

ReSAKSS Working Paper No.24

December, 2008

**Indicators for Monitoring and Evaluation of
Agricultural Performance and Shared Goals
in Southern Africa**

O. O. Olubode-Awosola, P. Chilonda, I. Minde and Y. Bhatt

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ABBREVIATIONS

AIMS	agricultural information management system
AIDS	acquired immune deficiency syndrome or acquired immunodeficiency syndrome
AU	African Union
CAADP	Comprehensive Africa Agriculture Development Programme
CGIAR	Consultative Group for International Agricultural Research
COMESA	Common Market for Eastern and Southern Africa
FANR	food, agriculture and natural resources
FAO	Food and Agriculture Organization of the United Nations
FPI	food price index
GDP	gross domestic product
HIV	human immunodeficiency virus
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IEHA	Initiative to End Hunger in Africa
IWMI	International Water Management Institute
MDG	Millennium Development Goal
PRSP	poverty reduction strategy paper
ReSAKSS	Regional Strategic Analysis and Knowledge Support System
ReSAKSS-SA	Regional Strategic Analysis and Knowledge Support System for Southern Africa
RISDP	Regional Indicative Strategic Development Plan
SADC	Southern African Development Community
TFP	total factor productivity
TADs	transboundary animal diseases
UN	United Nations
USAID	United States Agency for International Development
USD	United States dollar

EXECUTIVE SUMMARY

Since the early 1990s, countries in Africa, and southern Africa in particular, have recognised the contribution that agriculture can and should play in achieving the first Millennium Development Goal (MDG1) targets of halving poverty and hunger by 2015. To this end they have set a number of targets under different initiatives to harness the roles of agriculture in reducing poverty and hunger and enhancing economic and household income growth. These initiatives include the targets set in the Africa Union New Partnership for Africa's Development (AU/NEPAD)'s Comprehensive Africa Agriculture Development Programme (CAADP) of achieving at least a 6% agricultural growth rate per annum by investing at least 10% of national budgets in agriculture under the Maputo Declaration (African Union, 2003). The other initiative, specific to the southern Africa, is the Southern African Development Community (SADC)'s Regional Indicative Strategic Development Plan (RISDP), which includes regional integration and other national agricultural growth targets.

However, achieving these shared goals and targets is a daunting task, both at national and regional levels. Hence, monitoring agricultural performance, using performance indicators, needs to receive urgent and increasing attention in order to show the stakeholders:

- the current performance of agriculture in an economy;
- the trend that may need to be reversed and
- to stimulate discussion on the policy and investment options that may improve the performance of agriculture within the economy or region.

But there are many indicators of agricultural performance in the literature, and monitoring performance with well-conceptualised and relevant indicators is therefore necessary to inform policy makers in the region where agricultural sector performance stands in relation to the agreed targets, and hence provide information on whether each country, and the region as a whole, are on course.

Another challenge is that the concept of agricultural performance is broad as agriculture can play many roles in a given economy. This depends on the socio-economic and biophysical *cum* the political and development thrusts in an economy. The growth stages and rates in a country can also affect the performance of agriculture sector. Hence, in order for agricultural growth to contribute to food security, poverty reduction and make the maximum contribution to economic growth as advocated in the AU/NEPAD's CAADP and the SADC's RISDP, it must be monitored using performance indicators that incorporate social, political and biophysical effects and that accommodate the diverse economic growth stages and growth rates that characterise the region.

This study explores the concepts of performance monitoring and evaluation (M&E) with the use of indicators. The study further identifies the standing of agriculture in the economies of the southern African countries in order to identify a set of priority indicators to monitor the performance of the agricultural sector in southern African countries. The exploratory analysis shows that agriculture plays a more or less dominant role in the economies of most of the countries, and the countries have diverse agro-ecological and economic characteristics. A challenging question arising from this analysis is whether, given the diverse growth rates in the countries, attaining and maintaining the 6% growth rate will result in achieving the MDG1 targets of halving poverty and hunger by 2015.

The purpose of evaluation is to objectively attribute the changes in the indicators of shared regional goals and targets to agricultural performance which itself can be monitored with a set of proposed prioritised indicators. To this end, the report presents a comprehensive pool of indicators that might be used for M&E of the progress each country is making towards the shared goals and targets. Based on the review of literature on existing indicators of agriculture performance, poverty and hunger, and taking cognisance of the AU/NEPAD CAADP, the SADC RISDP, the MGD1 goals and targets, and SADC's agricultural information and management system (AIMS) research objectives and other sources, a long list of indicators were selected and some developed and organised into a set of data domains. These will help in attending to enquiries on different topical issues. The data domains include poverty and hunger, agricultural production, the natural resource base, plant and animal health, and trade and investment. In selecting these indicators, the principles of selecting and developing indicators with desirable properties were observed.

