted summations. The weights are computed using country's area harvested (ha) as a share of regional area harvested. Seychelles and Somalia are not included in the analysis due to lack of data.
** IGAD values exclude Somalia because of data limitations.
Sudan includes South Sudan because the data for the two countries are not disaggregated.

Source: Authors' calculations based on FAO (2011).

ASARECA (+9%) and IGAD (+14%). EAC registered a decline of about 11% during the same period. Countries that registered declines in maize productivity within the 2 periods were Zimbabwe (51%), Burundi (22%), Swaziland (21%), Comoros (13%), Djibouti (11%), Kenya (11%) and Tanzania (11%).

The annual average growth rate in maize yields has been fluctuating highly at both sub-regional and country levels (Table 6). The COMESA average growth in maize yield (1990–2010) has been about 0.7% per year. The region experienced a relatively higher growth rate of about 2.8% per year in the late 1990s (1995–2000) and negative growth at the beginning of the millennium. Recently the EAC region has experienced negative growth in most periods indicated in Table 6 (except for 1990–1995 and 2005–2010).

There are several factors could explain the poor performance in maize productivity in Eastern, Southern and Central Africa. High input use was a core factor of the technological trinity—seed, water and fertilizer—responsible for bringing about the Green Revolution in Asia (CIRAD 2005; Fan 2010), but within Eastern, Southern and Central Africa these lessons are yet to be borrowed fully. Use of yield enhancing inputs in agriculture remains minimal in many countries in this region. Despite the recently observed trends of rainfall unreliability and prolonged dry spells, most smallholders farmers in Eastern and Southern Africa continue to practise rainfed agriculture (see Rockström and Falkenmark 2000; Mati 2007). Egypt, Mauritius, Libya, Madagascar, Sudan and Swaziland are performing relatively well in the irrigation indicator (irrigated land as a percentage of the total agricultural land) compared to the other countries discussed in this report (see Appendix 8). This could explain their relatively higher productivity values compared

to other countries in the region. In the rest of the countries only a small proportion of the available irrigation potential has been tapped leaving considerable room to improve the use of irrigation potential (Mati 2007; Droogers et al. 2011).

Dry beans

Dry beans have historically been used as an important food staple in Eastern, Central and Southern Africa. Productivity of this crop is rather low in the regional groupings discussed in this report. Annual average productivity of dry beans (1990–2010) for COMESA, EAC, ASARECA and IGAD sub-regions has been approximately O.5 t/ha (Table 7). Annual average levels (2005–2010) for productivity of dry beans in these regional groupings were: COMESA (0.6 t/ha), EAC (0.7 t/ha), ASARECA (0.7 t/ha) and IGAD (0.6 t/ha). Such figures are far below what is achieved in other parts of the world such as Asia, North America and Europe. Based on recent statistics (averages for 2005–2010) Egypt, Libya and Sudan are the only countries in the region with dry bean yields above 2 t/ha.

Analysis of long-term trends for beans productivity reveal declining trends in all regional groupings presented in Table 7. This is depicted by the negative annual average growth rates in dry beans productivity for the period between 1990 and 2010. A comparison of recent statistics (average levels 2005–2010) for dry bean productivity with values for the early 1990s (average levels 1990–1995) shows a decline in the yields of the commodity: COMESA (-11%), EAC (-12%), ASARECA (-7%) and IGAD (-19%).

TABLE 7: TRENDS IN DRY BEANS PRODUCTIVITY (1990–2010)

Country/ region	Annual avg. level 1990–2010 (t/ha)	Annual avg. change 1990–2010 (%)	Annual avg. level 1990–1995 (t/ha)	Annual avg. change 1990–1995 (%)	Annual avg. level 1995–2000 (t/ha)	Annual avg. change 1995–2000 (%)	Annual avg. level 2000–2005 (t/ha)	Annual avg. change 2000–2005 (%)	Annual avg. level 2005–2010 (t/ha)	Annual avg. change 2005–2010 (%)
COMESA	**0.7**	**-0.7**	**0.7**	**-5.4**	**0.6**	**0.0**	**0.6**	**-1.9**	**0.6**	**3.7**
EAC	**0.7**	**-0.7**	**0.7**	**-4.9**	**0.6**	**0.4**	**0.6**	**-0.8**	**0.7**	**1.9**
ASARECA	**0.7**	**-0.4**	**0.7**	**-4.8**	**0.6**	**0.4**	**0.6**	**-0.7**	**0.7**	**2.4**
****IGAD**	**0.6**	**-0.9**	**0.7**	**-7.8**	**0.5**	**3.2**	**0.5**	**-2.6**	**0.6**	**3.1**
Burundi	1.0	-1.1	1.1	-4.4	1.0	-3.4	0.9	-0.2	1.0	3.5
Comoros	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DRC	0.6	-0.2	0.6	-0.7	0.5	-0.4	0.5	0.0	0.5	0.0
Djibouti	0.3	2.0	0.2	-9.5	0.2	12.8	0.3	-0.3	0.3	3.1
Egypt	2.7	1.3	2.3	-1.6	2.6	4.8	2.8	0.3	2.9	-1.4
Eritrea	0.3	0.0	0.4	3.8	0.6	-5.4	0.3	-33.6	0.1	0.00
Ethiopia	0.6	0.0	0.2	-18.9	0.8	4.9	0.6	1.9	1.0	9.5
Kenya	0.5	-1.5	0.7	-10.4	0.4	1.4	0.4	-3.0	0.5	4.8
Libya	2.9	0.0	3.0	-0.4	3.0	0.1	2.7	3.0	3.1	0.0
Madagascar	0.9	0.4	0.9	1.1	0.9	-0.7	0.9	1.9	1.0	-1.8
Malawi	0.5	-0.5	0.6	-0.3	0.5	-8.0	0.4	-3.9	0.5	11.7
Rwanda	0.7	1.1	0.7	-1.7	0.7	-1.8	0.7	-1.3	0.9	8.6
Sudan	1.9	2.4	1.6	4.9	1.8	4.5	2.2	0.8	2.2	-0.6
Swaziland	0.5	-3.5	0.5	24.3	0.8	-14.0	0.3	-0.2	0.3	0.0
Uganda	0.6	-1.7	0.7	-3.9	0.5	4.4	0.6	-2.5	0.5	-2.4
Tanzania	0.7	0.9	0.6	1.4	0.7	0.8	0.7	2.0	0.8	-0.3
Zimbabwe	0.7	-2.1	0.7	0.2	0.7	2.0	0.8	-6.9	0.5	-1.4

Notes: Blank cells indicate missing values. Regional aggregate values are calculated as weighted summations. The country's area harvest (ha) as a share of the regional total area is used as a weight. Comoros, Mauritius, Seychelles and Zambia are not included because of data unavailability.
** IGAD values exclude Somalia because of data limitations.
Sudan includes South Sudan because the data for the two countries are not disaggregated.

SOURCE: AUTHORS' CALCULATIONS BASED ON FAO (2011).

Rice

Annual average productivity (for 1990–2010) for rice for the regional groupings discussed in this report has been: COMESA (3.7 t/ha), EAC (1.8 t/ha), ASARECA (1.8 t/ha) and IGAD (1.9 t/ha). Comparing productivity values for the early 1990s (average levels 1990–1995) with the figures for 2005–2010 we observed a slight increase in rice productivity in COMESA (up by 39%), EAC (up by 8%) and ASARECA (up by 38%). IGAD registered a decline of about 14% during the same period (see Table 8). Considerable increases in rice productivity were observed in Sudan (270%), Ethiopia (120%), Rwanda (101%), Madagascar (51%), Zambia (52%) and Egypt (27%). These countries influenced the regional trends in COMESA, ASARECA and EAC. Rice productivity declined in Zimbabwe, Swaziland, Kenya and Comoros. The rise in the productivity of rice in these countries might be explained by the factors discussed in the next paragraph.

Increase in demand for rice is one of the factors driving more investments towards enhancing production and productivity of the crop. As a response to the increasing demand for rice, governments and development partners supporting agriculture have been implementing various measures to stimulate growth in rice productivity. Examples of the measures include: promoting supportive policy interventions to stimulate rice production; promoting use of improved

TABLE 8: TRENDS IN RICE PRODUCTIVITY (1990–2010)

Country/ region	Annual avg. level 1990–2010 (t/ha)	Annual avg. change 1990–2010 (%)	Annual avg. level 1990–1995 (t/ha)	Annual avg. change 1990–1995 (%)	Annual avg. level 1995–2000 (t/ha)	Annual avg. change 1995–2000 (%)	Annual avg. level 2000–2005 (t/ha)	Annual avg. change (2000–2005) (%)	Annual avg. level 2005–2010 (t/ha)	Annual avg. change 2005–2010 (%)
COMESA	**3.6**	**2.2**	**3.0**	**3.0**	**3.5**	**1.6**	**3.8**	**2.7**	**4.2**	**-0.5**
EAC	**1.8**	**0.6**	**1.7**	**-1.5**	**1.7**	**3.8**	**1.9**	**-2.6**	**1.9**	**-2.6**
ASARECA	**1.9**	**2.0**	**1.7**	**-0.6**	**1.7**	**0.5**	**1.9**	**2.9**	**2.3**	**3.2**
IGAD	**2.2**	**-1.0**	**2.3**	**1.1**	**2.3**	**-1.0**	**2.2**	**2.5**	**2.0**	**-1.3**
Burundi	3.2	0.6	3.2	-1.5	3.0	2.9	3.2	1.8	3.4	1.3
Comoros	1.1	-0.4	1.2	0.5	1.1	-1.2	1.1	1.5	1.1	-5.0
Congo DR	0.8	0.0	0.8	-2.2	0.8	0.4	0.8	0.0	0.8	0.0
Egypt	8.9	1.6	7.7	2.2	8.6	2.3	9.6	2.0	9.8	-1.3
Ethiopia	1.6		0.9		1.9	-1.6	1.8	-0.2	1.9	0.9
Kenya	3.6	-2.4	3.8	5.2	4.1	-0.3	3.7	1.6	2.8	-5.2
Madagascar	2.4	2.5	2.1	0.4	2.1	-1.0	2.3	5.3	3.1	5.9
Malawi	1.7	0.7	1.6	-0.6	1.7	2.0	1.5	-12.7	1.8	18.3
Mauritius	5.4		5.4	2.	3.	4.	5.	6.	7.	8.
Rwanda	3.4	5.2	2.5	16.3	2.7	-10.0	3.5	9.6	5.1	7.2
Sudan	2.1	9.8	1.0	-11.2	0.9	14.9	2.5	23.2	3.7	1.3
Swaziland	4.5	-5.8	7.1	-15.4	4.7	-5.8	2.7	-3.6	3.0	0.3
Uganda	1.4	0.3	1.4	0.5	1.4	1.2	1.5	-1.3	1.4	1.4
Tanzania	1.7	0.7	1.7	-1.6	1.6	4.4	1.8	-3.5	1.8	-3.8
Zambia	1.2	3.2	1.0	3.5	1.1	-5.5	1.3	2.9	1.5	11.0
Zimbabwe	2.1	-1.5	2.3	-2.0	1.9	2.1	2.3	-1.6	1.8	-11.4

Notes: Libya, Seychelles, Djibouti and Eritrea are not included due to data unavailability. Regional aggregate values are calculated as weighted summations. The weights are computed using country's area harvested (ha) as a share of regional area harvested.
Blank cells indicate missing values.
** IGAD values exclude Somalia because of data limitations.
Sudan includes South Sudan because the data for the two countries are not disaggregated.

Source: Authors' calculations based on FAO (2011).

rice varieties; supporting irrigation among others. In Rwanda, for example, owing to support from the Ministry of Agriculture and Animal Resources, area under rice cultivation in Rwanda has increased considerably and rice productivity has been increasing (IFAD 2009). The government is collaborating with other agriculture stakeholders to promote the System of Rice Intensification (SRI). Furthermore, significant progress is being made to enhance irrigation and rehabilitation of marshland for rice production. Replication of SRI in the marshlands by the Rural Sector Support Project (RSSP) is ongoing in other parts of the country. These clearly evident efforts by multiple actors to support the rice sector may explain the observed increase in national level rice yields in Rwanda. Table 8 shows that rice yields rose from an average of 2.5 t/ha (in 1990–1995) to 5.1 t/ha (in 2005–2010). Higher yields have been recorded in selected sites in Rwanda. For instance in Kibaza area, rice yields increased from 4 t/ha to at least 6 t/ha and in Rwabutazi, yields rose from 4 t/ha to at least 7 t/ha in 2008 (see IFAD, 2009).

Wheat

Although some fluctuations in wheat productivity were observed across all regional groups, a general stagnation was observed in the growth of wheat yields in COMESA, EAC, ASARECA and IGAD. The average annual growth rates for the period 1990–2010 in these regional groupings have been only 0.2%, 1.2%, 1.1% and 1.0% respectively (Table 9). As a result of this slow growth, changes in productivity compared to the 1990s have only been minimal.

TABLE 9: TRENDS IN WHEAT PRODUCTIVITY (1990–2010)

Country region/	Annual avg. level 1990–2010 (t/ha)	Annual avg. change 1990–2010 (%)	Annual avg. level 1990–1995 (t/ha)	Annual avg. change 1990–1995 (%)	Annual avg. level 1995–2000 (t/ha)	Annual avg. change 1995–2000 (%)	Annual avg. level 2000–2005 (t/ha)	Annual avg. change 2000–2005 (%)	Annual avg. level 2005–(2010 (t/ha)	Annual avg. change 2005–2010 (%)
COMESA	**3.4**	**0.2**	**3.3**	**-5.4**	**3.2**	**2.0**	**3.4**	**0.1**	**3.5**	**-1.2**
EAC	**1.8**	**1.2**	**1.7**	**1.8**	**1.5**	**-7.8**	**1.9**	**11.2**	**1.9**	**-0.4**
ASARECA	**1.6**	**1.1**	**1.6**	**-4.3**	**1.4**	**-3.5**	**1.5**	**5.1**	**1.9**	**1.6**
IGAD	**1.6**	**1.1**	**1.6**	**-4.3**	**1.4**	**-3.2**	**1.5**	**4.5**	**1.9**	**1.6**
Burundi	0.8	0.6	0.8	1.5	0.8	-2.8	0.8	2.7	0.8	-0.8
DRC	1.3	0.8	1.2	8.0	1.3	-0.1	1.3	-0.2	1.3	0.0
Egypt	5.9	1.3	5.2	1.0	5.9	3.5	6.5	0.6	6.3	-2.2
Ethiopia	1.5		1.3		1.2	-2.2	1.4	4.4	1.8	4.1
Kenya	2.1	2.2	1.9	4.1	1.8	-5.5	2.2	8.4	2.5	1.8
Madagascar	2.4	0.7	2.2	-0.7	2.3	4.0	2.5	5.9	2.5	-1.1
Malawi	0.9	6.0	0.6	-8.4	0.7	2.0	0.8	0.6	1.5	7.4
Rwanda	1.0	0.0	1.2	-2.0	0.9	-11.2	0.8	6.1	1.2	15.9
Somali	0.3	0.6	0.3	-4.9	0.3	11.9	0.3	-2.0	0.4	-3.1
Sudan	2.0	2.1	1.6	-2.0	1.9	2.5	2.3	0.2	2.4	-12.2
Swaziland	1.5	-2.3	1.9	-15.7	1.5	-0.1	1.2	-4.2	1.4	4.3
Uganda	1.8	-0.5	1.8	-1.4	1.8	-0.5	1.7	-1.0	1.7	-0.2
Tanzania	1.8	2.9	1.5	-8.2	1.2	-15.0	2.0	32.0	2.3	2.6
Zambia	5.9	2.1	4.7	3.7	6.0	5.1	6.3	-0.7	6.6	1.9
Zimbabwe	4.6	-3.9	5.5	-2.3	5.4	1.0	4.3	-10.6	3.2	-4.5

Notes: Blank cells indicate missing values. Regional aggregate values are calculated as weighted summations. The weights are computed using country's area harvested (ha) as a share of regional area harvested. Djibouti, Libya, Comoros, Seychelles, Mauritius and Eritrea are missing due to data unavailability. Sudan includes South Sudan because the data for the two countries are not disaggregated.

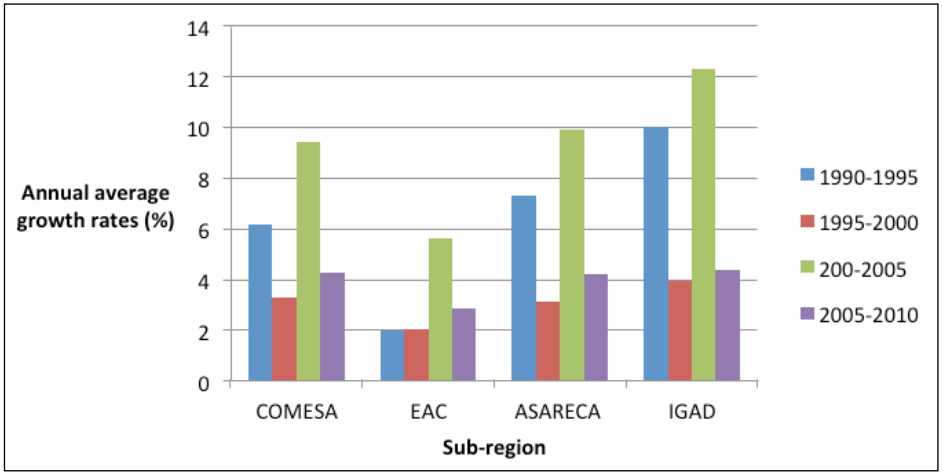
Source: Authors' calculations based on FAO (2011).

At country level, Table 9 indicates that wheat yields are generally low in many countries where wheat productivity data is available. The annual average wheat yields for 2005–2010 were less than 2 t/ha in Burundi, Rwanda, DRC, Ethiopia, Malawi, Swaziland and Uganda (see Table 9). The COMESA level average is high because of the influence from a few countries whose productivity levels stand at 2 t/ha or higher. The productivity level of these countries (annual average for 2005–2010) is as follows: Zambia (6.6 t/ha), Egypt (6.3 t/ha), Madagascar (2.5 t/ha), Zimbabwe (3.2 t/ha), Kenya (2.5 t/ha) and Sudan (2.4 t/ha). Zimbabwe's wheat productivity was the highest in developing countries in the early 1990s (Tanner, Payner and Abdalah, 1996), but this has since changed in recent years. The average annual yields for wheat in Zimbabwe for 2005–2010 were 43% lower than those of 1990–1995.The political and economic difficulties facing the country are in part responsible for this deterioration.