This report presents, with the results of the exploratory analysis and the conceptual framework, the performance indicators which will be used in the ReSAKSS-SA research programme on monitoring the progress of agricultural growth, poverty reduction and food security in southern Africa. It is hoped that these indicators will be used as the basis for developing a comprehensive knowledge management system for monitoring agriculture sector performance in southern Africa.

For each indicator, a justification for the estimates is presented, what is being measured is clarified, and the relationship between the indicator and agricultural sector performance, and potential sources of data for constructing each indicator are reported. Country level data will be supplemented with other sources to measure, quantify and qualify a number of multi-topic performance indicators of agricultural sector performance in the region.

Using these indicators, in monitoring and evaluation of agriculture sector performance and the progress the countries are making towards the shared goals and targets, on regular basis will provide information on the need to adjust policy and investment decisions. The indicators are developed to form a basis not only for evaluating progress towards the targets, but also to help adjust and fine-tune policies in order to meet the planned targets by linking programmes, goals, objectives and strategies of various programmes with agricultural sector performance at national and regional levels.

Both sets of indicators in this technical report can be used by various research groups and stakeholders to facilitate implementation and M&E of regional plans and programmes, and national plans and strategies. An indicative use of these indicators, in an empirical analysis, is presented in the appendix. The appendix presents a standard procedure for an empirical analysis of trends in agricultural sector performance with a brief on analytical techniques, data and sources, base year selection and reporting format. Some of these indicators have been applied in an effort to monitor and evaluate the recent trends in agricultural sector performance, poverty reduction and public investment in agriculture in the region. These indicators are now sufficiently mature to be recommended for use in M&E of agricultural-based regional and national poverty reduction strategies.

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CHAPTER ONE

INTRODUCTION

Agriculture has been identified as having great potential to promote economic development in the southern African region as most people in the region rely on it directly or indirectly as their main source of livelihood. Agriculture is the primary source of subsistence, employment and incomes for 61% (142 million) of the region's total population of 232 million. The sector accounts for close to 8% of the region's gross domestic product (GDP). Despite its importance in the economy of the Southern Africa Development Community (SADC), growth rates in the agricultural sector have been low and highly variable across the region averaging only 2.6% per annum in the last decade. Average agricultural growth rates have been similar to population growth rates of 2.4% over this period, almost cancelling out gains in agricultural growth. In addition, about one third of the people in the SADC region are affected by abject poverty (Chilonda et. al., 2006).

It is encouraging that countries in the region are embarking on a number of initiatives to reduce hunger and poverty. In addition they are endorsing Africa-wide and regional initiatives in order to achieve the first Millennium Development Goal (MDG1) of halving hunger and poverty by 2015. Most of these initiatives are based on agriculture-led growth strategies, As the majority of the people in southern Africa live in the rural areas the agricultural sector has the greatest potential to contribute to the achievement of MDG1.

Countries in southern Africa, along with the rest of Africa, have committed themselves to the Comprehensive Africa Agricultural Development Programme (CAADP) launched under the auspices of the African Union's New Plan for Africa's Development (AU/NEPAD). Under CAADP southern African countries aim to achieve an agricultural growth rate of at least 6% by investing at least 10% of their national budgets in agriculture as agreed in the 2003 Maputo Declaration. CAADP focuses especially on small-scale farmers in order to raise rural incomes and to reduce hunger and poverty in Africa (AU/NEPAD, 2003). NEPAD's strategic goals for the agricultural sector under CAADP include the following six targets:

- food security
- improved productivity to attain a 6% annual agricultural growth rate
- improved market access for small and large-scale farmers
- equitable distribution of wealth
- harnessing the role of science and technology for agricultural and food production
- harnessing and managing natural resources

In the southern African region, the countries under SADC's umbrella have committed themselves to the Regional Indicative and Strategic Development Plan (RISDP). The ultimate goal of the SADC RISDP is to promote sustainable and equitable economic growth and socio-economic development through efficient productive systems so, that the region emerges as a competitive

and effective player in the world economy. The SADC RISDP has the following targets for moving towards food security:

- achieve a gdp growth rate of at least 7% a year;
- halve the proportion of the population living on less than us\$1 per day between 1990 and 2015;
- double cropland under irrigation from 3.5% to 7% as a percentage of the total by 2015;
- increase fertiliser consumption from 44.6 kg/ha of arable land to 65 kg/ha of arable land by 2015 (the world average is 98 kg/ha);
- increase cereal yields in kg/ha from an average of 1,392 kg/ha to 2,000 kg/ha (the world average) by 2015;
- double the adoption rate of proven technologies such as the use of improved seed varieties, and effective management of water and land by 2015;
- reduce the incidence of transboundary animal diseases (tads) in particular foot and mouth disease, by half by 2015 with the ultimate objective of eliminating it;
- increase livestock production by at least 4% annually;
- increase the daily per capita dietary energy and protein intake from 2,160 kcal to 2,700 kcal and 49g to 68g respectively by 2015;
- halve the proportion of people who suffer from hunger by 2015 and
- halve the proportion of underweight children under five years by 2015.

Either before subscribing to Africa-wide and regional initiatives such as the CAADP and the regional SADC RISDP goals of broad-based growth and poverty reduction, or to supplement them, each country in the region has subscribed to a poverty reduction strategic paper (PRSP) in a process initiated by the IMF and the World Bank in 1999. PRSPs are comprehensive country-based strategies for poverty reduction. Each country's PRSP describes the macroeconomic, structural and social policies and programmes that it will pursue over several years to achieve broad-based growth and poverty reduction. They specifically provide the crucial link between national public actions, donor support, and the development outcomes needed to meet the MDG1 (IMF, 2005).

M&E of agricultural performance in the context of shared regional goals

The MDG1, CAADP and SADC RISDP have clearly stated goals that countries in the region have committed themselves to. As indicated these goals and targets are intended to translate into accelerated agricultural growth which, in turn, is expected to contribute to economic growth and poverty reduction in the region. Hence, monitoring agricultural performance, in the context of the shared regional goals and targets, needs to receive urgent and increasing attention. It is expected that monitoring agricultural sector performance will be an important function of SADC's agricultural information management system (AIMS), which is currently under development. In addition, monitoring targets as those spelt out in CAADP will allow for mutual review at continental level to reveal progress in implementing CAADP and for peer review at sub-regional and national levels to align sub-regional and national targets to CAADP regional targets (ReSAKSS, 2008).

Monitoring in this context is expected to involve repeated observation of status and trends in agricultural performance, especially to identify and signal progress towards the shared targets and goals. This will provide information on whether each member state, and the region as a whole, are making substantial progress towards achieving the shared goals and targets. This type of monitoring may benefit from the use of performance indicators. Broadly, relevant performance indicators are needed to show stakeholders:

- the current performance of agriculture in an economy;
- the trend that may need to be reversed and
- the current course of action that may improve the performance of agriculture within the economy or region.

Monitoring based on a specific target or goal, with well-defined and documented indicators for individual countries and the region as a whole may provide valuable information for use in evaluating policy and the effect of commitments. In addition to the actual application and the numerical results of the indicators, monitoring with an indicator forces each member state to reconcile their commitments to the indicated outcomes in the form of targets and goals.

This study therefore identifies the status of agriculture in the economies of southern African countries and the roles it can and should play in achieving the shared regional goals. To give a more relevant and objective definition of agricultural performance this study adopts a conceptual framework that underlies the proposed definition of agricultural performance and the choice of prioritised indicators for M&E of agricultural performance. The study then conceptualises agricultural performance taking into account the diversity among countries in the region and the multiple roles that agriculture can play in economic development, given the different economic growth stages. The study goes on to compile, from the indicators used by ministries of agriculture, ministries of planning and other development agencies, a wide range of indicators for M&E of the shared regional goals and targets and to report on progress towards the MDG1, CAADP, the SADC RISDP and national poverty reduction strategies. These indicators point to the performance of agriculture in the context of the goals and targets.

This study is primarily intended for use by various stakeholders to facilitate the implementation of M&E of the regional plans and programmes and national poverty reduction strategies. The technical report contains samples of indicators proposed in policy documents, those that are being used on a regular basis from national statistical systems and reports for selected countries in the region. It presents a set of prioritised indicators with descriptive information and a justification for using each of them. These indicators act as a blueprint for collecting the necessary data to measure the performance of the SADC RISDP and of each country's poverty reduction strategy.