2.3.3 Status and trends in the production and productivity of livestock and livestock products

Livestock production is a key economic activity for Eastern and Central Africa, especially in Kenya, Ethiopia, Sudan, Egypt, Tanzania, Uganda and Zimbabwe. The sector is crucial in the arid and semi-arid zones where livestock and agropastoral farming are common. Although some fluctuating trends are observed, overall, positive trends are recorded in beef production across the regional groupings examined. Annual average growth rates (1990–2010) in beef production in COMESA, EAC, ASARECA and IGAD were 6%, 3.2%, 6% and 8% respectively (see Figure 1). The highest growth rates in beef production were recorded in the period 2000–2005. Slower growth rates were reported in the subsequent period (i.e. 2005–2010). At country level positive trends in beef production (based on annual average growth rate, 1990–2010) are observed in all countries discussed here except Seychelles, Libya, DRC and Madagascar (Appendix 3).

Figure 1: Growth rates in beef production in COMESA, EAC, ASARECA and IGAD.



Source: Authors' calculations based on FAO (2011).

Beef productivity (carcass weight in kg/animal)

Annual average beef productivity for 2005–2010 was 153 kg/animal in COMESA, 127 kg/animal in EAC, 131 kg/animal in ASARECA and 146 kg/animal in IGAD. These figures are lower than the global average of 206 kg/animal (FAO, 2011), showing that there is still room to improve cattle productivity. The good news is that beef yields have been increasing, albeit at a slow pace (Table 10). The annual average increase in cattle meat productivity (annual average change 1990–2010) were 0.9% in COMESA, 1.3% in EAC, 0.6% in ASARECA and 1.1%in IGAD. A comparison of carcass weight for 1990–1995 with that of 2005–2010 shows that beef productivity in these regional groups increased by 15%, 21%, 9% and 18% respectively.

TABLE 10: TRENDS IN BEEF YIELDS, KG/ANIMAL

Region country/	Annual avg. level 1990–2010 (kg/animal)	Annual avg. change 1990–2010 (%)	Annual avg. level 1990–1995 (kg/animal)	Annual avg. change 1990–1995 (%)	Annual avg. level 1995–2000 (kg/animal)	Annual avg. change 1995–2000 (%)	Annual avg. level 2000–2005 (kg/animal)	Annual avg. change 2000–2005 (%)	Annual avg. level 2010–2005 (kg/animal)	Annual avg. change 2005–2010 (%)
COMESA	**140**	**0.9**	**133**	**-2.4**	**130**	**0.9**	**142**	**2.0**	**153**	**1.3**
EAC	**113**	**1.3**	**105**	**-1.6**	**103**	**0.8**	**114**	**2.8**	**127**	**1.5**
ASARECA	**125**	**0.6**	**121**	**0.2**	**120**	**0.6**	**130**	**0.2**	**131**	**0.1**
IGAD	**129**	**1.1**	**124**	**-3.2**	**115**	**0.7**	**130**	**2.9**	**146**	**1.9**
Burundi	128	-0.1	130	0.0	129	-0.6	127	-0.1	127	0.4
Comoros	110	0.0	110	0.0	110	0.0	110	0.0	110	0.0
DRC	156	-0.1	157	0.0	157	-0.3	156	0.0	156	0.0
Djibouti	110	0.0	110	0.0	110	0.0	110	0.0	110	0.0
Egypt	173	2.3	138	1.6	169	2.6	182	3.4	202	-0.5
Eritrea	90	-0.8	54	2.5	108	0.1	109	0.0	98	-3.4
Ethiopia	93	-0.1	54	-1.1	109	-0.2	108	0.0	108	-0.6
Kenya	138	1.2	129	0.1	125	1.4	150	-0.2	150	0.1
Libya	184	-0.4	196	-2.2	171	1.5	183	-0.1	180	0.0
Madagascar	127	0.0	128	0.0	128	0.0	127	0.0	128	0.0
Malawi	203	0.2	200	-0.2	203	0.4	205	0.0	205	0.0
Mauritius	210	1.9	183	8.7	210	1.4	218	3.9	238	1.3
Rwanda	104	0.0	104	0.0	104	0.0	104	0.0	104	0.0
Somalia	110	0.1	110	0.0	110	0.0	110	0.0	112	-0.3
Sudan	133	2.2	119	-6.4	108	2.0	135	7.0	165	3.1
Swaziland	227	-0.1	215	0.1	250	-0.2	223	-1.9	221	-0.1
Uganda	150	0.0	150	0.0	150	0.0	150	0.0	150	0.0
Tanzania	107	0.1	106	0.7	108	0.4	108	-0.1	108	0.0
Zambia	158	0.2	156	-0.8	155	0.7	160	0.0	160	0.0
Zimbabwe	212	1.0	192	-0.9	208	3.1	225	0.0	225	0.0

Notes: Seychelles is missing due to data unavailability.
Sudan includes South Sudan because the data for the two countries are not disaggregated.
Regional aggregate values are calculated as weighted summations.
The weights are computed using total population of cattle.

Source: Authors' computations based on data from FAO, 2012

Wide variations in cattle beef productivity exist across countries. The average carcass weight (2005–2010) ranged from a low of 98 kg/animal in Eritrea to a high of 238 kg/animal in Mauritius. The mean carcass weight in the period 2005–2010 for the countries included in Table 10 was about 153 kg/animal. Countries that exceeded this mean weight included Mauritius (238 kg/animal), Zimbabwe (225 kg/animal), Swaziland (221 kg/animal), Malawi (205 kg/animal), Egypt (202 kg/animal), Libya (180 kg/animal), Zambia (160 kg/animal), Sudan (164 kg/animal) and DRC (156 kg/animal).

Milk productivity

Average annual milk productivity (average 2005–2010) for COMESA, EAC, ASARECA and IGAD stood at 426 kg/animal, 391 kg/animal,346 kg/animal and 423 kg/animal respectively. COMESA milk productivity levels are influenced by Egypt, Libya, Mauritius, Rwanda, Seychelles, DRC, Comoros and Kenya. Average milk productivity levels in these countries are above the COMESA mean productivity level. Kenya and Rwanda are the key drivers of EAC milk productivity levels. Kenya, Rwanda and DRC are the best performers in milk productivity in the ASARECA region.

The long-term average (1990–2010) shows that milk productivity is generally declining in COMESA, ASARECA and IGAD. The average rate of decline in these sub-regions has been -0.1%, -0.2% and -0.8% respectively. During the same period the EAC region

recorded an annual growth rate of about 1% (Table 11). The relatively better situation in EAC can in part be attributed to improvements in the dairy sector in Kenya. Promotion of productivity-enhancing technologies is one of the areas through which these improvements have occurred.

Average annual growth rates in milk productivity have been fluctuating over time (Table 11). In the period 1990–1995 most sub-regions performed poorly and experienced declines in milk productivity. Declining rates were also experienced in the subsequent period (2000–2005) in all regions including EAC that had a positive annual average growth in milk productivity in the earlier period. Good progress was achieved in the most recent period (2005–2010) where all sub-regions attained positive growth rates in milk productivity gains.

TABLE 11: MILK PRODUCTIVITY, KG/ANIMAL (1990–2010)

Region country/	Annual avg. level 1990–2010	Annual avg. change 1990–2010	Annual avg. level 1990–1995	Annual avg. change 1990–1995	Annual avg. level 1995–2000	Annual avg. change 1995–2000	Annual avg. level 2000–2005	Annual avg. change 2000–2005	Annual avg. level 2005–2010	Annual avg. change 2005–2010
COMESA	**432**	**-0.1**	**439**	**-3.2**	**422**	**0.3**	**431**	**-1.6**	**426**	**2.6**
EAC	**370**	**0.9**	**348**	**-1.2**	**348**	**2.2**	**384**	**-1.9**	**391**	**2.2**
ASARECA	**355**	**-0.2**	**362**	**-3.1**	**348**	**0.5**	**358**	**-1.8**	**346**	**1.9**
IGAD	**430**	**-0.8**	**465**	**-5.3**	**415**	**-0.4**	**423**	**-1.5**	**407**	**2.2**
Burundi	352	0.1	350	0.0	350	0.0	351	0.1	356	0.3
Comoros	500	0.0	500	0.0	500	0.0	500	0.0	500	0.0
DRC	795	-0.6	852	-0.1	804	-3.8	704	-0.6	786	3.6
Djibouti	350	0.0	350	0.0	350	0.0	350	0.0	350	0.0
Egypt	1229	3.8	904	2.4	1101	3.6	1276	3.3	1594	6.8
Eritrea	148		97	1.7	194	0.0	163	-6.8	156	3.5
Ethiopia	181		95	3.2	212	-1.2	209	1.0	224	3.1
Kenya	510	1.2	465	-1.4	461	2.6	547	-2.9	540	2.7
Libya	1157	-0.6	1193	0.1	1193	-0.1	1174	-1.0	1075	-0.9
Madagascar	289	0.9	274	0.1	279	0.4	287	0.2	317	3.4
Malawi	463	0.4	456	-0.2	453	0.1	460	-1.3	481	4.8
Mauritius	1441	-3.0	1805	-1.2	1638	-6.8	1075	1.3	1232	-2.4
Rwanda	531	0.1	539	-2.6	497	-2.0	502	-1.1	560	2.1
Seychelles	589	0.5	555	1.9	587	2.4	618	-4.1	589	4.0
Somalia	396	-0.1	406	1.3	381	-1.7	406	-2.2	388	3.0
Sudan	427	-1.8	480	0.0	457	-2.2	414	-3.4	357	1.2
Swaziland	290	0.1	286	2.8	293	0.8	288	-0.3	289	0.2
Uganda	350	0.0	350	0.0	350	0.0	350	0.0	350	0.0
Tanzania	203	2.0	174	1.3	189	3.2	220	2.2	234	0.2
Zambia	300	0.0	300	0.0	300	0.0	300	0.0	300	0.0
Zimbabwe	435	0.4	429	2.1	430	-0.1	430	0.0	448	3.2

Notes: Sudan includes South Sudan because the data for the two countries were not disaggregated.

Source: Authors' computations based on data from FAO, 2012.

3. Key Observations on Productivity Trends inn Eastern and Central Africa

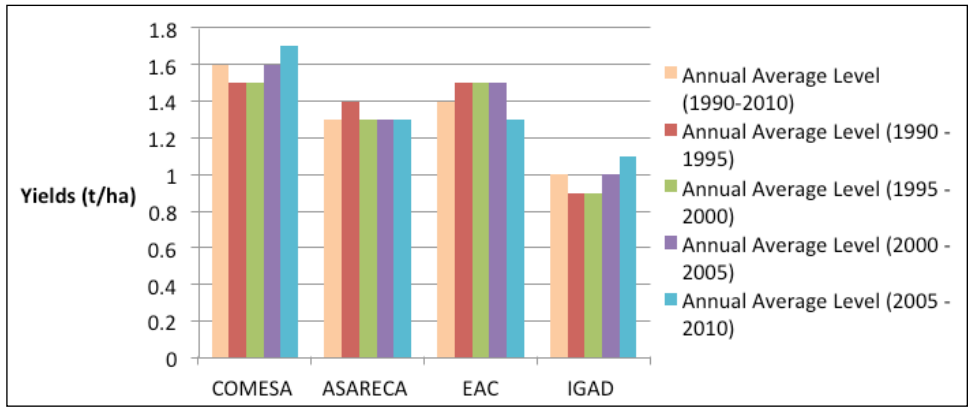
Introduction

This chapter presents a synthesis of information on the key points emerging from the analysis of trends of agricultural productivity in the Eastern and Central Africa region with a focus on COMESA, EAC and ASARECA regions. The chapter is informed by the analysis done in the previous chapters and by literature (see, for example, Owuor 1999; Appleton 2000; Feleke et al. 2003; Nabbumba and Bahiigwa 2003; Odhiambo et al. 2004; Ehui and Pender 2005; Randrianarisoa and Minten 2005; Omamo et al. 2006; Ouma et al. 2007; Audibert 2008).

I. CEREAL PRODUCTIVITY HAS ONLY BEEN RISING AT MODERATE RATES SINCE THE 1990S; THE LEVELS ARE FAR BELOW WHAT IS FOUND IN OTHER PARTS OF THE WORLD. DECLINING TRENDS IN THE PRODUCTIVITY OF SOME CROPS HAS ALSO BEEN OBSERVED

Cereal yields in COMESA, EAC, ASARECA and IGAD have fluctuated below 2 t/ha since the 1990s (see Figure 3 and Appendix 2). Country reports and data provide further evidence of declining or stagnating productivity, not just for cereals, but also for other crops. For example, UBOS (2010) indicates that between 2004 and 2009 Uganda experienced a decline in the yields of beans, cassava, plantain bananas, Irish potatoes and maize. Bekunda (1999) indicates that banana production in Uganda has been declining since the 1990s. Similarly, statistics from the Kenya Ministry of Agriculture indicate that maize yields are declining in Kenya.

FIGURE 2: CEREAL YIELDS (T/HA) IN COMESA, ASARECA AND EAC (1990–2010).



Notes: Cereals include wheat, rice, maize, barley, oats, rye, millet, sorghum, buckwheat and mixed grains Production data on cereals relate to crops harvested for dry grain only. Cereal crops harvested for hay or harvested green for food, feed or silage and those used for grazing are excluded.

Source: Authors' calculations based on World Bank (2011).

II. PRODUCTIVITY OF DRY BEANS IS VERY LOW, RECENT PRODUCTIVITY LEVELS ARE LOWER THAN THOSE OF THE1990S

Despite the importance of dry beans for food security in all sub-regions discussed in this report, productivity remains rather low compared to the potential. Average yields for dry beans are only slightly more than 0.5 t/ha recorded in COMESA, EAC, ASARECA and IGAD. Such levels are about four times lower than what has been achieved in other countries such as Egypt and Libya. This is an indication of the yield gaps for this crop. In addition to the challenges of low productivity levels, a general declining trend has been observed in several countries resulting in an overall decline at sub-regional level. Between 1990 and 2010 all sub-regions discussed here recorded negative average annual growth in beans productivity. Recently (2005–2010), all sub-regions recorded some improvements in the growth rate of beans productivity (Table 7). Efforts to sustain the recorded positive gains are necessary because the crop is the main source of protein for the poor, since access to animal protein is constrained by soaring food prices.

III. EXPANSION OF CROP LAND IS THE MAJOR DRIVER OF INCREASED PRODUCTION

Generally, crop production is growing faster than crop productivity. Annual average growth rate for production of maize in COMESA has been 2.4% while the productivity growth remained almost stagnant—increasing at 0.5% annually. Similar trends are recorded for the other key staples (see Table 12). Appendix 2 provides country specific examples on the trends of expansion of area under crop production in selected countries. Although area expansion might be feasible where land is available, this option is not sustainable in the long run. Currently, land scarcity prevents expansion of area under cultivation in areas with high population density (especially the high potential areas of Kenya, Rwanda, Burundi, Malawi and Tanzania). Farm size per household has been declining over time among the rural communities living in the high potential areas of these countries. In such situations, farmers are compelled to shift from extensive to semi-intensive or intensive crop and livestock production strategies. Increase in yields remains the only option for sustainably increasing food production so as to ensure adequate food supply, especially among the households that rely heavily on subsistence agriculture. Unfortunately, farmers with smaller farms face more challenges in increasing productivity than those with larger farms (see Byiringiroa and Reardon 1996). Productivity-enhancing interventions also need to target such farmers.

Table 12 shows that in a few cases productivity growth is relatively faster than growth of production. We discuss here some of the factors that could contribute towards such trends so as to highlight lessons on strategies to enhance productivity.

TABLE 12: ANNUAL AVERAGE CHANGE (%) IN PRODUCTION AND YIELD (1990–2010)

Production					**Yield**			
Countries/sub-regions	Beans	Maize	Rice	Wheat	Beans	Maize	Rice	Wheat
COMESA	**3.8**	**2.4**	**2.9**	**3.2**	**-0.7**	**0.7**	**2.2**	**0.2**
EAC	**3.8**	**2.3**	**4.7**	**1.0**	**-0.7**	**-0.5**	**0.6**	**1.2**
ASARECA	**3.8**	**2.9**	**-4.0**	**16.8**	**-0.4**	**0.6**	**2.0**	**1.1**
Burundi	-2.7	-1.8	4.4	-0.3	-1.1	-1.7	0.6	0.6
Comoros		2.2	1.2			-0.1	-0.4	
DRC	-2.1	0.5	-1.5	0.0	-0.2	-0.3	0.0	0.8
Djibouti	-1.1	0.5			2.0	-0.9		
Egypt	8.4	2.2	2.8	3.4	1.3	1.7	1.6	1.3
Eritrea		2.3		3.9		3.4		4.0
Ethiopia	12.1	5.2	3.6	8.1		3.0	0.3	2.6
Kenya	0.6	1.0	0.4	1.7	-1.5	-0.6	-2.4	2.2
Libya	3.1	14.5		-1.1	0.0	5.3		-1.9
Madagascar	1.0	6.7	3.2	3.4	0.4	2.5	2.5	0.7
Malawi	2.8	4.8	5.2	6.6	-0.5	3.5	0.7	6.0
Rwanda	5.1	4.8	14.9	11.6	1.1	-0.2	5.2	0.0
Sudan	8.1	1.5	22.3	-0.2	2.3	7.3	9.8	2.1
Swaziland	-8.1	-4.9	-15.8	-1.9	-6.2	-1.8	-5.8	-2.3
Uganda	1.5	4.2	6.6	6.3	-1.7	0.3	0.3	-0.5
Tanzania	9.0	3.1	4.9	0.6	0.9	-0.5	0.7	2.9
Zambia		3.1	6.1	5.8		2.5	3.2	2.1
Zimbabwe	-2.6	-3.0	0.6	-5.7	-2.1	-4.5	-1.5	-3.9

Sudan includes South Sudan because the data are not disaggregated for the two countries.

Source: Authors' computations based on data from FAO (2011).

Faster growth in the productivity of wheat in Burundi could be explained by the fact that the country is very suitable for wheat production (see Shiferaw et al. 2012). The country's biophysical conditions (such as soil conditions, including fertility and climatic conditions) are suitable for wheat production (COMPETE 2010). In addition, Burundi has long experience in wheat production dating back to the colonial period. Many investments in the development and adoption of improved varieties (that are resistant to diseases) have been instituted. Some of the investments include the work by the Agronomic Sciences Institute of Burundi (ISABU) and the International Maize and Wheat Improvement Center (CIMMYT) in developing and promoting germplasm resistant to diseases and suitable for different parts of the country (Shiferaw et al. 2012).

Growth in wheat productivity in Tanzania is accelerated by adoption of improved wheat technologies by farmers. This practice is especially notable in the southern highlands of Tanzania including Rukwa, Mbeya, Iringa and Njombe regions. Various stakeholders (including CIMMYT, national agricultural research systems, government and development agencies) promote wheat technologies (including improved varieties and wheat management techniques)(see Doss et al, 2003; MAFC 2011). Improved varieties are complemented by use of fertilisers, mechanization and farmer education leading to higher productivity. In addition, productivity increase in wheat in Tanzania has been associated with use of improved soil and water conservation techniques, in particular conservation agriculture (CA). Adoption of the three CA principles of minimum soil disturbance, permanent organic matter soil cover and diversified crop rotations in wheat production (in Babati, Karatu and Hanang' districts in northern Tanzania) has protected and enhanced ecosystem services (Owenya et al. 2012), contributing to increased wheat productivity.