Chapter Two continues with the presentation of the conceptual framework detailing the use of indicators and the concept of agriculture performance and the indicators used to measure it. Chapter Three presents an exploratory analysis of agriculture's standing in the SADC countries. Issues considered include the distribution of income, agricultural income, agricultural resources and productivity, and agricultural trade amongst other things. This forms the basis for the proposed list of priority indicators for the direct monitoring of agricultural performance. Chapter Four presents a list of indicators that could be used to monitor progress towards the shared goals and targets. These indicators are organised into the following related data domains; poverty and hunger, agricultural production, agricultural trade and investment, natural resource base and plants and health. Chapter Five presents overall concluding remarks. The appendix presents a standard procedure for empirical analysis using the indicators as a sample reporting format and template.

CHAPTER TWO

CONCEPTS OF PERFORMANCE MONITORING AND AGRICULTURAL DEVELOPMENT

Monitoring agricultural growth performance towards the achievement of the shared regional goals of food security, poverty reduction and economic growth in southern Africa deserves continued attention. The concept of performance in the agricultural sector is broad and can be related in various ways to the many roles that agriculture can play in a given economy. Similarly, monitoring can be done from different perspectives and for different purposes. It is therefore of paramount importance that the monitoring of agricultural performance should consider the diverse roles agriculture can and should play in economic development in a particular context.

Conceptualising performance monitoring

According to Bos (1997), there are two types of performance monitoring. The first, *trend performance* monitoring involves checking the regular contribution of agriculture to an economy against its expected level of contribution. This involves measuring the extent to which growth targets are being met in any year and thus requires that current contributions are measured on a regular basis, for example annually. The second, *strategic performance* monitoring involves longer-term activity to assess the extent to which the use of agricultural resources and potentials are being maximised to achieve the expected roles of agriculture in the economic development of the economy. It also involves checking whether performing these roles also meets the broader set of economic objectives in the economy or region as a whole. Time-series indicators and their rates of change are commonly used for this. Agricultural resources in this context may include agricultural resources, human resources and government commitment to the sector. This analysis is relevant for national and regional planning and policy making.

However, at all levels performance must be assessed using a combination of targets. Each of these targets being an acceptable rate of values around that target. An acceptable rate of values is the planned or expected values according to the policy and development thrusts and given the unforeseen circumstances. Policy makers and international donor agencies at national, regional or international levels should be concerned about broad policy objectives in terms of the potential performance that can be achieved through the use of agricultural resources at country and regional levels. Each country's targets should reflect country specific characteristics since agricultural performance is influenced by a number of biophysical, socio-economic and political variables and by the size of each economy, among other things. This will inform the choice of indicators and what they are used to measure.

The use of indicators

At the very least, any country where the government is concerned about the performance of the economy, and how agriculture contributes to this, needs to routinely collect data on indicators of agricultural performance. This will allow effective monitoring of agricultural growth performance and enable analysis of the performance trends that each government and its key stakeholders can

use on a regular basis to make informed policy decisions. Indicators are instrumental in providing a basis for intra-regional and sector-specific agricultural performance assessment. According to RDOS (2007) an indicator should reveal a condition, a trend, or an emerging issue. Among other things, performance trends analysis with indicators will help in the following ways:

- ensuring early detection of problems encountered during implementation of programmes so that they can be rectified in time to minimise wastage of resources and delays in achieving desired results;
- identifying successful strategies so that these can be further strengthened and fully exploited;
- ensuring a constant supply of good quality information on the performance of the programmes to decision makers and practitioners so that they continue to take correct decisions and actions in support of the policy goals;
- establishing accountability for resources allocated to specific strategies of the policy in relation to results produced. For example, this will enhance the accountability of each member state vis-à-vis its commitment to increasing public spending in agriculture;
- creating awareness among stakeholders of progress made in implementing programmes, of lessons learned and of the expected participation and contribution of stakeholders to identifying areas for improvement;
- providing for systematic evaluation and documentation of impacts against set targets as a check on whether programmes are on track or not and
- evaluating the success of specific government or corporate programme, project or policy measures.

In order for a performance indicator to be useful in this way it should be constructed from both an actual or observed value juxtaposed with an expected potential and target value. This will enable an assessment of the amount of deviation from the target. The indicator should contain information that allows policy makers to determine if the deviation is acceptable. It is therefore desirable, wherever possible, to express indicators in the form of a ratio of the actually measured versus the expected situation. A fuller description of desirable attributes of performance indicators is given in Bos (1997).