The observed increase in rice productivity in the ASARECA region is driven by improvements in rice productivity is the member states such as Sudan, Ethiopia, Rwanda and Madagascar. Various factors have interacted to lead to these gains, examples include:

Promotion of irrigation and water management

Examples include promotion of irrigation under the Agricultural Sector Development Programme (ASDP) in Tanzania, investment in developing marshlands (mostly applied in Rwanda). Furthermore, there has been promotion of upland rice (e.g. in in Kenya, Uganda and Ethiopia).

Use of improved varieties in rice production

This has led to tremendous gains. ASARECA has been collaborating with local agricultural research stations to promote the adoption of improved rice varieties that are disease resistant, drought tolerant and high yielding (Kimenye and Bombom 2009). Promoting the New Rice for Africa (NERICA) variety in ASARECA has largely contributed to an increase in rice productivity in Ethiopia and Uganda (Kijima, 2008; Diagne et al, 2010; Seyoum et al. 2011). The NERICA varieties have good agronomic performance, are resistant to Africa's harsh growth conditions, and have short growth duration, much appreciated by farmers (Diagne et al, 2010). More than 30 districts in Uganda, previously not traditional rice growing districts, have embraced upland rice production with most of them planting NERICA varieties (Diagne et al, 2010). NERICA was developed by Africa Rice (WARDA) and some national research programmes. Innovative approaches are being used to promote the improved rice varieties, including early involvement of stakeholders in problem identification testing and evaluation.

In addition to using improved varieties, countries in the ASARECA region have also invested in promoting better agronomic practices for rice production. Application of SRI is an example of an improved farming approach for rice production. SRI work began in Madagascar and has also been applied in Rwanda. In both countries evidence is available on the contribution of this approach in raising rice productivity. Box 1 provides another example of efforts to improve rice farming methods in the ASARECA region.

Box 1: Improving rice yields through an integrated approach to combat Rice Yellow Mottle Virus Disease

Rice yields in Tanzania are affected by the Rice Yellow Mottle Virus Disease with reported crop losses of 50–100% and reduction in average production to 1.5 t/ha. Although resistant varieties have been developed, resistance alone has proved an insufficient and an ineffective control measure for the disease. Scientists, at the Agricultural Research Institute, Uyole, in Tanzania working with farmers, have developed an integrated approach that incorporates the use of resistance with other agronomic practices including manipulation of planting date and herbicide use. The technology was validated on farm through farmer managed participatory research trials. Farmer-to-farmer interaction played a big role in disseminating the approach amongst participating and non-participating farmers within Uyole in Mbeya. Other methods used were publications of reports and extension booklets for farmers and extension staff. Stakeholder meetings held at the end of the project to develop a strategy for the way forward also helped spread the knowledge. Exchange visits involving farmers from different villages enabled the sharing of experiences and knowledge. Farmer field schools and demonstration plots were also used. The approach is currently being used by both small- and large-scale farmers in Kilwa, Ngonga, Bujonde, Mwaya and Mababu villages in Kyela District. However, uptake of the technology within Tanzania has been limited due to inadequate awareness and knowledge by farmers outside the project sites. The project recommended using a combination of other dissemination methods: publications (booklets, brochures and posters); mass media (including television and radio); and involvement of district authorities as stakeholders through advocacy as a strategy to enhance the uptake and up scaling of the technology. Outside Tanzania, reports indicate the technology is being used by some farmers in DRC and in Kenya.
Source: Kimenye Bombom (2009).

Capacity building events for farmers have also been instrumental in improving rice productivity. Farmer training through farmer field schools, exchange visits and on-farm trials has contributed to increased adoption of better approaches to rice farming.

IV. WIDE YIELD GAPS ARE OBSERVED IN COMESA, EAC, ASARECA AND IGAD SUB-REGIONS

Yield gaps are defined as the difference between yield potential and average farmers' yields over a given spatial or temporal scale (Lobell et al. 2009). Comparing the productivity using the average farm conditions against interventions that used improved inputs or research stations give an indication of yield gaps Nabbumba and Bahiigwa (2003).[4] In addition to these two standard definitions of yields gaps, we propose an approach of comparing productivity figures between countries and regional groupings as an additional perspective of demonstrating yield gaps. Table 13 indicates that whereas low crop productivity is a general problem in Eastern and Southern Africa, wide variations are observed across countries and regional groupings.

Several factors influence agricultural production and farm-level productivity negatively, thereby resulting in the existing yield gaps in the regional groupings discussed in this report. These factors can be classified into three categories: i) biophysical and technical management (e.g. improved production technologies, geographical and biophysical conditions, resource management practices, livestock/crop management practices); ii) socio-economic factors (e.g. farmer education, income level, gender); and iii) policy and institutional factors (see a summary of information from literature in Table 14).

4 It is an indication because it cannot give an accurate estimate of exploitable yield gap because national yield averages refer to crops planted across agro-ecological zones and locations in the country. It is therefore inaccurate to consider yield gaps as a difference between national average yields and what is achieved in experimental stations.

TABLE 13: YIELD DIFFERENCES ACROSS COUNTRIES AND SUB-REGIONS

Commodity	Sub-regions		Countries	
	Lowest	Highest	Lowest two	Highest two
Maize (t/ha)	EAC: 1.4	COMESA: 2	Eritrea: 0.7 DRC: 0.8	Mauritius: 8.5 Egypt: 7.8
Beans (t/ha)	COMESA: 0.6	EAC and ASARECA: 0.7	Burundi: 0.1 Swaziland and Djibouti: 0.3	Libya: 3.1 Egypt: 2.8
Wheat (t/ha)	EAC, ASARECA, IGAD: 1.9	COMESA: 3.5	Somalia: 0.4 and Burundi: 0.8	Zambia: 6.6 Egypt: 6.3
Rice (t/ha)	EAC: 1.9	COMESA: 4.2	DRC: 0.8 Comoros: 1.1	Egypt: 9.8 Rwanda: 5.1
Beef (carcass weight in kg/animal)	EAC: 127	COMESA: 153	Eritrea: 98 Rwanda: 104	Mauritius: 238 Zimbabwe: 225
Milk in kg/ animal	ASARECA: 346	COMESA: 426	Ethiopia: 224 Tanzania: 234	Ethiopia: 224 Tanzania: 234

Notes: The figures are averages for 2005–2010.

Source: Compiled by the authors from the tables 6-10 above.

TABLE 14: KEY CAUSES OF YIELD GAPS IN EASTERN AND CENTRAL AFRICA

Biophysical factors and technical management	Socio-economic factors	Policy and institutional factors
Nutrient deficiencies and imbalances (nitrogen, phosphorus, potassium, zinc, and other essential nutrients)	Inadequate capital at the household level which is influenced by household income, household assets, expenses, whether or not the household receives remittances, and off-farm employment	Government policies: Policies on land ownership and land tenure agricultural trade policies and regulations (e.g. on tariff and non-tariff barriers, prices of agricultural outputs and inputs)
Climatic shocks: Water stress (caused by frequent droughts, rainfall unreliability) coupled with limited investment in irrigation and flooding	Lack of knowledge on improved agricultural technologies or improved land and water conservation measures; this could be influenced by the education level of the household head	Limited institutional capacities (financial, managerial and technical) Limited investment in supporting institutions such as national agricultural research institutions, universities, agricultural advisory services, agricultural extension systems (both private and public), and agricultural markets
Soil nutrients and physical properties: Decline in fertility, salinity, alkalinity, acidity, iron, aluminium and others	Risk aversion: e.g. farmers' resistance to new technologies	Funding to agriculture: To address the challenges and strengthen the institutions that support agriculture
Inadequate application of better agronomic practices: Time of planting, timing and amount of fertilizer use, time of weeding, time of harvesting	Lack of access to credit: This limits farmers' ability to purchase productivity-enhancing inputs such as improved animal breeds, quality seeds, fertilizer, pesticides, quality feeds and mechanized farm inputs	Political environment: As shown by a steep drop in agricultural productivity in Kenya in 2008 occasioned by post-election violence
Limited adoption of improved inputs such as fertilizers, improved seed, pesticides, improved animal breeds, quality feeds, farm machinery and others	Gender inequality: Women do not have access to land and inputs	
Weed infestation	Reduction of labour input to agriculture due to family shocks: e.g. due to human illnesses, deaths etc.	
Pests and insect damage		
Diseases		
Remoteness of the farm land (distance or travel time to markets, roads, towns)		

Sources: Compiled by authors based on information from Nabbumba and Bahiigwa (2003); Ouma et al. (2007); Audibert (2008); and Asenso-Okyere et al. (2009).

Examples from Uganda, Ethiopia and Tanzania provided below present country-specific examples on yield gaps.

In Uganda, Nabbumba and Bahiigwa (2003) found that the average crop yields were in the range of 13–49% of the yields achieved at research stations. In another example that illustrates the yield gaps in Uganda, Bayite-Kasule (2009) compares farmer yields with what is achieved in the research stations where relevant inputs and agronomic practices are used. Significant differences are noted (Table 15).

TABLE 15: YIELD GAPS FOR SELECTED CROPS IN UGANDA, T/HA

Crop	Farmer yields (average)	Research yields (average)	Gap (%)
Maize	0.6	5–8	800–1350
Beans	0.4	2–4	470-1040
Groundnuts	0.6	2.7–3.5	330–460
Bananas	1.8	4.5	140
Coffee	0.4	3.5	870

Source: NARO and UNHS 2005/06 cited in Bayite-Kasule (2009).

In Ethiopia, Spielman and Pandya-Lorch (2010) found that the average yields of maize and wheat in Ethiopia were less than half what was achieved by the National Agricultural Extension Intervention Program (NAEIP) and the Sasakawa Global interventions which supported the use of improved inputs (Table 16). In another example, in Rwanda Aertssen et al. (2006) compared farm-level yields (actual yields) with experimental yields (potential yields). They found large yield gaps ranging from a low of about 25% in banana to 75% or more for wheat, maize and beans.

TABLE 16: DATA ON YIELDS OF IMPROVED AND TRADITIONAL VARIETIES OF STAPLE CROPS IN ETHIOPIA FROM THREE SOURCES (1993–2009)

	Yield (t/ha)				
	NAEIP (1995–1999)		SG 2000 (1993–1999)		CSA average (2007–2009)
Crop	Improved	Traditional	Improved	Traditional	
Maize	4.73	1.57	4.60	1.17	2.1
Wheat	2.93	1.17	2.31	0.95	1.7
Sorghum	2.79	1.12	2.08	0.92	
Teff	1.43	0.85	1.62	0.64	1.2
Barley	2.15	1.00			

Notes: NAEIP = National Agricultural Extension Intervention Program; CSA = Central Statistical Agency; SG 2000 = Sasakawa Global 2000.

Source: Spielman and Pandya-Lorch (2010).

Recent interventions by ASDP in Tanzania have been promoting rice production through irrigation and the use of improved seed varieties. These interventions indicate that it is possible to double rice productivity in the country from the current national average (of 1.9 t/ha). Case studies from the sites benefiting from interventions under this programme show that rice yields of some smallholder farmers in improved and well-managed irrigation schemes have been able to increase to as high as 4.0–5.0 t/ha.

These examples clearly show that there is much potential to enhance agricultural productivity in the COMESA region by implementing strategic interventions to address productivity constraints at various points along the agricultural value chain.

V. YIELD VARIABILITY IS HIGH

The COMESA region is characterized by high variability in crop yields (see Table 17). The regional variability for maize yields stands at about 8%, and 15% and 10% for COMESA, EAC and ASARECA regional groupings respectively. At country level, substantially high levels of variability are observed for some selected crops. Double-digit coefficients are common. For example, coefficients of variation for rice in selected countries are as follows: Ethiopia (43%), Rwanda (29%), Madagascar (19%), Malawi (20%), Swaziland (56%), Kenya (22%), Zambia (27%) and Zimbabwe (19%). In contrast, in Asian countries where rice is a major food staple, coefficients of variation in production are in the single digits (Smale et al. 2011). Variability of aggregate yields has important implications for domestic food markets and food prices. Both consumers and producers benefit from stable prices, which are generally related to reduced yield variability (Gollin 2006; Smale et al. 2011).

Climatic factors are to a large extent responsible for the observed yield variability and low productivity in Eastern, Central and Southern Africa (see Mati, 2007).[5] Countries in these regional groupings frequently experience extreme climatic conditions such as droughts and floods. One of the measures used to enhance stability of crop production is to invest in irrigation and improved soil and water management practices (including efficient storage and use of rainfall water). Similarly, using better land and water management techniques (e.g. conservation farming, agro-forestry and others) is beneficial in enhancing adaptation to climatic challenges. For example, maize productivity gains achieved in the drylands of Zambia were driven by using improved inputs and adopting conservation farming techniques (see Haggblade and Hazell 2010; Haggblade et al. 2011).

TABLE 17: COEFFICIENT OF VARIATION (%) OF SELECTED STAPLES IN COMESA (1990–2010)

	Beans	Maize	Rice	Wheat	Sweet potato	Cassava
COMESA	**9.4**	**7.9**	**12.0**	**8.0**	**9.8**	**4.4**
EAC	**12.4**	**15.5**	**12.8**	**16.9**	**9.5**	**8.8**
ASARECA	**10.1**	**9.6**	**14.4**	**15.6**	**9.4**	**4.2**
Burundi	11.3	12.2	7.8	8.8	16.1	16.6
Comoros	25.	9.7	7.2	2.	10.7	5.6
DRC	1.7	2.4	2.7	8.7	5.5	1.4
Djibouti	19.7	16.1	3.	4.	5.	6.
Egypt	10.1	11.8	10.3	9.9	16.6	7.
Eritrea	104.8	55.3	8.	72.9	9.	10.
Ethiopia	55.3	20.5	42.7	46.6	46.2	11.
Kenya	28.4	11.6	22.5	22.9	18.6	20.3
Libya	9.9	36.4	12.	21.7	13.	14.
Madagascar	6.5	25.9	19.2	11.3	14.0	15.3
Malawi	16.7	37.3	20.2	51.7	15.	66.7
Mauritius	26.	32.2	252.9	16.	20.2	11.2
Rwanda	16.8	40.2	40.4	29.0	12.8	60.2
Seychelles	27.	28.	29.	30.	31.	12.5
Sudan	16.8	54.3	68.1	29.6	23.2	9.6
Swaziland	55.5	27.3	55.6	39.8	26.5	17.
Uganda	20.9	10.5	5.1	4.3	8.7	26.8
Tanzania	12.2	37.8	16.5	37.0	41.3	31.3
Zambia	32.	26.2	27.0	20.6	4.6	5.0
Zimbabwe	20.6	46.4	18.8	25.4	8.5	7.9

Source: Authors' calculations based on data from FAO (2011) and country sources.

5 Other factors responsible for yield variability are: political factors (e.g. civil wars), change of government policies and priorities, change of land management practices, change of crop production technologies among others.

VI. INCREASE IN THE CATTLE POPULATION IS THE MAJOR DRIVER OF GROWTH IN THE PRODUCTION OF MILK AND BEEF

Beef and milk production have been increasing over the past 20 years. Some gains in beef and milk productivity have been recorded as well, however, the rates of growth have been rather slow. Milk productivity growth has been especially slow, suggesting that most of the observed increase in milk production is driven by growth in number of animals rather than productivity per animal.

4. Trends of Selected Agriculture and Rural Development Indicators in COMESA

Introduction

This chapter provides an overview of the trends of the key agriculture and rural development indicators in COMESA. Since the focus of this report was agricultural productivity, indicators in this chapter are only discussed briefly and supporting evidence is presented in the appendices.

4.1 Progress in implementation of CAADP

INTRODUCTION

At country level, the CAADP implementation process is geared towards aligning national agriculture sector policies, strategies and investment programmes with CAADP principles, pillars and targets. The process builds on ongoing country efforts and is led by national governments and key stakeholders, and coordinated by RECs. Implementation of CAADP requires involvement of all key stakeholders within countries such as development partners, farmer groups, civil society, private sector, national and international technical experts, and think tanks among others.

CAADP ROUNDTABLES AND COMPACTS

Of the 20 countries discussed in this report, 10 had signed the CAADP compact as at October 2012 (see Table 18). Rwanda was the first signatory to CAADP in the COMESA region, signing its compact on 31 March 2007. No other country in the region signed the compact for about two years. In August 2009 Burundi and Ethiopia signed their compacts. Countries within the COMESA region that had launched CAADP implementation and were working towards signing the compact in 2012 included Zimbabwe, Djibouti, Sudan and Seychelles (Bwalya 2012). The countries planning to launch CAADP processes are Comoros, Eritrea, Madagascar, Egypt and Mauritius.

TABLE 18: STATUS OF IMPLEMENTATION AT COUNTRY LEVEL

Country name	Date compact signed	Investment plan (IP) ready	IP review date	Business meeting held
Rwanda	Mar 2007 31–30	Yes	Dec 2009 8–4	Dec 2009 9–8
Ethiopia	Sept 2009 28–27	Yes	Sept 2010 16–10	Dec 2010 7–6
Burundi	Aug 2009 25–24	Yes	Aug 2011 31–22	Mar 2012 15–14
Uganda	Mar 2010 31–30	Yes	Sept 2010 10–2	Sept 2010 17–16
Malawi	Apr 2010 19	Yes	Sept 2010 16–10	Sept 2010 29–28
Tanzania	Jul 2010 8–6	Yes	May 2011 31–20	Nov 2011 10–9
Kenya	Jul 2010 24–23	Yes	Sept 2010 14–6	Sept 2010 27
Swaziland	Mar 2010 4–3	In process	Not yet	Not yet
Zambia	Jan 2011 18	In process	Not yet	Not yet
DRC	Mar 2011 18	In process	Not yet	Not yet
Djibouti	Apr 2012 19	Not yet	Not yet	Not yet
Seychelles	Sept2012 27	Not yet	Not yet	Not yet

Source: Adapted from Bwalya (2012) and supplemented by information from country CAADP teams and the CAADP website (http://www.nepad-caadp.net).

POST-COMPACT INVESTMENT PLANS, TECHNICAL REVIEWS AND FINANCING

To realize the CAADP objectives within countries, governments are required to develop detailed investment plans. The investment plans should clearly state priority investment areas for agricultural growth and poverty reduction as identified by agricultural stakeholders. Countries in the COMESA region that had developed detailed investment plans as of August 2011 are listed in Table 18. All the plans have been technically reviewed by independent experts under the coordination of COMESA and NPCA. Swaziland, Zambia and DRC are in the process of developing their investment plans.

IMPLEMENTATION OF M&E

Improving the level, relevance and reliability of evidence in decision-making processes is essential for effectively designing and implementing policies and programmes, and ultimately for greater and more desirable development outcomes (Benin et al. 2011). COMESA countries have committed to strengthening their agriculture M&E systems in various government documents (see examples in Government of Rwanda 2009; Government of Kenya 2010). An overview of progress made by selected COMESA countries is given in the following paragraphs.