Agricultural performance or the contribution of agriculture to an economy or to the region as a whole may be conceptualised into an indicator of an expected role of agriculture in a fundamental ratio as follows:

$$\text{Agricultural performance indicator} = \frac{\text{observed level of contribution}}{\text{target level of contribution}} \quad (1)$$

Where the observed level of contribution is the contribution that agriculture makes to the economy in a particular time period, usually one year. The target level of contribution is the maximum expected or planned contribution that agriculture could make to the economy given the resource base of the economy. Technically, for each indicator used for M&E the target level of contribution has to be conditional on each country's local attributes, development stages, and so on. This will limit cross-country comparison or benchmarking analysis using such a performance indicator.

A multi-performance approach for each of the roles of agriculture in an economy thus quantifies the observed value of a subset of a parameter. Agricultural performance will differ from year to year as the economy develops. Therefore, the recommendation is to define the agricultural performance level for each country and the region as a whole on a regular basis after review.

The main purpose of monitoring agricultural performance is to quantify the observed level of contribution in relation to the target reference level. The target level should be relevant to the country's development objective. Its actual value may be less important. If the observed level of contribution cannot be determined, there will be no yardstick against which performance can be measured. In that case, the description of the agricultural performance level has priority. As mentioned above, agricultural performance does not remain constant over time which makes it tricky to define agriculture performance.

Conceptualising agricultural performance and its indicators

Agriculture as a primary sector of an economy has basically three fundamental roles in economic growth and development. Agriculture contributes primary commodities, especially food for domestic consumption, and raw materials for industry as a secondary sector. It also generates foreign exchange earnings in the form of exports earnings. These roles are not expected to be mutually exclusive, although at certain stages of economic development, one or other role is usually more prominent. According to Sachs (2004), agriculture's contribution is expected to help an economy in making a transition to a higher stage of economic development. The process of [economic development] depends on the national agricultural production potential which is a function of resource availability, which itself is a function of the climate and other factors such as global market forces and national policies. Governments can enhance agricultural production potential through the use of policy and development strategies that encourage effective allocation of existing resources, increasing the rate of use of the existing resources, and improving technology and competitive industry structure among other things (Olubode-Awosola, 2006).

Each of the fundamental roles of agriculture has unique features and contributions it can make towards economic growth and development in an economy. There seems to be long term evidence of agriculture's relative importance and the contributions it can make in different situations and economic stages (Rostow, 1960; Adegeye and Dittoh, 1985; Dorward and Morrison, 2000; Sachs, 2004). Given this complexity, it may be difficult to rigidly define what agricultural performance is. However, for the purpose of development policy and strategy, especially for the agriculture-led economic growth and development which underpins CAADP and the SADC RISDP, what is expected from an agricultural sector, given the economy's development stage, may form the basis for selecting agricultural performance indicators for monitoring and evaluation and, perhaps, for benchmarking.

Adegeye and Dittoh (1985) consider the importance of agricultural development for a given country and specify the expected contributions of agriculture in each stage of the economic development of an economy. First, in an economy at a subsistence development stage, which Sachs (2004) terms a pre-commercial stage, the agricultural sector and the rural economy are usually not sufficiently integrated with the urban economy. This is because there are limited roads and other information channels linking agricultural production centres to consumption centres. Farmers have limited access to urban markets to sell their produce and for buying inputs such as fertiliser and, improved seed. This results in less surplus to sell as productivity is low. These are features that characterise agriculture in most southern African countries. At this stage, agriculture is expected to play a primary role of ensuring food self-sufficiency and producing a marketable surplus to increase peasant

incomes. In this way it increases the income and standard of living, while decreasing unemployment and underemployment in a sustainable manner before the transition to a higher stage of development. This transition will ultimately lead to increasing agricultural GDP since large proportion of the economy depends on agriculture.

Second, we have the role of agriculture in economies that have transformed from a subsistence stage to an industrial stage, where the urban and rural sectors are integrated. Here, the urban sector produces manufactured goods and services and the rural sector produces food and other agricultural products. This is the basic division of labour between urban and rural activities. At this stage, agriculture is primarily expected to contribute to increasing the supply of raw materials to industries. At the same time it needs to increase the supply of food to meet the needs of the growing industrial population. The farming population is expected to decrease as farming productivity and intensification increase.

As an economy reaches a fully monetised development stage, where the whole economy is well linked with the international market and with advanced information technology, agriculture will primarily be expected to produce high grade or quality products for exports. The economy will earn high and increasing foreign exchange to buy capital goods.