Tanzania recently revised the ASDP M&E framework that was developed in 2007 (United Republic of Tanzania 2011). The framework was developed by the ASDP M&E Thematic Working Group (TWG) comprising officials of both the Government of Tanzania and development partners. Several development partners participated in the working group: the Japan International Cooperation Agency (JICA), the Food and Agriculture Organization of the United Nations (FAO), Irish Aid and the World Bank. The ASDP M&E Guideline, which delineates actions to be taken by each stakeholder for ASDP M&E, was developed and approved by directors of the Committee of Agricultural Sector Line Ministries (ASLMs). Both the framework and guideline have been disseminated to all the regions/districts. In 2011 Tanzania revised the ASDP M&E framework to incorporate the necessary changes required to monitor and evaluate recent developments in the agriculture sector. Examples of the changes include recent revisions in the implementation of ASDP and other government strategies such as *Mkututa II* and *Kilimo Kwanza*. The ASDP M&E TWG is in the process of operationalizing the framework.

Rwanda's investment plan clearly states the country's commitment to agriculture M&E (Government of Rwanda 2009). Sub-programme 4.3 of the investment

plan focuses on agricultural statistics and information and communication technology (ICT). The aim of this programme is to strengthen the quality, reliability, relevance and timeliness of agricultural statistics. In implementing this, the government is developing partnerships with the private sector in research and development to enhance sharing of information and statistics. Sub-programme 4.4 of the investment plan covers M&E systems and coordination for the agriculture sector. The Rwanda Ministry of Agriculture signed a Sector-Wide Approach Memorandum of Understanding (MOU) with various partners in 2008, determining the implementation modalities for the Strategic Plan for Agriculture Transformation in Rwanda (PSTA) II period. M&E was one of the components in this MOU. Partnerships between government and other data generators in the country have facilitated collection, analysis and reporting of data on progress of the interventions in the agriculture sector. The Rwanda SAKSS node is hosted by the Directorate of Planning of the Ministry of Agriculture and is working closely with key agricultural stakeholders on the aspects of M&E.

In Kenya, the Agricultural Sector Coordinating Unit (ASCU) has been mandated to lead M&E for the agriculture sector. ASCU is coordinating work on agriculture M&E including periodic progress reviews. The unit has been coordinating the development of a sector-wide M&E framework. The framework is expected to serve as an overarching tool to monitor and evaluate all initiatives being implemented by various stakeholders under the Agricultural Sector Development Strategy (ASDS). A thematic working group on M&E comprising members from agriculture line ministries, research institutes (local and international) and development partners has been meeting to review drafts of the framework and provide feedback to the consultants. The group has met several times to review drafts of the M&E framework. Some delays have been experienced in finalizing the framework.

In Ethiopia the Ministry of Agriculture is working in collaboration with various stakeholders to develop a common M&E system for the agriculture sector. The stakeholders are committed to strengthening the M&E function of the sector in the aspects of data collection, management and analysis. The stakeholders include the Ministry of Agriculture, the Agricultural Sector Transformation Agency (ATA), the International Food Policy Research Institute (IFPRI), the Ethiopian Institute of Agricultural Research (EIAR) and the Central Statistical Agency (CSA). The development of the framework builds on previous efforts by the Ministry of Agriculture.

Uganda's agricultural M&E function is overseen by the Department of Agricultural Planning. The M&E and statistics sections of this department perform various M&E functions of the sector. The M&E section undertakes the following functions: i) M&E of development activities to ensure successful implementation of all programmes and projects within the ministry in liaison with the specialist departments; ii) sector and district monitoring and reporting of project implementation; iii) implementation of sector and district project and programme review; and iv) preparation of project and programme completion reports. The statistics department of the ministry is responsible for:

- design and implementation of annual agricultural sample surveys
- liaison with the Uganda Bureau of Statistics (UBOS) in preparing and implementing national sample census of crops and livestock and integrated fish fry surveys, and collecting informal cross-border agricultural trade information
- implementation of the Plan for National Statistics Development for the sector
- maintenance of a comprehensive database for the sector
- provision of agricultural statistics to users, who include all other departments, divisions and sections of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), other ministries and departments, international agencies, non-governmental organizations (NGOs) and others interested in agricultural statistics.

Uganda has designed a sector-wide M&E framework to guide the implementation of the Agricultural Sector Development Strategy and Investment Plan (DISP). A draft of the framework is presented in chapter six of the country's investment plan. The chapter presents the draft list of indicators for monitoring performance of the agriculture sector as well as the implementation strategy to operationalize the framework. To implement the sector-wide M&E framework MAAIF is using a combination of strategies including:

- data collection by departmental staff
- partner participation (where the ministry is working with various stakeholders to strengthen M&E capacities); examples of the partners are producer groups, agribusiness providers, agro-enterprises, government counterparts, development partners and others
- undertaking of surveys and special studies which will include targeted impact assessment studies and other forms of assessment or reviews

To enhance the M&E capacity at MAAIF, Uganda recently recruited several M&E officers. The country is also investing in building the capacity of the M&E officers through training. In January–February 2012 the country collaborated with ReSAKSS-ECA to organize a training course in geographic information systems (GIS) for the M&E technical officers.

Several other initiatives are also aimed at contributing towards enhancing capacity for agriculture M&E. The first is the initiative by various development partners such as the United States Agency for International Development (USAID), the World Bank and others to review the existing statistical data systems and possibly support areas that require improvements. The other is the FAO initiative to support collection, management and reporting of agricultural data in a standardized manner though the CountrySTAT initiative. Several countries in the region are implementing this initiative. Third is the initiative to standardize collection and reporting of agricultural trade data. This is being implemented by various stakeholders including national governments, COMESA, Alliance for Commodity Trade in Eastern and Southern Africa (ACTESA), EAC, East African Grain Council, ReSAKSS-ECA node, the World Food Programme, Famine Early Warning Systems Network (FEWSNET) and development partners.

The examples described here show that COMESA countries are indeed attempting to enhance their M&E capacity. Some positive trends are evident. Governments are increasingly supporting M&E; and there is also increased demand for M&E information by various stakeholders including policy makers and other development practitioners. However, what could be required is to fully operationalize the sound plans for M&E that are articulated in the government documents. Although some progress is being made in implementing these plans, this has been happening at a rather slow pace in some countries. There is need to dedicate further efforts to eliminate the barriers (e.g. financial, technical, managerial and institutional) to operationalization of these plans.

CAADP 6% AGRICULTURAL GDP GROWTH TARGET

Annual average agricultural GDP growth has not reached the 6% CAADP target in COMESA, EAC, ASARECA or IGAD (Table 19). For COMESA, the annual average growth rates were 2.6%, 4.3%, 2.6% and 3.5% in 1990–1995, 1995–2000, 2000–2005 and 2005–2010 respectively. For EAC the annual average growth rates were 1.9%, 3.8%, 3.3% and 1.9% in 1990–1995, 1995–2000, 2000–2005 and 2005–2010 respectively. During the same periods annual average growth rates in ASARECA were 1.8%, 4.2%, 2.8% and 4.1%. In IGAD the growth rates were 1.6%, 4.8%, 3.2% and 4.6%. The main countries showing upward trends in IGAD are Ethiopia, Eritrea and Djibouti. These countries have had growth rates of more than 3% in the two latest periods. In the most recent period (2005–2010) Sudan recorded a growth rate of about 3.4%, which also contributed to the relatively higher growth rate recorded in IGAD compared to the other countries discussed here.

Comparing the latest figures with the levels in the early 1990s, we notice that moderate improvements in the growth of agricultural GDP are observed in the region. The levels of GDP growth rates in the sub-regions discussed in this report have improved from the range of 1.6–2.6% recorded in 1990–1995 to a range of 1.9–4.6% recorded in 2005–2010. These improvements could in part be attributed to improvements in policies at country and regional levels, more private investments in agriculture and the growing demand for agricultural products. Significant variations in the national trends are observed.

TABLE 19: AGRICULTURE VALUE ADDED, ANNUAL % GROWTH (1990–2010)

Country name	Annual avg. (1990–2010) level	Annual avg. percentage point (1990–(2010	Annual avg. (1990–1995) level	Annual avg. percentage point (1990–(1995	Annual avg. (1995–2000) level	Annual avg. percentage point (1995–(2000	Annual avg. (2000–2005) level	Annual avg. percentage point (2000–(2005	Annual avg. (2005–2010) level	Annual avg. percentage point (2005–(2010
COMESA	**3.18**	**0.16**	**2.62**	**1.10**	**4.30**	**-0.83**	**2.55**	**0.43**	**3.50**	**-0.07**
EAC	**2.61**	**0.05**	**1.85**	**0.78**	**3.81**	**-1.19**	**3.28**	**0.70**	**1.93**	**-0.08**
ASARECA	**3.14**	**0.24**	**1.80**	**1.51**	**4.24**	**-1.23**	**2.79**	**1.00**	**4.07**	**-0.33**
IGAD	**3.51**	**0.34**	**1.61**	**1.49**	**4.79**	**-0.88**	**3.22**	**1.14**	**4.64**	**-0.41**
Burundi	-0.95	-0.08	-1.67	-2.47	-1.04	0.32	-2.45	-0.28	-1.23	2.09
Comoros	2.71	-0.27	2.14	0.84	5.06	-0.21	4.60	-0.83	1.21	-0.88
DRC	1.13	-0.13	3.53	1.80	0.02	-4.66	-1.74	2.91	2.88	-0.57
Djibouti	1.17	0.00	-1.72	-2.88	-1.30	3.26	3.06	0.23	3.65	-0.60
Egypt	3.20	0.04	2.73	0.03	3.32	0.10	3.37	-0.03	3.36	0.04
Eritrea	3.11	0.00	1.85	-2.34	-1.79	-6.36	5.46	22.63	7.97	-13.93
Ethiopia	4.71	0.00	2.51	-0.43	3.29	-0.13	5.13	2.10	8.93	-1.54
Kenya	2.15	0.14	0.67	0.26	3.38	-1.21	2.99	1.64	2.21	-0.13
Madagascar	2.27	-0.10	1.49	-0.04	2.16	-0.15	1.79	0.27	3.67	-0.50
Malawi	6.37	0.09	8.51	7.97	15.16	-6.86	0.71	-2.59	4.10	1.83
Mauritius	1.31	-0.55	1.68	-0.43	4.06	5.27	4.79	-7.85	0.04	0.82
Rwanda	4.19	0.13	-1.73	6.40	13.23	-4.51	6.49	-1.37		0.00
Seychelles	1.50	-0.66	-1.54	-3.38	3.58	1.60	-0.72	-0.61	4.75	-0.24
Somalia	1.33	-0.07	1.33	-0.27	.33	0.00	.34	0.00	.35	0.00
Sudan	3.73	1.15	1.15	5.24	8.01	-0.96	1.75	-0.18	3.40	0.50
Tanzania	3.79	0.20	3.17	1.17	3.76	-0.28	4.66	-0.01	4.03	-0.07
Uganda	3.00	-0.25	4.02	0.13	3.07	-1.27	3.38	0.50	1.30	-0.34
Zambia	2.85	0.45	7.63	8.45	6.74	-6.36	1.00	-0.42	0.33	0.13
Zimbabwe	-0.11	0.07	2.80	-3.94	4.50	1.92	-6.17	-1.40	-3.28	3.72

Notes: Libya, Somalia and South Sudan omitted due to missing values. Regional and economic aggregate values are calculated as weighted summations, where a country's GDP as a share of regional GDP is used as a weight. Annual average change percentage point for GDP growth rates is annual average percentage point change, which is a simple average of the difference in two consecutive years over the years specified in the range. Sudan includes South Sudan because the data for the two countries are not disaggregated.

Source: Authors' calculations based on data from World Bank (2011).

4.2 GDP growth 1990–2010

Annual average GDP growth rates for COMESA, EAC, ASARECA and IGAD were 3.5%, 4.1%, 3.2% and 4.8% respectively during 1990–2010 (Table 20). Slower rates of growth were recorded between 1990 and 1995. The rate of expansion in GDP increased over the periods 1995–2000 and 2000–2005. Recently, growth has been very impressive. From 2005 to 2010 annual average GDP growth rates in these sub-regions were: COMESA (5.4%), EAC (5.8%), ASARECA (6%) and IGAD (7.3%). Countries driving growth trends in their respective regions in 2005–2010 are Ethiopia, Uganda, Sudan, Tanzania, Malawi and Zambia. These had an average growth rate of more than 6% during this period. Kenya has generally been doing well economically and could have been in this category. However, the growth rate was set back by the post-election violence that affected the country in 2007–2008. The violence had a detrimental impact on the country's economy. Comparing country level growth rates for the early 1990s (1990–1995) and recent estimates (2005–2010) we observe that some countries are currently growing at a much faster rate than they did in the early 1990s. These include DRC, Ethiopia, Djibouti, Tanzania and Zambia (Table 20).

TABLE 20: TRENDS OF GDP GROWTH RATES, ANNUAL % (1990–2010)

Country/ region	Annual avg. (1990–2010)	Annual avg. (1990–1995)	Annual avg. (1995–2000)	Annual avg. (2000–2005)	Annual avg. (2005–2010)
COMESA	**3.53**	**1.99**	**3.62**	**3.53**	**5.37**
EAC	**4.19**	**2.86**	**3.68**	**4.66**	**5.74**
ASARECA	**3.28**	**0.44**	**2.91**	**4.19**	**6.01**
IGAD	**4.77**	**2.50**	**4.83**	**5.05**	**7.25**
Burundi	0.87	-1.41	-2.44	1.69	3.90
Comoros	1.79	1.59	1.83	2.56	1.81
DRC	-0.57	-7.03	-3.12	2.45	5.97
Djibouti	0.95	-3.07	-0.94	2.55	4.77
Egypt	4.63	3.79	5.11	3.84	5.90
Eritrea	3.65	12.51	1.45	2.08	-0.11
Ethiopia	5.60	1.56	4.91	6.52	10.61
Kenya	3.06	2.04	2.54	3.14	4.83
Libya	4.32		3.70	4.23	5.54
Madagascar	2.35	0.29	3.48	2.96	3.33
Malawi	4.31	3.88	6.06	1.98	6.66
Mauritius	4.69	5.27	5.55	4.06	3.96
Seychelles	3.61	3.58	5.10	0.32	5.44
Somalia	-1.48	-1.48			
Sudan	5.52	3.37	6.38	5.86	7.17
Swaziland	3.50	6.06	3.18	2.05	2.47
Tanzania	5.11	2.67	4.19	6.70	6.96
Rwanda					
Uganda	6.98	6.95	6.97	6.11	7.90
Zambia	3.02	-1.15	1.89	4.60	6.24
Zimbabwe	-0.94	2.32	2.03	-6.50	-2.58

Source: Authors' calculations based on World Bank (2011).

Notes: Regional estimates for COMESA, EAC, ASARECA and IGAD are computed using country's GDP as a share of regional GDP.
Sudan includes South Sudan because the data for the two countries are not disaggregated.

4.3 Per capita income

Consistent with GDP growth observed in COMESA, EAC, ASARECA and IGAD, increases in per capita income were also experienced in these sub-regions. Overall, the sub-regions experienced a positive trend in annual average growth of GDP per capita in the period between 1990 and 2010 (Table 21). During this period the annual average growth rate in per capita income were 3.5%, 4.9%, 3.9% and 4.7% in COMESA, EAC, ASARECA and IGAD respectively (Appendix 4). As a result, annual average GDP per capita levels in 2005–2010 were well above those of 1990–1995. During these periods the recorded increases were: COMESA (from USD 285 per person per year to USD 886 per person per year), EAC (from USD 229 per person per year to USD 501 per person per year), ASARECA (from USD 234 per person per year to USD 441 per person per year) and IGAD (from USD 245 per person per year to USD 525 per person per year).

The COMESA average is much higher than that of the other sub-regions due to the influence of Seychelles, Libya, Swaziland, Djibouti, Egypt and Mauritius. The ASARECA average is low as a result of the influence of Burundi, DRC, Ethiopia and Eritrea whose per capita income is only about USD 300 per person per year or lower. Djibouti, Sudan and Kenya are the major drivers for the higher levels of per capita income registered in IGAD.

TABLE 21: GDP PER CAPITA (USD PER PERSON PER YEAR)

	Annual average per capita income (USD/person per year)					Annual average growth rate in per capita income (%)				
Country/ region	1990–1995	1995–2000	2000–2005	2005–2010	1990–2010	1990–1995	1995–2000	2000–2005	2005–2010	1990–2010
World	**4571**	**5191**	**5886**	**8276**	**6001**	**4.3**	**0.1**	**6.6**	**5.2**	**3.9**
Sub-Saharan Africa	**558.4**	**540.9**	**624.6**	**1109.2**	**717.3**	**-2.2**	**-2.2**	**12.5**	**7.9**	**4.3**
COMESA	**495**	**551**	**553**	**886**	**629**	**-1.8**	**2.9**	**0.5**	**10.5**	**3.5**
EAC	**229**	**303**	**326**	**500**	**343**	**-2.9**	**3.8**	**4.9**	**9.2**	**4.8**
ASARECA	**234**	**228**	**249**	**441**	**293**	**-6.0**	**0.1**	**6.8**	**12.1**	**3.9**
IGAD	**245**	**247**	**271**	**525**	**328**	**-4.9**	**-1.0**	**8.1**	**13.3**	**4.7**
Burundi	178	144	128	193	162	-5.7	-4.2	2.3	9.9	0.3
Comoros	519	417	480	690	534	-5.8	-4.7	12.3	5.0	1.9
DRC	205	117	105	167	153	-13.2	-7.6	7.5	8.6	-1.4
Djibouti	795	761	801	1034	845	-0.2	-0.9	3.1	8.8	1.6
Egypt	784	1234	1266	1912	1311	6.4	8.6	-5.2	17.9	5.7
Eritrea	161	197	206	304	226	7.0	-1.2	9.0	10.5	4.4
Ethiopia	202	134	131	284	194	-15.6	-2.7	5.5	19.3	1.9
Kenya	309	419	440	705	475	-4.4	3.1	5.3	8.5	5.0
Libya	6590	5851	5556	10848	7138	-4.8	2.7	3.8	10.4	2.3
Madagascar	250	258	278	382	297	-1.4	-0.7	1.0	9.7	2.6
Malawi	182	185	192	277	215	-9.6	-2.7	7.5	10.2	2.5
Mauritius	2987	3709	4400	6423	4409	7.0	0.4	7.2	9.3	5.2
Rwanda	275	253	220	417	299	-11.8	-0.6	5.6	14.3	2.3
Seychelles	6079	7276	8607	11155	8253	5.8	3.3	6.5	-2.0	3.9
Sudan	391	358	490	1169	615	0.6	-2.7	14.7	15.5	7.5
Swaziland	1458	1619	1800	2947	1959	5.9	-3.0	14.6	4.4	4.6
Tanzania	173	259	329	451	305	-1.3	11.5	4.2	8.4	6.3
Uganda	202	274	263	420	290	2.8	-1.9	5.3	10.7	4.6
Zambia	397	355	421	989	554	-1.7	-4.5	13.9	12.0	5.7
Zimbabwe	675	607	492	456	561	-7.0	-4.8	-3.8	3.9	-2.8

Notes: Regional estimates for COMESA, EAC, ASARECA and IGAD are computed using country's population as a share of regional population.
Sudan includes South Sudan because the data for the two countries are not disaggregated.

Source: Authors' calculations based on World Bank (2011).

The rates of growth in per capita income were slower in the 1990s but have been improving over the past decade. The fastest rates of growth were experienced in 2005–2010. During this period average annual growth in per capita income in COMESA, EAC, ASARECA and IGAD were about 11%, 9%, 12% and 13% respectively. Despite the fast growth rates, per capita income in these sub-regions remains lower than the average in sub-Saharan Africa which was about USD 1109 per person per year. This shows the need for more efforts in promoting measures to stimulate economic growth and also enhance equitable distribution of incomes.

4.4 Tracking government expenditures on agriculture

Budgetary allocation to agriculture remains less than 10% in most of the countries discussed in this report, despite the commitment under the Maputo Declaration (Table 22). Share of public allocated agriculture spending in total public allocated spending (average for 2003–2009) was 9.8% in Malawi and 13.7% in Ethiopia. These are the only countries that adhered to the CAADP commitment.

TABLE 22: SHARE OF PUBLIC ALLOCATED AGRICULTURE SPENDING IN TOTAL PUBLIC ALLOCATED SPENDING

Region /country	Annual avg. (1990–1995)	Annual avg. % change (1990–1995)	Annual avg. (1995–2003)	Annual avg. % change (1995–2003)	2003	Annual avg. (2003–2009)	Annual avg. % change (2003–2009)
Burundi						4.7	10.6
DRC					1.2	1.3	1.7
Ethiopia	9.7	8	8.2	-4.7	9.2	13.7	5.7
Kenya	7.6	3.1	5.7	-0.6	4.9	4.7	-9.5
Madagascar					8	7	-17.5
Mauritius					4	3.2	-1.9
Rwanda					5.5	3.7	-6.4
Seychelles					0.9	0.9	-2.6
Somalia					36.	37.	38.
Sudan					3.4	5.6	19.9
Tanzania					5.7	5.2	–12.8
Uganda	2.6	0.4	2	1.2	2.3	2.6	9.1
Egypt	4.8	-0.2	5.9	1.3	5.1	4.2	-15.5
Malawi	10.3	–9.3	8.2	-2.9	7.4	9.8	20.2
Swaziland	46.	47.	48.	49.	4.1	4.5	-10.6
Zambia	2.8	-3.7	2.9	-6.3	2.7	5.3	19.4
Zimbabwe	8.1	-20.6	3.9	12.4	9.7	8.6	-13.6

Notes: Comoros value reported for average over 2003–2009 is a single data point measured in 2005. Data on Ethiopia include rural development and agriculture programmes in total agriculture spending.

Data were compiled from a variety of sources including IMF, CAADP publications, and several national sources (particularly the Ministry of Finance) by the ReSAKSS regional networks. Data collected by ReSAKSS from national sources were first used, then gaps were filled by data obtained from CAADP publications and then IMF. Blank cells indicate missing values.

Source: Benin et al. (2010).

Agricultural spending in COMESA as a percentage of agricultural GDP has averaged 10% or less over the period 1990–2010. In the EAC region, agriculture expenditure as a percentage of agricultural GDP remained more or less stagnant (2.0–3.3%) throughout the 20 years. IGAD experienced some improvements from the low share of about 0.9% in 1990–1995 to about 2.8% in 2003–2010. Table 22 also shows that agriculture expenditure relative to agricultural GDP in COMESA, EAC and IGAD remains lower than in the other sub-regions such as the Economic Community of West African States (ECOWAS) and the Southern African Development Community (SADC). This means that these sub-regions are prioritizing resource allocation to agriculture more than those considered in this report.

Agricultural spending as a percentage of agricultural GDP has decreased in some countries in the region. In Kenya, agricultural spending as a percentage of agricultural GDP decreased from 5.7% in the period 1990–1995 to 3.4% in the period 2003–2010. During the same period, Burundi saw a decline from 3.5% to 0.5% and Malawi experienced a decline from 8% to 3%.

4.5 Trends in the hunger situation

COMESA, EAC, ASARECA and IGAD have made progress in reducing hunger (Table 23). However, hunger levels remain high in these sub-regions. The Global Hunger Index (GHI) offers a useful and multidimensional overview of hunger situation (Von Grebmer et al. 2011). In 2010 the GHI scores were 21.7, 20.3, 27.2 and 22.8 for COMESA, EAC, ASARECA and IGAD respectively. The 2010 GHI shows some improvement over the 1990 GHI in these sub-regions. The percentage reduction in GHI scores were 11% in COMESA, 18% in EAC, 7.5% in ASARECA and about 23% in IGAD. Nonetheless, the index for hunger in the all sub-regions remains at a level characterized as "alarming".[6]

6 Values less than 5.0 reflect low hunger; values between 5.0 and 9.9 reflect moderate hunger; values between 10.0 and 19.9 indicate a serious problem; values between 20.0 and 29.9 are alarming; and values of 30.0 or higher are extremely alarming.

At country level, latest data indicate that DRC, Burundi and Djibouti have the highest GHI scores. These countries are within the "extremely alarming" category of the hunger situation. Ethiopia, Madagascar, Djibouti, Zambia, Zimbabwe, Rwanda, Tanzania and Sudan are under the alarming category. Moderate hunger is recorded in Uganda, Kenya, Malawi and Swaziland.

Some countries achieved significant absolute progress in improving their GHI values. Between 1990 and 2010, Malawi, Ethiopia, Djibouti and Tanzania experienced much higher improvements than other countries in the region (Table 23). These countries experienced a reduction of more than 20% in GHI scores. Other countries (including DRC, Zimbabwe, Burundi and Comoros) registered deterioration in the hunger situation. Their recent GHI scores are higher than those of 1990.

TABLE 23: GLOBAL HUNGER INDEX (1990–2010)

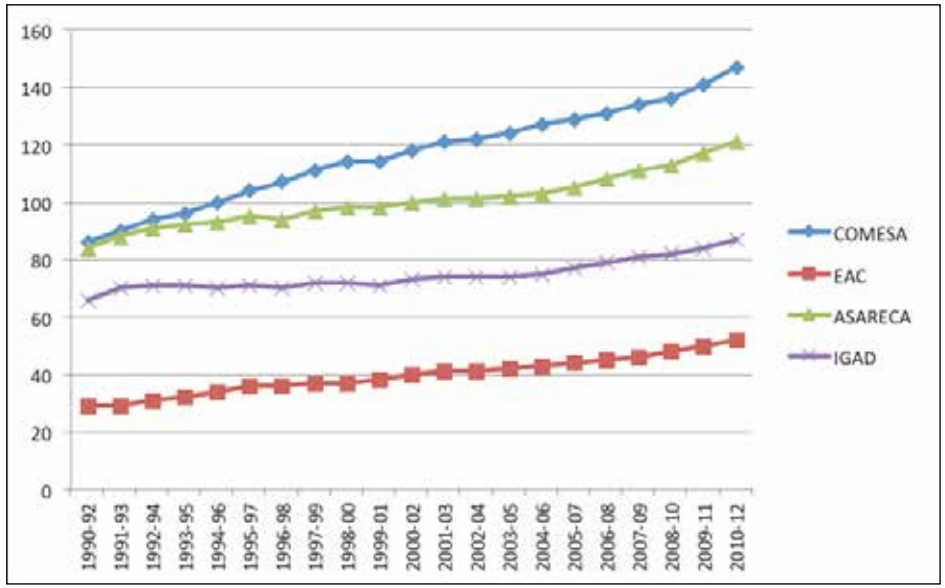
	1990	1992	1997	2003	2007	2008	2010	% change 1990–2010
COMESA	**24.4**	**25.4**	**26.6**	**25.5**	**24.7**	**23.5**	**21.7**	**-11.0**
EAC	**24.6**	**25.5**	**27.2**	**25.4**	**23.8**	**21.9**	**20.3**	**-17.5**
ASARECA	**29.4**	**30.6**	**32.3**	**31.0**	**30.3**	**28.6**	**27.2**	**-7.5**
IGAD	**29.7**	**31.2**	**29.8**	**27.5**	**26.0**	**23.6**	**22.8**	**-23.4**
Burundi	32.6	32.3	39.7	42.7	42.4	38.3	38.3	**17.5**
Comoros	26.4	28.3	29.6	30.8	31.5	29.1	27.9	**5.7**
DRC	25.5	25.4	35.1	37.6	41.2	42.7	41.0	**60.8**
Djibouti	30.7	32.1	24.5	20.9	17.1	20.9	23.5	**-23.5**
Egypt	8.6	6.8	7.0	5.2	4.3	4.3	<5	
Eritrea	1.	-	41.1	40.4	40.3	39.0	35.7	
Ethiopia	44.0	46.3	41.7	36.7	33.7	31.0	29.8	**-32.3**
Kenya	23.5	23.7	22.9	21.7	21.0	19.9	19.8	**-15.7**
Libya	2.7	25.3	30.7	32.0	0.9	0.9	<5	
Madagascar	29.1	30.8	31.9	29.9	30.7	28.8	27.5	**-5.5**
Malawi	32.2	33.3	30.5	25.4	24.5	21.0	18.2	**-43.5**
Mauritius	6.1	8.4	7.7	3.8	3.8	5.0	6.7	**9.8**
Rwanda	28.3	29.2	32.1	27.2	26.3	22.3	23.1	**-18.4**
Sudan	25.6	26.2	22.8	25.7	25.6	20.5	20.9	**-18.3**
Swaziland	13.4	11.2	14.0	14.9	15.0	17.7	10.8	**-19.4**
Tanzania	26.1	27.5	31.6	30.0	26.1	24.2	20.7	**-20.7**
Uganda	19.9	21.8	21.7	18.6	18.6	17.1	15.0	**-24.6**
Zambia	29.1	31.2	30.5	31.8	31.1	29.2	24.9	**-14.4**
Zimbabwe	20.2	21.8	23.5	23.2	21.3	23.8	20.9	**3.5**

Notes: Calculations are weighted summations, where each country's population as a share of the regional population is used as a weight. Blank cells indicate missing values.
Sudan includes South Sudan because the data for the two countries are not disaggregated.

Source: Authors' calculations based on Von Grebmer et al. (2011).

The number of poor hungry people (in absolute terms) is increasing (Appendix 5 and Figure 4). COMESA, EAC, ASARECA and IGAD have all experienced an increase in the number of undernourished people.[7]

FIGURE 3: NUMBER UNDERNOURISHED IN MILLIONS (1990–2012).



Notes: The indicator is calculated on three-year averages. Regional estimates are calculated by summing up the number of undernourished people in each of the countries for the members of the region.

Source: Calculated by the authors using FAO (2012).

7 Proportion of the population estimated to be at risk of caloric inadequacy. This is the traditional FAO hunger indicator, adopted as official Millennium Development Goal indicator for Goal 1, Target 1.9.

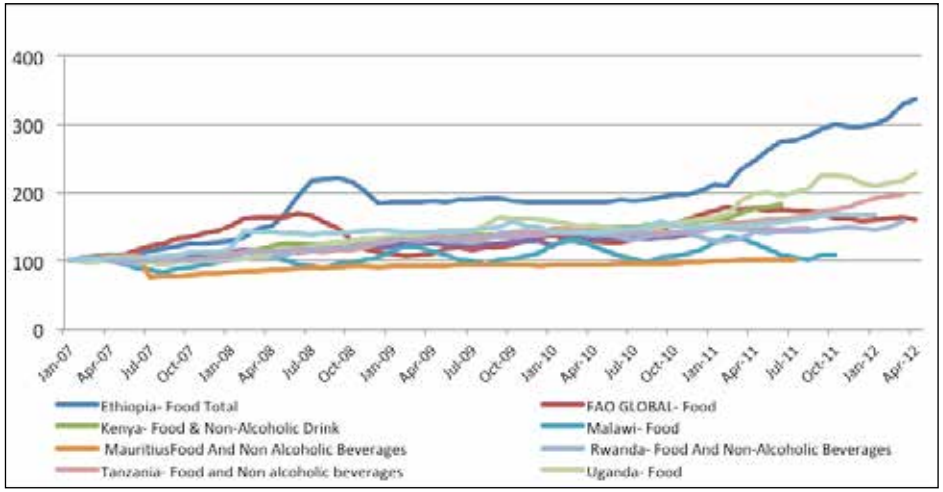
4.6 Progress in reducing poverty

Poverty has reduced but as in the case of hunger, poverty rates are still high in most countries discussed in this report (see Appendix 7). This situation indicates that the gains in growth of GDP and agricultural GDP observed in the past decade have not necessarily translated to reduction in poverty and hunger. For example, evidence of low or no reduction in poverty and food insecurity has been reported in Tanzania despite the impressive recent trends in the growth of agricultural GDP (Pauw and Thurlow 2010). This clearly indicates that poverty and hunger reduction at the country level require more than just attaining the CAADP growth target. Countries must enhance the quality of agricultural development interventions including aspects such as the choice of sub-sectors whose interventions could have a high impact on poverty, and geographical and household targeting (Pauw and Thurlow 2010).

4.7 Trends in food prices

As is the case with other parts of the world, ECA has also been experiencing the crisis of high food prices. Prices of the key food items remain much higher than the levels before the global food crisis of 2008/2009 (Figure 4). The vulnerable groups have been and continue to be most affected. Factors responsible for the food price trends fall in two categories: demand side factors and supply side factors. On the demand side, the combination of rising incomes in developing countries, increasing world population, rapid urbanization, changing diets and the ever-increasing demand for biofuel products to cater for energy needs have been the driving forces behind the food price crisis. On the supply side, the combination of high agricultural input prices (especially fertilizers and fuel), climatic shocks, reduced world food stocks, reduced exports, underinvestment in agriculture and declining agricultural resources such as land and water have been associated with low supply of food commodities. The low supply of food commodities implies that demand outstrips supply to cause rising food prices. The factors are discussed further in Karugia et al. (2009). Furthermore, the impact of the food price crisis in the ECA region has been compounded by other regional factors such as persistent droughts and political conflicts such as those experienced in Zimbabwe, Kenya and Madagascar. High food prices are likely to worsen the hunger situation and negate the gains in hunger reduction.

FIGURE 4: TRENDS IN THE FOOD CONSUMER PRICE INDICES JAN 2007–APRIL 2012.



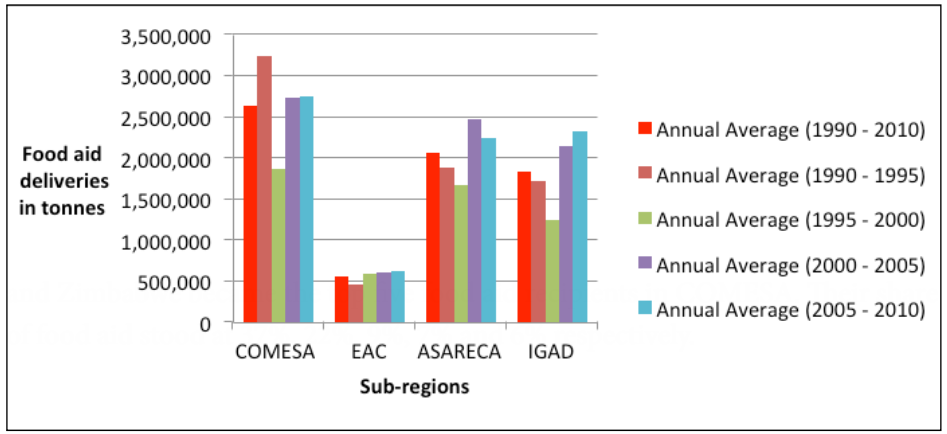
Source: ReSAKSS ECA database.

4.8 Food aid in COMESA, EAC, ASARECA and IGAD regions

Due to high levels of food insecurity, food aid deliveries to the region have been a historical phenomenon in COMESA, EAC, ASARECA and IGAD. Long-term trends data for the period 1990–2010 show that on average these sub-regions received an annual average of about 2.6 million tonnes, 0.6 million tonnes, 2 million tonnes and 1.8 million tonnes respectively (Figure 6, Appendix 6). During the same period, COMESA experienced a slow decline in food aid deliveries by about 0.5% per year. EAC, ASARECA and IGAD recorded increases of about 3%, 2% and 3% respectively. Wide variations are observed across sub-regions, countries and time. The COMESA food aid delivery was at its peak in the period

from 1990 to 1995, with deliveries of about 3.2 million tonnes (Figure 6). The largest portion of this amount went to Ethiopia, Egypt, Sudan, Malawi and Kenya. Their shares relative to the total amount of deliveries to the COMESA region were 26%, 23%, 12%, 9% and 5% respectively (Appendix 6). During 2005–2010. Improved use of agricultural inputs including water for irrigation, better seeds and chemical fertilizers are largely responsible for the improved food security in these two countries. In the period 2005–2010 Ethiopia, Sudan, Kenya, Uganda

FIGURE 5: FOOD AID TO COMESA, EAC, ASARECA AND IGAD.



Source: Authors computations using data from WFP (2012).

Rwanda and Kenya received more than half of the total food aid to the EAC in 1990–1995. The unstable political situation in Rwanda during that period was in part responsible for the need for food aid. In 2005–2010 Kenya and Uganda became the major recipients of food aid in EAC. This could in part be explained by climatic shocks (prolonged dry spell and occasional flooding), insecurity in Northern Uganda and post-election violence that hit Kenya in 2007/2008.

In the early 1990s Ethiopia, Sudan, Kenya, Eritrea, Rwanda and Uganda were the main recipients of food aid in the ASARECA region. The period 2005–2010 saw a major reduction in food aid deliveries to Eritrea and Rwanda. Large shares of ASARECA food aid deliveries went to Ethiopia, Sudan, Kenya and Uganda. These four countries and Somalia are the largest recipients of food aid in the IGAD region.

COMESA, EAC, ASARECA and EAC have also been affected by the declining trend in global food aid. Annual average changes in food aid in 2005–2010 were -3%, -11%, -2% and -1% respectively. Such declines could have serious implications on nutrition among vulnerable communities since this decline is taking place when poor households in these sub-regions are still faced with the challenges of hunger and food price volatility. Such trends might be reasonable in situations where countries have made progress in promoting food security, as is the case with Malawi and Rwanda, or in cases where alternative approaches to food aid deliveries are in place.