The identification of economic growth stages as itemised above does not presume a lack of overlapping stages in and within a country. That is, there is no rigid sequence as in some countries, according to Sachs (2004), development transitions are taking place simultaneously, for example in China. Also, a sector may contribute to various goals simultaneously, and this may differ to some degree from country to country (Chilonda and Otte, 2006). Therefore, the classification above is necessary to inform strategic analyses that will provide information on options for accelerated agricultural growth, food security and poverty reduction in a region. An analysis that bears this diversity in mind will also inform policy options that have limited pay-offs for each economy. The classification of economic stages could also inform the procedures that will be used for updating and improving agricultural growth targets and the purpose of policy thrusts. Therefore this theorising will inform the process of identifying, designing and implementing the policies, planning, programmes, and projects needed for sustained attainment of target roles and therefore the contribution of agriculture to the economy.

At this juncture, one obvious area for further research would be empirical analysis to identify the contribution of agriculture to the economies of southern African countries and the dominant economic development stages. However, at present it will suffice to examine some relevant characteristics, along with possible patterns of economic development of southern African countries in the next chapter. This, coupled with the knowledge gleaned from the expected roles of agriculture in economic development, will inform the choice of a set of prioritised indicators for M&E of agricultural performance in the countries and the region as a whole.

CHAPTER THREE

REGIONAL SYNTHESIS OF THE STATUS OF AGRICULTURE IN SOUTHERN AFRICAN ECONOMIES

This chapter presents an exploratory analysis of the situation of agriculture in southern African economies in a regional synthesis. It helps to identify the key facts about agricultural resources and agricultural growth, and their contribution to economic growth in the countries. This exploratory analysis shows the need for different types of agricultural development strategies depending on the importance of agriculture in an economy by categorising agricultural development in the country using the classification given in the previous chapter. It also looks at where countries are located in the region and at other relevant features to provide a descriptive analysis of agricultural and economic development in the countries. Agricultural characteristics are explored across income categories using the World Bank's (2008) income classification. The study sets out to elicit a pattern that can inform the selection of agriculture performance indicators in the region.

According to the World Bank's official estimates and classification of countries by the size of their economies, the main criterion for classifying economies is the gross national income (GNI) per capita, which consists of the gross domestic product (GDP) plus income received from other countries, notably in the form of interest and dividends, less payments made to other countries. Countries with GNI per capita of \$9,206 or more are categorised as high income countries. These are mostly developed countries and on average have the highest material standards of living. Their economies use the most advanced production techniques and equipment, and they have many research and technology centres. In these countries, the share of agriculture's contribution to the economy is declining as they develop. In the low income countries average GNI per capita is \$745 or less. Countries with GNI per capita of between \$746 and \$2,975 are categorised as low-middle income countries. Upper-middle income countries have average GNI per capita of between \$2,976 and \$9,205. According to these criteria, the countries in southern Africa classified as low-income countries are the Democratic Republic of Congo, Madagascar, Malawi, Mozambique, Tanzania, Zambia, and Zimbabwe; those classified as low-middle income countries are Angola, Namibia, Swaziland and Lesotho and the upper-middle income countries are Botswana, Mauritius and South Africa (United Nations, 2008).

Table 1 presents a descriptive analysis of recent (2000 to 2006) levels of, and growth in, the incomes of these countries. Southern Africa comprises countries with diverse income levels and growth rates. There are fast growing upper- and low-middle income countries and low-income countries with lesser growth rates. This income classification is in effect from July 2008 till 1 July 2009 (World Bank, 2008). Three of the six low-income countries in southern Africa for which data are available have average GNI per capita lower than \$745. In the same vein, in two of the four low-middle income countries in southern Africa, average GNI per capita is within the low-middle income range while in the other two, it is far above the range. Two of the three upper-middle-income countries in southern Africa fall within the World Bank's upper-middle income range while Botswana exceeds it with a per capita GNI of \$9,774.3.

While it is interesting that quite a number of countries in the region are making progress in the level of per capita GNI, it is also noteworthy that over this period all the low-income countries

Table 1: Trends in GNI and GDP per capita in southern Africa (1990-2006)

Countries	GNI (current international \$) per capita PPP		Agricultural GDP		Agricultural value added per worker	
	Average annual value	Average annual growth (%)	Average annual % value added	Average annual growth (%)	Average (constant 2000 US\$)	Average annual growth (%)
	2000-06	2000-06	2000-06	2000-06	2000-05	2000-05
Low-income						
Congo, Dem. Rep.	230.0	4.3	4.8	0.6	151.5	-1.5
Madagascar	775.7	2.5	26.7	2.0	176.2	-0.4
Malawi	610.0	2.1	33.6	1.0	121.0	-4.3
Mozambique	545.7	7.8	23.2	8.0	139.9	6.0
Tanzania	815.7	6.3	39.9	4.9	281.2	3.4
Zambia	991.4	4.8	17.5	0.6	202.3	0.5
Zimbabwe	na	na	14.1	-8.0	254.8	-8.6
Low-middle income						
Angola	2641.4	12.6	7.0	21.2	151.0	11.8
Namibia	4117.1	5.2	8.7	0.9	1,068.4	1.1
Swaziland	4254.3	3.2	9.7	0.0	1,216.8	0.3
Lesotho	1492.9	5.3	13.2	-2.6	438.5	-3.8
Upper-middle income						
Botswana	9774.3	6.2	1.9	-0.7	391.8	-1.0
Mauritius	8945.7	6.0	5.6	3.0	4,878.9	7.2
South Africa (SA)	7462.9	5.5	2.7	-1.6	2,349.6	4.0
SADC			7.8	2.4		

Data source: World Bank (2008b)
na = not available

had positive annual average growth rates though the rates vary across countries. Mozambique is the fastest growing (7.8%) among this group while Malawi has the lowest growth rate (2.1%). Even more impressive is that all the low-middle income countries have positive average annual growth rates – with Swaziland the lowest at 3.2%, while Angola records an incredible 12.6% average annual growth rate. Amongst the upper-middle income countries, the growth rates are not only relatively higher on average, but they are also similar ranging from 5.5% in South Africa to 6.2% in Botswana.

While the rate of growth in GNI is increasing in all the countries, poverty levels remain high and the rate of poverty reduction is not as fast as envisioned in the shared goals and targets (World Bank, 2008). It is necessary to understand to what extent agriculture is contributing to achieving the shared goals and targets of halving poverty and hunger by 2015. The figure for GNI gives little information about the contribution of a particular sector, or the contribution from economic activity within the country. Using this measure may also result in overestimating poverty reduction as the income gap may be widening despite increasing absolute income. GDP per sector gives more information about the contribution of a sector and its performance. This insight becomes important in light of the recognition by southern African countries that agriculture can and should contribute to economic development. GDP per sector is an estimate

of the total value of all goods and services produced within a country in a particular sector during a specified period. In other words, this is the total value of all goods and services produced by labour and other factors of production located in that country. It is a measure of the value added to the general economy by the performance of a sector. It also gives an estimate of the economic activity in a sector.

Agriculture value added to the economies of southern Africa countries

As expected, agriculture is the biggest contributor to the economies of the low-income countries and generally contributes more to the economies of the low-middle income countries compared to its contribution to the economies of the upper-middle income countries in the region. The DRC is an exception among the low-income countries with agriculture making the lowest contribution to its GDP (4.8%) compared to other countries in this group. Generally across all the countries except Angola, growth in agricultural GDP is slower compared to growth in GNI. It is worrying that growth in agriculture's contribution in absolute terms is negative for some countries such as Zimbabwe, Lesotho, Botswana and South Africa. The growth in agriculture's contribution to the economy is relatively more substantial in Angola, Mozambique, Tanzania and Mauritius. The worry is to what extent the progress in exploiting the potential of agriculture is contributing to achieving the shared goals and targets of having poverty and hunger by 2015.

Although, the extent to which agriculture contributes is a function of resource availability and climate, amongst other things, increasing the rate of use of existing resources will raise agricultural production and the value it adds to the economy (Olubode-Awosola, 2006). As more than half of each country's population lives in rural areas and depends (directly or indirectly) on agricultural activities for employment and incomes, it is necessary to exploit agriculture to reduce poverty and hunger and raise household incomes in the region.

Rural and agricultural populations in southern Africa

Population estimates for 2000-06 show that the region has a total population of about 250 million with diverse population sizes. The DRC, South Africa and Tanzania have the largest populations in that order. They are followed by a group of five countries with populations ranging from about 12 million in Zambia to about 20 million in Mozambique. Swaziland, with a population of about 1.1 million, and Botswana and Lesotho, with about 1.8 million each, make up a group of countries at the bottom end with relatively low populations. The majority of people in the region live in rural areas with South Africa having the lowest proportion at about 40% while Malawi has the highest proportion of its population living in rural areas at 82%. Overall about 63% of the region's people live in rural areas. Almost the same distribution holds for the agricultural population with nine countries having more than half of their population engaged in agriculture. Mauritius has the lowest agricultural population at about 10% while a group made up of Malawi, Lesotho, Swaziland, Tanzania and Angola have the highest, with each having more than 75% of their populations engaged in agriculture. The agricultural population across the region averages 57% of total populations (Table 2).