4.9 Use of agricultural inputs

Low use of fertilizer clearly exemplifies the limited use of productivity-enhancing interventions in the region. Average fertilizer consumption in COMESA is only about 33 kg/ha. The consumption is about 11 kg/ha, 7 kg/ha and 10 kg/ha in EAC, ASARECA and IGAD respectively (Table 24). These figures are much lower than the target of 50 kg/ha by 2015 that countries committed to during the African Fertilizer Summit. Trends data show little progress in increasing fertiliser usage in the sub-regions. A comparison of average fertilizer consumption levels in 2002–2005 with that of 2005–2009 shows that COMESA has experienced some decline while EAC, ASARECA witnessed some minor improvements. Causes of low use of fertilizer in Africa include high costs, inadequate transport, fertilizer unavailability in remote areas especially for small-scale farmers among others.

TABLE 24: FERTILIZER CONSUMPTION, KG/HA OF ARABLE LAND

Country/region	2009–2002 annual avg. (level (kg/ha	2009–2002 annual avg. (%) change	2005–2002 annual average level ((kg/ha	2005–2002 annual aver-age change (%)	2009–2005 annual avg. level	2009–2005 annual avg. change
COMESA	**33.5**	**-0.1**	**34.4**	**3.4**	**33.1**	**0.9**
EAC	**10.3**	**4.4**	**9.5**	**8.2**	**11.1**	**1.5**
ASARECA	**6.8**	**6.5**	**5.9**	**-0.4**	**7.4**	**10.9**
IGAD	**9.8**	**5.4**	**8.7**	**-3.1**	**10.4**	**11.4**
Burundi	1.9	16.3	1.6	52.8	2.5	-18.2
DRC	0.4	29.0	0.1	-50.4	0.5	61.2
Egypt	563.0	1.3	572.7	12.8	577.2	-2.3
Eritrea	2.1	-26.0	2.5	-58.3	1.7	22.7
Ethiopia	13.2	8.9	10.9	-7.1	14.6	15.2
Kenya	32.2	2.4	30.6	5.2	33.9	-1.1
Libya	48.6	-5.1	54.5	5.0	47.6	-13.6
Madagascar	3.1	7.2	3.0	34.2	3.7	-8.3
Malawi	34.0	0.4	32.3	3.3	35.0	-4.9
Mauritius	261.5	-5.3	296.3	2.7	245.7	-9.2
Rwanda	3.4	7.6	1.7	17.8	4.6	-10.0
Seychelles	24.5	17.2	17.3	19.0	32.2	21.9
Sudan	4.0	6.9	3.5	-6.0	4.1	31.1
Uganda	1.6	7.3	1.3	-9.9	1.7	26.9
Tanzania	5.5	9.9	4.7	20.1	6.2	8.1
Zambia	29.3	2.9	27.5	3.5	30.4	3.7
Zimbabwe	29.2	-3.9	30.2	-18.5	26.9	2.0

Notes: Comoros, Djibouti and Swaziland are not included due to data limitations. Regional and economic aggregate values are calculated as weighted summations, where a country's share of arable land (ha) in the regional total area is used as a weight.
Sudan includes South Sudan because the data for the two countries are not disaggregated.

Source: Authors' calculation based on World Bank (2011).

Use of low-yielding seed varieties is also a common problem in Eastern and Central Africa. Most small-scale farmers in the region still use traditional or low-yielding crop varieties (see Bayite-Kasule 2009; Jayne et al. 2009). Improved maize seeds are used in less than half the total area under maize production in the Eastern and Southern Africa region (Jayne et al. 2009). In Uganda, for example, only 6.3% of households use improved seed (Bayite-Kasule 2009). A similar situation is observed in livestock production: most of the animals kept in the region are local breeds.

4.10 Agricultural trade balance

The agricultural trade balance, measured by the ratio of the value of total agricultural exports to imports, has been on a declining trend in COMESA, EAC, ASARECA and IGAD.[8] The annual average changes in the ratio of agricultural export to import in these sub-regions for the period 1990–2010 were: -1.7%, -3.5%, -4.5% and -4.1% respectively (see Table 25).Declines in agricultural trade balance from the period 1990–1995 to 2005–2010 were: COMESA (0.74 to 0.57), EAC (2.64 to 1.59), ASARECA (1.9 to 0.98) and IGAD (1.89–1.05). These changes show that the ASARECA region went from being a net exporter of agricultural products to a net importer. The EAC and IGAD sub-regions remained net exporters of agricultural products despite the decline in their trade balance. COMESA experienced some reductions in the agricultural trade balance, but maintained its status as a net importer. Countries driving the net importing status of COMESA are: Comoros, Egypt, DRC, Djibouti, Libya, Mauritius, Zambia and Seychelles.

8 Values greater than one indicate that the country or region is a net exporter; values less than one indicate that the country is a net importer.

TABLE 25: AGRICULTURAL TRADE BALANCE (1990–2010)

	Annual avg. level 2010–1990	Annual avg. % change 1990–2010	Annual avg. level 1990–1995	Annual avg. % change 1990–1995	Annual avg. level 1995-2000	Annual avg. % change 1995–2000	Annual avg. level 2000–2005	Annual avg. % change 2000–2005	Annual avg. level 2005–2010	Annual avg.% change 2005–2010
COMESA	**0.7**	**-1.7**	**0.7**	**2.4**	**0.7**	**-3.0**	**0.7**	**2.6**	**0.6**	**-4.2**
EAC	**2.0**	**-3.5**	**2.6**	**-6.3**	**2.2**	**-8.5**	**1.7**	**0.9**	**1.6**	**-2.6**
ASARECA	**1.4**	**-4.5**	**1.9**	**-3.8**	**1.7**	**-8.5**	**1.2**	**-1.4**	**1.0**	**-3.7**
IGAD	**1.5**	**-4.1**	**1.9**	**-2.6**	**1.8**	**-9.8**	**1.2**	**0.0**	**1.0**	**-1.3**
Burundi	1.7	-7.2	2.6	-11.9	2.2	1.2	1.1	-9.2	1.0	4.0
Comoros	0.4	-4.9	0.7	-19.0	0.2	9.3	0.5	3.3	0.2	-12.7
DRC	0.2	-12.1	0.4	-2.7	0.3	-14.4	0.1	-14.1	0.1	-0.1
Djibouti	0.1	6.1	0.1	-15.3	0.0	-8.6	0.1	19.4	0.1	3.6
Egypt	0.2	4.4	0.2	4.2	0.1	1.0	0.3	19.7	0.3	1.7
Eritrea	0.0	-9.8	0.1	-18.9	0.1	-18.3	0.0	-12.0	0.0	18.5
Ethiopia	1.6	-1.3	1.2	22.1	2.2	-7.1	1.2	11.1	1.5	-6.4
Kenya	2.5	-2.3	3.0	-2.3	2.6	-5.4	2.4	6.8	2.1	-7.5
Libya	0.0	-12.7	0.0	-4.2	0.0	-0.4	0.0	-26.2	0.0	-10.0
Madagascar	1.6	-8.8	2.7	-1.0	1.4	-15.1	1.4	-14.7	0.5	-2.9
Malawi	4.5	-0.3	3.4	-13.2	6.8	20.9	4.8	-18.2	3.6	-3.9
Mauritius	1.1	-6.1	1.6	-6.9	1.2	-7.2	1.0	-1.1	0.7	-15.4
Rwanda	0.8	-0.1	1.0	-36.4	0.5	24.3	0.6	2.0	0.9	-7.2
Seychelles	0.0	1.9	0.0	14.6	0.0	-8.4	0.0	4.3	0.0	17.8
Somalia	0.7	-5.5	0.8	8.6	1.1	-10.5	0.6	-7.5	0.3	0.8
Sudan	1.1	-10.4	1.8	-0.1	1.6	-14.7	0.8	-3.6	0.4	-14.4
Swaziland	1.9	-6.6	3.0	-4.4	2.0	-17.5	1.2	-11.1	1.2	-1.2
Uganda	2.3	-7.4	4.0	-16.3	2.5	-11.9	1.4	-15.2	1.3	5.4
Zambia	1.0	8.7	0.5	-6.0	0.8	21.7	1.3	14.2	1.6	3.5
Zimbabwe	4.4	-11.5	7.0	-7.0	5.2	6.0	4.7	-30.8	0.9	-14.1
Tanzania	1.7	-4.4	2.4	-5.6	1.8	-14.1	1.3	1.1	1.2	1.5

Regional estimates were calculated using share of import trade as a weighting factor.

Source: Computed by the authors using data from FAO(2011).

5. Conclusion

This report focused on the analysis of trends in the productivity of selected agricultural products in COMESA, ASARECA, EAC and IGAD at national and regional levels. Explanations for the observed trends were discussed. The findings indicate that agricultural productivity is low in most of the countries studied and consequently regional productivity estimates are generally low. In a few exceptional cases, high productivity was observed in some countries such as Egypt and Mauritius. There are lessons to learn from such countries.

Generally, production of crops and livestock is growing faster than growth in productivity. This clearly indicates that, to a large extent, the recently observed growth in the production of crops and livestock products (e.g. meat and milk) is being driven by expansion of cropland or increase in in livestock numbers rather than increase in output per unit of land or per animal. Increasing the area of land under production or animal herd sizes is only feasible in the short term and where land is available. These strategies are unlikely to be sustainable in the densely populated parts of the region that are already facing land constraints, hence the need for intensification. However, in a few cases productivity of some crops is growing faster than production; possible determinants for such trends are discussed.

Wide yield gaps are observed in countries and regional groupings discussed in this report. Average yields achieved for most crops and livestock products are much lower than the potential. Therefore, there is need to promote interventions that enhance agricultural productivity.

Agriculture labour productivity remains generally low. Although increasing trends in labour productivity have observed in several countries and regional groups, values are still low because the starting levels in the 1980s were very low. Ironically, decline in agriculture labour productivity is observed in some countries, this is an issue of concern given the importance of the sector to people's livelihoods.
The report recommends several strategies to enhance agriculture productivity. These are discussed in the following sections.

i) Promote and support the adoption of improved inputs in agricultural production

This report presents evidence of productivity gains arising from use of improved agricultural inputs such as drought and disease-tolerant crop varieties; high yielding crop varieties; chemical fertilizers; and rearing of improved livestock breeds in various parts of Eastern, Central and Southern Africa. The results, however, show that use of improved inputs is rather limited in most countries, especially among small-scale farmers. Constraints limiting the use of inputs are highlighted. Strategies to address these constraints are necessary. Examples of strategies may include: enhancing accessibility and affordability of inputs to small-scale farmers; training and awareness creation; promoting efficient marketing of inputs through enabling laws, regulations and policies among others.

Suitability of agricultural inputs varies across space. The choice of appropriate strategy or type of input to suit different geographical settings need to be guided by evidence from credible studies (e.g. community needs assessments, suitability analysis, feasibility analysis, ex ante impact analysis and others).

ii) Promote adoption of good crop and animal management techniques

Use of improved inputs alone is insufficient in enhancing agricultural productivity. Available evidence shows that complementing improved input use with better crop and livestock husbandry approaches enhances the chances of attaining productivity gains from investments in improved inputs. Examples of good crop management techniques that would be useful to promote include: improved soil and water conservation measures; effective weed management; timely sowing; proper spacing; and optimal fertilizer application. Promotion of better animal husbandry techniques such as, use of improved breeds and feeds is essential for improving animal production.

iii) Enhance access to agricultural extension services

Agricultural research has generated various useful technologies for enhancing agriculture productivity. Adoption of these techniques is taking place in some places, but significant room for improvement remains with respect to linkages between research results and field applications. Enhanced extension systems are instrumental in promoting adoption. Innovative extension approaches that involve public–private partnerships should be promoted.

iv) Incentivize farmers to adopt productivity enhancing techniques through strengthening of agricultural marketing and reduction of post-harvest losses

Farmers are more likely to invest in productivity enhancing inputs if they are assured of increased productivity through sale of produce. Measures to enhance agricultural marketing and reduce post-harvest losses therefore offer huge incentives for adoption of productivity enhancing technologies. Strategies for agricultural trade facilitations are recommended through: development of rural infrastructure; removal or reduction of tariff and non-tariff barriers; organizing farmers into groups; and linking small-scale farmers with vendors and markets of agricultural products. To reduce post-harvest losses, there is need to improve storage facilities and promote post-harvest processing.

(viii) Investing in irrigation

The report provides evidence of high crop productivity in areas that have harnessed their irrigation potential (for example, in Egypt and Mauritius). Eastern and Southern Africa still has much untapped irrigation potential (Mati 2007). Efforts to increase agricultural productivity should also focus on promoting irrigation. Several water harvesting techniques have been applied successfully in different places in this region. It would be beneficial to upscale these interventions in the areas where they can be applied.

References

Aertssen G, Mutijima A and Mbarubugeye S. 2006. Prospects for achieving sustainable agricultural growth in Rwanda. Rwanda Agricultural Policy Note, Background Study #1. Unpublished.

Appleton S. 2000. Education and health at the household level in sub-Saharan Africa. Explaining African Economic Growth Performance Conference Series. CID Working Paper 13. CID (Center for International Development), Harvard University, Cambridge, Massachusetts, USA.

Asenso-Okyere K, Asante FA, Tarekegn J and Andam KS. 2009. *The linkage between agriculture and health*. IFPRI Discussion Paper 00861. IFPRI (International Food Policy Research Institute), Washington, DC, USA.

Audibert M. 2008. Endemic diseases and agricultural productivity: Challenges and policy response. Paper presented at the AERC Biannual Research Workshop, Nairobi, Kenya, 29 November–4 December 2008.

Bayite-Kasule S. 2009. Inorganic fertilizer in Uganda: Knowledge gaps, profitability, subsidy, and implications of a national policy. Uganda Strategy Support Program Brief 8. IFPRI (International Food Policy Research Institute), Kampala, Uganda.

Bekunda M. 1999. Farmers' responses to soil fertility decline in banana-based cropping systems of Uganda. Managing Africa's Soils 4. (Available from http://pubs.iied.org/pdfs/7397IIED.pdf) (Accessed on 29 November 2011). Russell Press, Nottingham, UK

Benin S, Kennedy A, Lambert M and McBride L. 2010. *Monitoring African agricultural development processes and performance: A comparative analysis*. ReSAKSS Annual Trends and Outlook Report. IFPRI (International Food Policy Research Institute), Washington, DC, USA.

Bishop-Sambrook C. 2003. Labour saving technologies and practices farming and household activities in Eastern and Southern Africa: Labour constraints and the impact of HIV/AIDS on rural livelihoods in Bondo and Busia districts, western Kenya. A joint study by IFAD (International Fund for Agricultural Development) and FAO (Food and Agriculture Organization of the United Nations), Rome, Italy

Bwalya M. 2012. Countries with compacts /investment plans as of March 2012. African Union and NEPAD (New Partnership for Africa's Development) Planning and Coordinating Agency (NPSA), Johannesburg, South Africa.

Byiringiroa F and Reardon T. 1996. Farm productivity in Rwanda: Effects of farm size, erosion, and soil conservation investments. *Agricultural Economics* 15(2):127–136.

CIRAD (French Agricultural Research Centre for International Development). 2005. Food security and agricultural development in sub-Saharan Africa: Building a case for more support. Background document prepared by CIRAD for FAO (Food and Agriculture Organization of the United Nations), Rome, Italy.

Central Statistical Agency. 2011. Data shared by Mr Yigezu Biratu, Addis Ababa, Ethiopia COMPETE (Competitiveness and Trade Expansion Program). 2010. Staple foods value chain analysis, country report for Burundi. COMPETE, Nairobi, Kenya

CountrySTAT Kenya. 2011. CountrySTAT Kenya. (Available from http://countrystat.org/ken) (Accessed on 29 November 2011).

CountrySTAT Tanzania. 2011. CountrySTAT Tanzania. (Available from http://countrystat.org/tza) (Accessed on 29 November 2011).

Chilonda P, Machethe C and Minde I. 2007. Poverty, food security and agricultural trends in Southern Africa. ReSAKSS Working Paper 1. ICRISAT (International Crops Research Institute for the Semi-Arid Tropics), IFPRI (International Food Policy Research Institute) and IWMI (International Water Management Institute),Washington, DC, USA.

Diagne A, Midingoyi SG, Wopereis M and Akintayo I. 2010. The NERICA success story: Development, achievements and lessons learned. Draft. AfricaRice (The Africa Rice Centre) Cotonou, Benin. (Available from http://siteresources.worldbank.org/AFRICAEXT/Resources/258643-1271798012256/NERICA-Success-Story-11-2010.pdf). Accessed in June 2011

Doss CR, Mwangi W, Verkuijl H and de Groote H. 2003. Adoption of maize and wheat technologies in Eastern Africa: A synthesis of the findings of 22 case studies. CIMMYT Economics Working Paper 03-06. CIMMYT (International Maize and Wheat Improvement Center), Mexico, DF.

Ehui S and Pender J. 2005.Resource degradation, low agricultural productivity, and poverty in sub-Saharan Africa: Pathways out of the spiral. In: Colman D and Vink N (eds), *Reshaping agriculture's contributions to society*. Proceedings of the twenty-fifth International Conference of Agricultural Economists. Blackwell, Ames, Iowa, USA. Pages 225–242

Fan S. 2010. *Halving hunger: Meeting the first Millennium Development Goal through "business as unusual"*. IFPRI (International Food Policy Research Institute), Washington, DC, USA.

FAO (Food and Agriculture Organisation of the United Nations). 2011. FAOSTAT. FAO, Rome, Italy. (Available from http://faostat.fao.org) (Accessed on 29 November 2011).

FAO (Food and Agriculture Organization of the United Nations). 2012. FAO food security indicators, released on 9 October 2012. FAO, Rome, Italy. (Available from http://www.fao.org/hunger/en/) (Accessed on 20 November 2012).

FAO (Food and Agricultural Organization of the United Nations) and UNIDO (United Nations Industrial Development Organization). 2009. *Agricultural mechanization in Africa: Executive summary.* Conclusions and recommendations of a round table meeting of experts. (Available from http://www.fao.org/fileadmin/user_upload/ags/publications/arusha_rt_web.pdf) (Accessed on 29 November 2011). Rome, Italy

Feleke S, Kilma RL and Gladwin C. 2003. Determinants of food security in southern Ethiopia. Paper presented at the 2003 annual meeting of the American Agricultural Economics Association, Montreal, Canada, 27–30 July 2003.

Gollin D. 2006. Impacts of international research on intertemporal yield stability in wheat and maize: An economic assessment. CIMMYT (International Maize and Wheat Improvement Center), Mexico, DF.

Government of Kenya. 2010. Agricultural Sector Development Strategy 2010–2020. Ministry of Agriculture, Nairobi, Kenya.

Government of Rwanda. 2009. Agriculture Sector Investment Plan 2009–2012. Ministry of Agriculture and Animal Resources, Kigali, Rwanda.

Haggblade S and Hazell PBR. 2010. Successes in African agriculture: Lessons for the future. IFPRI Issue Brief 63. IFPRI (International Food Policy Research Institute), Washington, DC, USA.

Steven Haggblade, S, S. Kabwe,C.Plerhoples, 2011. Productivity impact of conservation farming on smallholder cotton farmers in Zambia, *working paper No. 47, Food Security Research Project, Lusaka, Zambia, March 2011, (Downloadable at:* http://www.aec.msu.edu/agecon/fs2/zambia/index.htm *)*

IFAD (International Fund for Agricultural Development). 2009. Making rice a cash cow in Rwanda. A brief published by the Union of Rice Cooperative in Rwanda (UCORIRWA) and IFAD Country Office, Kigali, Rwanda.

Jayne T, Rashid S, Minot N and Kasule S. 2009. *Promoting fertilizer use in Africa: Current issues and empirical evidence from the COMESA region.* Presentation at the African Agricultural Markets Programme Policy Conference, Livingstone, Zambia, 15–16 June 2009.

Karugia J, Waithaka M, Freeman A, Prabhu R, Shiferaw B, Gbegbelegbe S, Massawe S, Kyotalimye M, Wanjiku J and Macharia E. 2009. Responding to food price crisis in Eastern and Southern Africa: Policy options for national and regional action. ReSAKSS Working Paper 27. ReSAKSS-ECA (Regional Strategic Analysis and Knowledge Support System-East and Central Africa), Nairobi, Kenya.

Kijima, Y. 2008. New technology and emergence of markets: Evidence from NERICA rice in Uganda. Discussion Paper 165. Graduate School of International Development, Nagoya University, Nagoya, Japan.

Kimenye L and Bombom A. 2009. Best-bet research outputs for enhancing agricultural productivity in Eastern and Central Africa: Abstracts. ASARECA (Association for Strengthening Agricultural Research in Eastern and Central Africa) Entebbe, Uganda.

Lobell DB, Cassman KG and Field CB. 2009. *Crop yield gaps: Their importance, magnitudes, and causes*. NCESR Publications and Research Paper 3. (Available from http://digitalcommons.unl.edu/ncesrpub/3) (Accessed in May 2012). Published in Annual Review of Environment and Resources 34 (2009); doi: 10.1146/

MAFC (Ministry of Agriculture, Food Security and Cooperatives). 2010. Agricultural Sector Development Programme (ASDP) Performance review (2006/07-2009/10). MAFC, Dar es Salaam, Tanzania.

MAFC (Ministry of Agriculture, Food Security and Cooperatives). 2011. Inventory of wheat technologies in Tanzania, prepared by the extension services, August, 2011.

Mati, BM. (2007), 100 Ways to Manage Water for Smallholder agriculture in Eastern and Southern Africa, A Compendium of Technologies and Practices, SWMnet Working Paper 13, Available at http://www.asareca.org/swmnet/downloads/1179993482SWMnet%20Working%20Paper%2013%20100%20Ways%20of%20AWM%20in%20ESA.pdf Accessed in June, 2012

Nabbumba R and Bahiigwa G. 2003. *Agricultural productivity constraints in Uganda: Implications for investment.* EPRC Research Series 31. EPRC (Economic Policy Research Centre), Kampala, Uganda. (Available from http://www.eprc.or.ug/pdf_files/researchseries/series31.pdf) (Accessed on 30 November 2011).

Rockström, J., Falkenmark, M., 2000. Semiarid crop production from a hydrological perspective: Gap between potential and actual yields. Plant Science 19 (4), 319–346.

Rwanda National Institute of Statistics. 2012. (Available from http://www.statistics.gov.rw/surveys/agriculture). Accessed on July 2012

Nyoro JK and Jayne TS. 1999. Trends in regional agricultural productivity in Kenya. Kenya Agricultural Marketing and Policy Analysis Project. Tegemeo Institute of Agricultural Policy and Development, KARI (Kenya Agricultural Research Institute) and Michigan State University. (Available from http://www.tegemeo.org/documents/conference/trends.pdf) (Accessed on 30 November 2011).

Odhiambo W, Nyangito HO and Nzuma J. 2004. Sources and determinants of agricultural growth and productivity in Kenya. KIPPRA Discussion Paper 34. KIPPRA (Kenya Institute for Public Policy Research and Analysis), Nairobi, Kenya.

Omamo SW, Diao X, Wood S, Chamberlain J, You L, Benin S, Wood-Sichara, Tatwangire A. 2006. *Strategic priorities for agricultural development in Eastern and Central Africa*. IFPRI Report 150. IFPRI (International Food Policy Research Institute), Washington, DC, USA.

Ouma R, Njoroge L, Romney D, Ochungo P, Staal S and Baltenweck I. 2007. *Targeting dairy interventions in Kenya: A guide for development planners, researchers and extension workers.* SDP/KDDP (Smallholder Dairy Project/Kenya Dairy Development Programme), Nairobi, Kenya.

Owenya, M., Mariki, W, Stewart, A., Friedrich, T, Kienzle, J, Kassam, A, Shetto, R and Mkomwa, S. (2012), Conservation Agriculture and Sustainable Crop Intensification in Karatu District, Tanzania, Integrated Crop Management Vol.15-2012 http://www.fao.org/fileadmin/user_upload/agp/icm15.pdf , Accessed in April, 2013

Owuor J. 1999. Determinants of agricultural productivity in Kenya. Kenya Agricultural Marketing and Policy Analysis Project. Tegemeo Institute of Agricultural Policy and Development, KARI (Kenya Agricultural Research Institute) and Michigan State University. (Available from http://www.tegemeo.org/documents/conference/deter.pdf) (Accessed on 30 November 2011).

Pauw K and Thurlow J. 2010. Agricultural growth, poverty and nutrition in Tanzania. IFPRI Discussion Paper 00947. IFPRI (International Food Policy Research Institute), Washington, DC, USA.

Pingali PL and Heisey PW. 1999. *Cereal crop productivity in developing countries.* CIMMYT Economics Paper 99-03. CIMMYT (International Maize and Wheat Improvement Center), Mexico, DF.

Randrianarisoa C and Minten B. 2005. Getting the inputs right for improved agricultural productivity in Madagascar: Which inputs matter and are the poor different? Mimeo. The World Bank, Washington DC, USA.

Salami A, Kamara BA and Brixiova Z. 2010. Smallholder agriculture in East Africa: Trends, constraints and opportunities. African Development Bank Group Working Paper Series. (Available from athttp:/www.afdb.org), Accessed in April, 2012

Seyoum M, Alamerew S andBantte K. 2011 Evaluation of upland rice (*Oryza sativa L.*) genotypes for grain yield and yield components along an altitude gradient in South West Ethiopia. *Journal of Agronomy* 10(4):105–111.

Shiferaw B, Nagassa A, Koo J, Sonder K, Smale M, Wood S, Brawn H, Payne T, Guo Z and Gbegbelegbe S. 2012. Potential economic profitability and competitiveness of what production in Sub-Saharan Africa. Presentation made at the Wheat for Food Security in Africa Conference, Addis Ababa, Ethiopia, 8–10 October 2012.

Skarstein, R., (2005) Economic Liberalization and Smallholder Productivity in Tanzania. From Promised Success to Real Failure, 1985–1998, Journal of Agrarian Change, Vol.5 No.3, July 2005, PP. 334-362© Blackwell Publishing Ltd, Henry Bernstein and Terence J. Byres 2005.

Smale M, Byerlee D and Jayne TS. 2011. Maize revolutions in sub-Saharan Africa. Working Paper WPS 40/2011. Tegemeo Institute of Agricultural Policy and Development, Nairobi, Kenya. (Available from http://www.tegemeo.org/documents/work/Wp40-Maize-Revolutions-in-sub-Saharan-Africa.pdf). Accessed in Febreuary, 2012

Spielman D and Pandya-Lorch R. (eds). 2010. *Proven successes in agricultural development: A technical compendium to Millions Fed.* IFPRI (International Food Policy Research Institute), Washington DC, USA.

Tanner DG, Payne TS and Abdalla OS. (eds). 1996. The Nineth Regional Wheat Workshop for Eastern, Central and Southern Africa. Addis Ababa, Ethiopia, October 2-6, 1995. CIMMYT (International Maize and Wheat Improvement Center), Addis Ababa, Ethiopia

Timmer P. 1988. The Agricultural Transformation In: Cheneo H and Srinivasan TM (eds), *Handbook of development economics*. Volume 1. Elsevier Science Publishers B.V. Amsterdam, The Netehrlands (Available FROM http://www.dipsa.unifi.it/romano/PDF/Timmer%20HDE%20ch08.pdf) (Accessed in March 2013).

UBOS (Uganda Bureau of Statistics). 2010. *2010 statistical abstract.* UBOS, Kampala, Uganda.

United Republic of Tanzania. 2011. Agricultural Sector Development Programme (ASDP), Monitoring and Evaluation Framework. Revised Final Draft. Dar Es Salaam, Tanzania. (Available fromhttp://www.agriculture.go.tz/M&E/ASDP%20M&E%20HP/Key%20documents/ASDPM&E_Framework_FinalDraft_Revised_Mar2011.pdf) (Accessed in November 2011)

Von Grebmer K, Torero M, Olofinbiyi T, Fritschel H, Wiesmann D, Johannes Y, Schofield L and von Oppeln C. 2011. *2011 Global Hunger Index: The challenge of hunger: Taming price spikes and excessive food price volatility*. IFPRI (International Food Policy Research Institute), Washington, DC, USA.

WFP (World Food Programme). 2012. Food Aid Information System. Online dataset. WFP (Available from http://www.wfp.org/fais/). Accessed in November, 2012

World Bank. 2011. World Development Indicators. The World Bank online datasets. The World Bank, Washington, DC, USA. (Available from http://data.worldbank.org) (Accessed in November 2011).

World Bank. 2013. World Bank Indicators Database. The World Bank Group, Washington DC, USA. (Available from http://data.worldbank.org/indicator/AG.LND.IRIG.AG.ZS) (Accessed in May 2013).

WRI (World Resources Institute). 2007. Earth Trends, Agriculture and Food Database. (Available from www.earthtrends.wri.org) (Accessed in November 2010).

Appendices

APPENDIX 1: CEREAL YIELDS (T/HA) IN THE COMESA REGION (1990–2010)

Country/region	Annual avg. level1990–2010 (t/ha)	Annual avg. change 1990–2010 (%)	Annual avg. level 1990–1995 (t/ha)	Annual avg. change 1990–1995 (%)	Annual avg. level 1995–2000 (t/ha)	Annual avg. change 1995–2000 (%)	Annual avg. level 2000–2005 (t/ha)	Annual avg. change (2000–2005) (%)	Annual avg. level 2005–2010 (t/ha)	Annual avg. change 2005–2010 (%)
COMESA	**1.6**	**0.6**	**1.5**	**-4.1**	**1.5**	**2.9**	**1.6**	**-0.7**	**1.7**	**2.0**
ASARECA	**1.3**	**-0.2**	**1.4**	**-0.8**	**1.3**	**-1.7**	**1.3**	**1.8**	**1.3**	**-0.9**
EAC	**1.4**	**-0.4**	**1.5**	**2.0**	**1.5**	**-1.4**	**1.5**	**-3.3**	**1.3**	**-0.8**
IGAD	**1.0**	**1.4**	**0.9**	**-1.8**	**0.9**	**0.9**	**1.0**	**1.1**	**1.1**	**2.1**
Burundi	1.3	-0.2	1.4	-0.8	1.3	-1.7	1.3	1.8	1.3	-0.9
Comoros	1.3	-0.1	1.3	0.9	1.3	-0.2	1.3	0.0	1.3	-0.8
DRC	0.8	-0.2	0.8	-0.7	0.8	0.5	0.8	-0.4	0.8	0.0
Djibouti	1.7	-0.1	1.7	0.0	1.7	1.4	1.7	-3.1	1.6	2.1
Egypt	6.8	1.8	5.8	0.9	6.7	4.0	7.4	1.1	7.5	0.2
Eritrea	0.6	3.2	0.5	25.4	0.6	8.8	0.3	-5.8	0.8	18.6
Ethiopia	1.3	2.1	1.1	-11.3	1.2	0.2	1.2	2.1	1.5	2.4
Kenya	1.6	-0.4	1.7	2.3	1.5	-2.9	1.6	3.7	1.5	-7.5
Libya	0.7	-0.9	0.7	-0.5	0.7	-1.9	0.6	-0.1	0.6	0.0
Madagascar	2.1	1.3	1.9	0.1	2.0	-1.0	2.2	5.9	2.4	-2.5
Malawi	1.3	2.6	1.1	5.3	1.4	6.3	1.2	-11.1	1.6	16.7
Mauritius	6.1	4.8	4.0	-1.3	5.5	12.9	7.4	-3.7	8.1	1.1
Rwanda	1.1	-0.4	1.2	0.7	1.0	-7.9	1.0	5.1	1.1	-1.9
Seychelles	0.0		0.0		0.0		0.0		0.0	
Sudan	0.6	0.9	0.5	-4.2	0.5	0.4	0.6	1.2	0.6	1.8
Swaziland	1.3	-4.0	1.5	9.3	1.8	-4.6	1.3	-4.1	0.9	-23.1
Tanzania	1.4	-0.4	1.3	1.5	1.5	-1.2	1.4	-8.8	1.2	2.9
Uganda	1.5	0.4	1.5	1.1	1.5	3.0	1.6	-1.0	1.5	0.2
Zambia	1.6	2.2	1.5	1.7	1.5	-0.3	1.7	4.6	2.0	3.4
Zimbabwe	1.0	-5.0	1.1	-10.7	1.2	10.8	0.9	-11.3	0.5	-20.4

Notes: Blank cells indicate missing values. Regional aggregate values are computed as weighted summations. The country's land area under cereal production (ha) as a share of the regional total area is used as a weight. Cereal yield, measured as t/ha of harvested land, includes wheat, rice, maize, barley, oats, rye, millet, sorghum, buckwheat and mixed grains. Production data on cereals relate to crops harvested for dry grain only. Cereal crops harvested for hay or harvested green for food, feed or silage, and those used for grazing, are excluded.
Sudan includes South Sudan because the data for the two countries are not disaggregated.
Source: Authors' calculations based on data from World Bank (2011).

APPENDIX 2: TRENDS IN AREA UNDER CROP LAND FOR SELECTED CROPS AND COUNTRIES9

Appendix 2.1: Trends in area under production of selected staple crops in Uganda (1992–2009)

Crop	Area under production ('000 ha)							Change in area under production (%)
	1992	2004	2005	2006	2007	2008	2009 (estimate)	1992–2009
Plantain bananas	1459	1670	1675	1677	1678	1680	1682	15.3
Finger millet	396	412	420	429	437	448	460	16.2
Maize	438	750	780	819	839	862	887	102.4
Sorghum	250	285	294	308	314	321	329	31.6
Rice	50	93	102	113	119	128	138	176.0
Wheat	5	9	9	10	11	11	12	140.0
Sweet potatoes	442	602	590	584	590	599	609	37.8
Irish potatoes	37	83	86	90	93	97	101	173.0
Cassava	362	407	387	379	386	398	411	13.5

Source: Data for 1992 are from MAAIF;[10] the rest are from UBOS (2010).

Appendix 2.2: Trends in cereal production, area under production and yields in Ethiopia (2001–2009)

Crop	Indicator	Indicator level			Change in indicator (%)	Change in indicator (%)
		2001–2003	2004–2006	2007–2009	2001–2009	2004–2009
Maize	Area (ha)	1,293,860	1,539,802	1,769,255	36.7	14.9
	Production (t)	2,377,069	3,173,319	3,859,811	62.4	21.6
	Yield (t/ha)	1.8	2.0	2.2	19.5	6.7
Teff	Area (ha)	1,912,844	2,262,081	2,545,050	33.1	12.5
	Production (t)	1,574,758	2,212,956	3,066,772	94.7	38.6
	Yield (t/ha)	0.8	1.0	1.2	46.2	23.4
Wheat	Area (ha)	1,033,875	1,444,224	1,520,700	47.1	5.3
	Production (t)	1,377,007	2,286,247	2,642,591	91.9	15.6
	Yield (t/ha)	1.3	1.6	1.7	30.5	9.5
Cereals	Area (ha)	6,564,301	8,066,562	8,911,048	35.8	10.5
	Production (t)	8,020,930	11,517,234	14,582,542	81.8	26.6
	Yield (t/ha)	1.2	1.4	1.6	34.1	14.8
Pulses	Area (ha)	1,024,253	1,340,146	1,530,735	49.4	14.2
	Production (t)	930,647	1,399,799	1,881,805	102.2	34.4
	Yield (t/ha)	0.9	1.0	1.2	35.0	17.9

Source: Central Statistical Agency (2011).

9 In this appendix we provide more detailed information on this indicator from national data sources. We used a case of selected countries: Ethiopia, Kenya, Rwanda, Tanzania and Uganda. These countries were selected because of data availability.

10 Statistics Department, MAAIF (1997) in Mubiru (2000).

Appendix 2.3: Harvested areas of selected food crops in Kenya (2001–2010)

Crop	Harvested area (ha)										Change in harvested area (%)
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2001–2010
Wheat	129,209	144,794	151,135	145,359	159,477	150,488	104,176	130,273	131,594	160,043	23.9
Rice	13,200	13,000	10,781	13,322	15,940	23,106	16,457	16,734	21,829	20,181	52.9
Maize	1,707,403	1,592,315	1,670,914	1,819,817	1,760,618	1,888,185	1,615,304	1,793,757	1,885,071	2,008,346	17.6
Sorghum	136,078	144,294	148,985	123,155	122,368	163,865	155,550	104,041	173,172	225,782	65.9
Millet	104,292	118,700	108,343	129,750	92,430	137,711	128,114	53,155	104,576	99,124	-5.0
Beans	870,357	928,651	879,032	872,070	1,034,477	995,391	846,327	610,428	960,705	689,377	-20.8
Pigeon peas	164,001	164,453	183,612	195,308	180,240	196,630	154,554	195,959	118,167	158,746	-3.2
Cowpeas	128,077	122,398	151,679	125,189	72,654	161,971	130,163	148,157	124,302	168,273	31.4
Cassava	78,332	81,967	53,297	56,010	68,320	68,502	53,610	54,673	70,426	61,573	-21.4
Sweet potatoes	66,520	60,410	58,770	60,701	61,300	74,937	61,111	62,785	77,821	42,312	-36.4
Yams	1,000	960	952	836	835	842	925	808	882	2,774	177.4
Sugar cane	117,131	126,826	122,580	131,507	144,765	147,730	158,568	169,421	154,298	157,583	34.5
Coconut	43,572	43,682	42,220	43,162	37,293	37,137	37,813	40,761	49,707	49,945	14.6
Tea	..	130,300	293,700	136,800	141,300	147,080	149,190	157,720	158,394	171,916	31.9
Coffee	170,000	170,000	170,000	170,000	170,000	170,000	162,720	162,720	160,000	160,000	-5.9
Onions	5,093	5,964	6,476	6,513	6,395	7,100	8,254	7,892	6,934	..	36.1
Carrots	2,737	3,535	4,462	3,088	2,737	2,974	4,475	3,485	3,165	4,844	77.0

Source: CountrySTAT Kenya (2011).

Appendix 2.4: Harvested areas of selected food crops in Tanzania (2000–2009)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Change in harvested area 2000–2009
Maize	1,870,384	1,515,160	1,587,766	2,594,793	2,954,952	3,001,337	2,570,147	2,600,341	2,848,449	2,961,334	58.3
Sorghum	736,173	609,473.7	695,894	696,227	844,830	868,966	715,884	817,946	897,912	874,218.8	18.8
Paddy	516,944	405,859.6	325,939	545,534	583,318	684,375	633,770	557,981	664,667	904,508	75.0
Wheat	71,683	58,544.1	55,336	75,123	69,491	93,377	53,224	75,369	80,492	170,731.9	138.2
Cassava	809,959	774,023.8	660,932.6	866,282	952,740	906,387	993,171	779,067	837,744	108,1384	33.5
Bananas	303,526	345,171.6	289,925.7	358,221	365,805	423,420	499,620	404,428	420,753	534,354.1	76.0

Source: CountrySTAT Tanzania (2011).

Appendix 3: Beef production in the COMESA region (1990–2010)

Sub-region/country	Annual avg. level 1990–2010 (t)	Annual avg. level 1990– 1995 (t)	Annual avg. level 1995–2000 (t)	Annual avg. level 2000–2005 (t)	Annual avg. level 2005–2010 (t)	Annual avg. change 1990–2010 (%)	Annual avg. change 1990-–1995 (%)	Annual avg. change 1995–2000 (%)	Annual avg. change 2000–2005 (%)	Annual avg. change 2005–2010 (%)
COMESA	**1,926,201**	**1,232,502**	**1,512,763**	**1,965,644**	**2,937,658**	**5.9**	**6.2**	**3.3**	**9.4**	**4.3**
EAC	**696,584**	**560,808**	**594,710**	**721,280**	**897,516**	**3.2**	**2.0**	**2.1**	**5.6**	**2.8**
ASARECA	**1,684,956**	**1,063,237**	**1,298,555**	**1,731,860**	**2,601,090**	**6.1**	**7.3**	**3.1**	**9.9**	**4.2**
IGAD	**1,318,347**	**715,554**	**954,670**	**1,374,186**	**2,182,598**	**7.7**	**10.0**	**4.0**	**12.3**	**4.4**
Burundi	11,268	12,090	9,315	9,613	13,366	0.7	-3.6	-2.0	5.5	7.2
Comoros	1,086	990	975	1,137	1,219	1.6	1.4	-0.1	1.9	1.6
DRC	14,883	19,207	14,729	12,716	12,383	-2.8	-4.8	-3.0	-1.6	0.1
Djibouti	4,399	3,020	4,041	5,500	5,253	3.9	7.3	11.1	-6.4	11.6
Egypt	278,006	182,111	241,208	284,759	400,295	5.3	8.3	2.2	7.1	4.0
Eritrea	15,887	9,667	14,108	15,873	20,018	4.7	4.3	10.1	1.8	6.7
Ethiopia	314,831	237,083	271,667	329,085	371,743	3.2	-0.7	4.0	3.3	1.4
Kenya	320,079	239,233	259,570	324,411	445,700	4.1	1.3	2.0	8.6	3.3
Libya	16,742	25,083	24,050	6,750	8,823	-7.6	-4.3	-11.9	-3.3	5.0
Madagascar	138,939	144,394	147,263	123,569	142,354	-0.3	0.4	0.3	-1.6	3.0
Malawi	20,487	16,395	15,999	20,746	27,528	3.5	-2.6	-1.1	4.0	9.3
Mauritius	2,651	2,536	2,826	2,930	2,529	0.1	6.3	7.1	3.1	-6.8
Rwanda	20,380	12,393	14,300	21,149	32,067	6.4	-7.1	12.0	6.9	8.7
Seychelles	41	71	53	27	13	-10.9	-2.5	-13.2	-8.1	-14.0
Somalia	56,262	43,083	57,567	63,708	62,350	2.3	2.1	3.9	1.7	-3.4
Sudan	552,053	221,284	256,359	528,667	1,154,333	11.4	-0.5	6.0	25.5	6.6
Swaziland	13,908	13,376	14,448	13,386	15,125	0.8	4.6	3.8	2.5	1.7
Uganda	102,081	85,558	91,358	106,942	123,200	2.5	1.1	2.6	3.6	2.5
Tanzania	242,776	211,533	220,167	259,167	283,183	2.2	4.0	1.6	2.7	1.4
Zambia	54,825	52,104	49,733	56,800	59,167	0.9	-4.6	5.7	1.9	0.8
Zimbabwe	90,900	79,282	80,761	101,588	102,541	1.9	-4.0	7.9	-0.3	-0.1

Notes: The figures represent five-year averages; regional estimates were calculated by summing up production by the regional member states.
Sudan includes South Sudan because the data for the two countries are not disaggregated.
Source: Authors' computations based on data from FAO, 2012.

Appendix 4: Trends of GDP per capita in COMESA (1990–2010)

	(Annual average per capita income (USD/person per year					(%) Annual average growth rate in per capita income				
Country name	1995–1990	2000–1995	2005–2000	2010–2005	2010–1990	1995–1990	2000–1995	2005–2000	2010–2005	2010–1990
World	**4571**	**5191**	**5886**	**8276**	**6001**	**4.3**	**0.1**	**6.6**	**5.2**	**3.9**
Sub-Saharan Africa	**558.4**	**540.9**	**624.6**	**1109.2**	**717.3**	**-2.2**	**-2.2**	**12.5**	**7.9**	**4.3**
COMESA	**495**	**551**	**553**	**886**	**629**	**-1.8**	**2.9**	**0.5**	**10.5**	**3.5**
EAC	**229**	**303**	**326**	**500**	**343**	**-2.9**	**3.8**	**4.9**	**9.2**	**4.8**
ASARECA	**234**	**228**	**249**	**441**	**293**	**-6.0**	**0.1**	**6.8**	**12.1**	**3.9**
IGAD	**245**	**247**	**271**	**525**	**328**	**-4.9**	**-1.0**	**8.1**	**13.3**	**4.7**
Burundi	178	144	128	193	162	-5.7	-4.2	2.3	9.9	0.3
Comoros	519	417	480	690	534	-5.8	-4.7	12.3	5.0	1.9
DRC	205	117	105	167	153	-13.2	-7.6	7.5	8.6	-1.4
Djibouti	795	761	801	1034	845	-0.2	-0.9	3.1	8.8	1.6
Egypt	784	1234	1266	1912	1311	6.4	8.6	-5.2	17.9	5.7
Eritrea	161	197	206	304	226	7.0	-1.2	9.0	10.5	4.4
Ethiopia	202	134	131	284	194	-15.6	-2.7	5.5	19.3	1.9
Kenya	309	419	440	705	475	-4.4	3.1	5.3	8.5	5.0
Libya	6590	5851	5556	10848	7138	-4.8	2.7	3.8	10.4	2.3
Madagascar	250	258	278	382	297	-1.4	-0.7	1.0	9.7	2.6
Malawi	182	185	192	277	215	-9.6	-2.7	7.5	10.2	2.5
Mauritius	2987	3709	4400	6423	4409	7.0	0.4	7.2	9.3	5.2
Rwanda	275	253	220	417	299	-11.8	-0.6	5.6	14.3	2.3
Seychelles	6079	7276	8607	11155	8253	5.8	3.3	6.5	-2.0	3.9
Sudan	391	358	490	1169	615	0.6	-2.7	14.7	15.5	7.5
Swaziland	1458	1619	1800	2947	1959	5.9	-3.0	14.6	4.4	4.6
Tanzania	173	259	329	451	305	-1.3	11.5	4.2	8.4	6.3
Uganda	202	274	263	420	290	2.8	-1.9	5.3	10.7	4.6
Zambia	397	355	421	989	554	-1.7	-4.5	13.9	12.0	5.7
Zimbabwe	675	607	492	456	561	-7.0	-4.8	-3.8	3.9	-2.8

Notes: Blank cells indicate missing values. Regional aggregate values are calculated as weighted summations. The weights are computed using country's GDP as a share of regional GDP.
Annual average level is in USD/person per year and the change is in percentage.
Sudan includes South Sudan because the data for the two countries are not disaggregated.
Source: Authors' calculations based on data from the World Bank (2011).

APPENDIX 5: POPULATION UNDERNOURISHED (IN MILLIONS)

Number of poor hungry terms (in absolute terms) is also increasing (Appendix x).and country levels.

	–1990 1992	–1991 1993	–1992 1994	–1993 1995	–1994 1996	–1995 97	–1996 1998	–1997 1999	–1998 2000	–1999 2001	–2000 2002	–2001 2003	–2002 2004	–2003 2005	–2004 2006	–2005 2007	–2006 2008	–2007 2009	–2008 2010	–2009 2011	–2010 2012
World	**1000**	**989**	**983**	**967**	**949**	**931**	**920**	**914**	**911**	**919**	**922**	**923**	**915**	**910**	**898**	**884**	**871**	**867**	**868**	**869**	**868**
Africa	**175**	**178**	**181**	**184**	**187**	**190**	**194**	**198**	**202**	**205**	**208**	**209**	**209**	**209**	**210**	**212**	**216**	**220**	**225**	**231**	**239**
Sub-Saharan Africa	**170**	**173**	**176**	**179**	**183**	**186**	**190**	**193**	**197**	**200**	**203**	**204**	**205**	**205**	**205**	**208**	**211**	**216**	**221**	**227**	**234**
COMESA	**86**	**90**	**94**	**96**	**100**	**104**	**107**	**111**	**114**	**114**	**118**	**121**	**122**	**124**	**127**	**129**	**131**	**134**	**136**	**141**	**147**
EAC	**29**	**29**	**31**	**32**	**34**	**36**	**36**	**37**	**37**	**38**	**40**	**41**	**41**	**42**	**43**	**44**	**45**	**46**	**48**	**50**	**52**
ASARECA	**84**	**88**	**91**	**92**	**93**	**95**	**94**	**97**	**98**	**98**	**100**	**101**	**101**	**102**	**103**	**105**	**108**	**111**	**113**	**117**	**121**
IGAD	**66**	**70**	**71**	**71**	**70**	**71**	**70**	**72**	**72**	**71**	**73**	**74**	**74**	**74**	**75**	**77**	**79**	**81**	**82**	**84**	**87**
Egypt	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Burundi	3	3	3	3	4	4	4	4	4	4	4	4	4	5	5	5	6	6	6	6	6
DRC	2	3	5	7	11	14	17	19	21	22	23	25	26	27	28	28	29	30	31	33	34
Eritrea	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	4
Ethiopia	34	38	39	39	38	38	37	37	37	36	36	36	36	36	35	35	35	35	34	34	34
Kenya	9	9	9	9	9	9	9	9	10	10	11	12	12	12	12	12	12	12	13	13	13
Madagascar	3	3	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	6	6	7	7
Malawi	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4
Rwanda	4	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3
Somalia	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6
Sudan	11	11	10	10	10	10	10	11	11	11	11	11	11	11	12	13	14	15	16	17	18
Uganda	5	5	6	6	6	7	7	7	6	6	7	7	7	7	8	9	9	10	10	11	12
Tanzania	8	9	10	11	12	12	12	13	13	14	14	14	14	14	14	14	14	15	16	17	18
Zambia	3	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	6	6	6
Zimbabwe	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	4	4	4

Notes: Sudan includes South Sudan because the data for the two countries are not disaggregated.
Comoros, Djibouti, Libya, Libya, Mauritius, Seychelles and Swaziland are missing from the table because of data unavailability.
The indicator is calculated on three-year averages. Regional estimates for COMESA, EAC, ASARECA and IGAD are calculated by summing up the number of undernourished people in each of the countries for the members of the region.

Source: FAO (2012).

APPENDIX 6: FOOD AID TO COMESA, T (1990–2010)

Region /country	Annual avg. level (1990–(2010	Annual avg. change (1990–(2010	Annual avg. level (1990–(1995	Annual avg. change (1990–(1995	Annual avg. level ((1995–2000	Annual avg. change (1995–(2000	Annual avg. level ((2000–2005	Annual avg. change (2000–(2005	Annual avg. level ((2005–2010	Annual avg change (2005–(2010
COMESA	**2,640,708**	**-0.5**	**3,239,519**	**-9.3**	**1,863,783**	**7.4**	**2,734,005**	**5.21**	**2,752,654**	**-3.1**
EAC	**553,061**	**3.0**	**449,290**	**36.9**	**594,687**	**-2.2**	**603,043**	**-0.61**	**617,860**	**-11.3**
ASARECA	**2,067,861**	**2.3**	**1,883,198**	**4.1**	**1,673,119**	**11.3**	**2,463,690**	**3.4**	**2,446,746**	**-2.3**
IGAD	**1,826,026**	**2.9**	**1,711,331**	**-2.3**	**1,248,817**	**21.0**	**2,142,179**	**4.29**	**2,314,508**	**-1.0**
Burundi	39,178	15.8	32,513	118.0	21,520	-30.6	54,564	36.16	59,115	-14.3
Comoros	4,290	-20.2	5,506	6.9	3,316	-31.3			3,840	
Djibouti	11,714	0.8		11.8	10,905	-4.6	12,440	3.41	13,585	-5.0
DRC	77,953	6.2	71,322	-3.3	42,021	-10.8	74,308	10.62	128,628	15.0
Egypt	234,018	-26.7	745,030	-38.6	84,779	-29.7	17,766	-18.6	8,901	-34.4
Eritrea	136,054	-18.1	145,931	44.6	98,489	14.1	261,026	-0.55	58,208	-88.3
Ethiopia	909,179	1.9	838,181	-5.7	749,809	20.8	1,132,209	-2.84	1,005,003	8.7
Kenya	188,685	4.6	175,526	7.1	115,618	31.3	197,151	-15.5	256,024	4.2
Madagascar	38,691	-0.1	40,439	-9.4	30,186	5.2	48,030	-1.08	37,342	-14.4
Malawi	151,960	-6.1	291,579	-0.5	95,683	-26.0	100,809	26.53	113,064	-24.3
Mauritius	5,050	-35.7	5,889	-35.7	757	29.7				
Rwanda	131,891	-6.3	121,589	114.3	318,520	-8.8	80,413	-25	29,444	-25.2
Seychelles	934	-51.4	293	-51.4					3,500	0.0
Somali	106,444	1.8	138,896	-3.5	41,093	13.0	36,231	7.92	181,042	16.2
Sudan	372,360	4.0	386,678	-17.0	157,929	24.8	345,073	35.2	609,407	-9.2
Swaziland	12,823	0.8	13,380	4.0	6,522	42.5	15,392	-14.6	13,509	-9.2
Tanzania	72,281	3.8	56,595	40.0	64,054	-8.1	112,867	6.24	72,337	-23.9
Uganda	121,025	7.5	63,067	9.8	74,975	10.2	158,048	33.73	200,941	-21.9
Zambia	86,557	-3.0	156,269	0.3	35,202	4.4	89,680	27.22	57,702	-46.0
Zimbabwe	145,771	11.7	184,355	2.0	20,786	36.2	152,226	174.94	169,621	9.1

Notes: Blank cells indicate missing values.
Source: Authors' calculations based on WFP (2012).

APPENDIX 7: TRENDS IN POVERTY INCIDENCE BASED ON THE NATIONAL POVERTY LINES

Country	Years	Poverty incidence (%)
Burundi	1990	34.9
	2002	68.0
DRC	2004–2005	71.34
Ethiopia	1994–1995	49.5
	2009–2010	29.0
Kenya	1992	44.8
	2005–2006	45.9
Malawi	1997–1998	66.5
	2007	40
Madagascar	1993	70
	2001	70.1
Rwanda	2000–2001	58.9
	2010–2011	44.9
Tanzania	1991–1992	38.6
	2007	33.6
Uganda	1992	56.4
	2009	24.5
Zambia	1991	70
	2006	64

Notes: The table indicates figures for the 1990s and the most recent statistics for each country.
Source: Compiled by the authors from national statistical authorities (from national household budget surveys and related studies).

APPENDIX 8: AGRICULTURAL IRRIGATED LAND (% OF TOTAL AGRICULTURAL LAND)

Country name	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
**Burundi	0.9	0.9	0.9								
Comoros											
DRC											
**Djibouti	0.1	0.1	0.1								
**Egypt	100	100	100								
**Eritrea	0.3	0.3	0.3								
Ethiopia		0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.5
Kenya	0.04	0.03	0.11	0.04	0.04	0.05	0.04	0.003	0.004		
**Libya	3.00	3.00	3.00								
Madagascar	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2		
**Malawi	1.3	1.3	1.3		0.6	0.5	0.7	0.5			
Mauritius		21.0	22.2	21.4	21.9	22.3	22.8	23.1	23.1	22.0	22.5
*Rwanda	0.5	0.5	0.3								
Sudan		1.0	1.1	1.2	1.2	1.1	0.9	1.2	1.0		
Tanzania		0.3	0.4	0.4			*2				
**Uganda		0.1	0.1	0.1			*3.8				
**Zambia		0.4	0.4	0.4							
**Zimbabwe		0.8	0.8	0.8							

Note: Blank cells indicate missing data.
** marks countries were the data gaps were filled by data that were downloaded from WRI (2007).
Sources: Salami et al (2010) (for figures marked *); World Bank (2013).

APPENDIX 9: TECHNICAL NOTES FOR ALL TABLES

1. To control for year-to-year fluctuations, point estimates are avoided in the table.
2. Annual average level and annual average change for 1990–2010 include data from 1990 up to the most recent year that is measured and available.
3. Annual average level is a simple average over the years shown, inclusive of the years shown.
4. Annual average change for all indicators except GDP growth rates (and others with possible negative values) is annual average per cent change from the beginning to the end years shown by fitting an exponential growth function to the data points (i.e. "LOGEST" function in excel).
5. Annual average change for GDP growth rates (and other indicators with possible negative values) is annual average percentage point change, which is a simple average of the difference in two consecutive years over the years specified in the range.
6. For indicators in which there are only a few measured data points over the years specified in the range (e.g. poverty, which is measured once every three to five years or so), a straight-line method was used to obtain missing values for the individual years between any two measured data points. Otherwise, estimated annual average change based on the measured values (see above) is used to obtain missing values preceding or following the measured data point.

   In cases where the missing values could not be interpolated, the data are reported as missing and excluded from the calculations for that time period. Any weights used for these indicators are adjusted to account for the missing data in the series of the indicator.
7. Values for the regional aggregations (COMESA, EAC, ASARECA and IGAD [see introduction]) are calculated by weighted summation. The weights vary by indicator; if a weight was used, the specific weight used is listed under each table, and weights are based on each country's proportion in the total value of the indicator used for the weighing measured at the respective aggregate level. Each country *i*'s weight in region *j* (*wij*) is then multiplied by the country's data point (*xi*) and then summed up for the relevant countries in the region to obtain the regional value (*yj*)according to: $yj = \Sigma i wijxi$.

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