Populations growth rates are decreasing for most countries with an average regional increase of about 2.1%. The proportion of rural population is generally increasing slightly and is decreasing in only three countries namely the DRC, Madagascar and Swaziland. The proportion of the population engaged in agriculture, on the other hand, is increasing markedly in half of the countries

and declining in the other half. Specifically, the agricultural population is markedly declining in South Africa, Mauritius, and Swaziland but the opposite is the case in Angola, Madagascar, the DRC, Mauritius, Mozambique and Tanzania. The fact that the rural and agricultural populations are increasing on aggregate at regional level at a rate of 1.1% and 1.4% respectively calls for increasing agricultural activities, which are the main means of livelihood and food security in the rural areas (Table 2).

Table 2: Distribution and growth in total, rural, agricultural and total populations in southern Africa

	Total population ('million)	Rural population (%)	Agricultural population (%)	Average annual change (%) in total population	Average annual change (%) in rural population	Average annual change (%) in agricultural population
Countries	2006	2006	2005	2000-06	2000-06	2000-05
Low-income						
Congo, Dem. Rep.	59.3	67.3	60.8	2.9	2.1	2.0
Madagascar	19.1	72.9	72.0	2.8	2.5	2.2
Malawi	13.2	82.3	75.0	2.3	1.8	1.6
Mozambique	20.1	64.7	75.4	2.0	0.2	1.6
Tanzania	39.5	75.4	75.7	2.6	0.3	1.3
Zambia	11.9	64.9	66.3	1.7	1.3	0.9
Zimbabwe	13.1	63.6	59.7	0.6	0.0	-0.4
Low-middle income						
Angola	16.4	46.0	70.5	2.9	1.7	2.5
Namibia	2.1	64.3	45.0	1.3	0.6	-0.3
Swaziland	1.1	75.6	31.0	1.3	0.0	-1.6
Lesotho	1.8	81.0	38.1	0.0	-0.1	-0.5
Upper-middle income						
Botswana	1.8	41.8	43.4	0.0	-0.8	-0.4
Mauritius	1.3	57.5	9.7	0.9	0.6	-2.5
South Africa (SA)	47.4	40.2	12.0	1.2	-0.3	-2.5
SADC	247.9	62.6	57.3	2.1	1.1	1.4

Data sources: World Bank (2008b); FAOSTAT (2008)

Agricultural resources in southern African countries

Table 3 shows how countries differ in their endowments of basic farm inputs, namely agricultural areas, arable land and inland water – each as a proportion of total land area –, irrigation potential and total economically active population in agriculture. The agricultural area refers to the sum of arable land and land cultivated to permanent crops including pastures (FAOSTAT, 2008). However, this study does not capture qualitative differences as these might be difficult to capture in a single indicator. Suffice it to state that the productivity of these resources depends largely on water and soil conditions, which in turn depend on weather variability.

Table 3: Distribution and trends in agricultural resources in SADC

Country	Land area	Agricultural area		Arable land		Inland water	Irrigation potential	Total economically active population	
	('million ha)	(% of total area)		(% of total land)		(% of total land)	(1000 ha)	in agriculture (million)	
		average	growth	Average	growth	Average	Average	average	growth
	2006	2000	2000	2000	2000	2000	2000	2000	2000
		-05	-05	-05	-05	-05	-05	-05	-05
Low-income countries									
Congo, Dem. Rep.	226.7	10.1	0	3	0	3.4	7,000.00	22.8	0.9
Madagascar	58.2	70.1	0.2	5.1	0.3	0.9	1,516.90	8.6	1
Malawi	9.4	46.4	2.3	25.2	4.4	25.9	161.9	5.9	0.6
Mozambique	78.6	61.6	0.2	5.4	2.4	1.7	3,072.00	10	0.7
Tanzania	88.6	38.6	0.2	10.3	0.6	6.9	2,132.20	19.6	0.7
Zambia	74.3	34.1	0.6	7.1	0	1.2	523	4.8	0.6
Zimbabwe	38.7	39.2	1.2	8.3	0	1	365.6	6	0.3
Low-middle income countries									
Angola	124.7	46.1	0.1	2.5	1.9	0	3,700.00	7.1	1
Namibia	82.3	47.2	0	1	0	0.1	47.3	0.8	0.5
Swaziland	1.7	80.9	0	10.3	0	0.9	93.2	0.4	0.2
Lesotho	3	76.9	0	10.9	0	0	12.5	0.7	0.1
Upper-middle income countries									
Botswana	56.7	45.8	0	0.7	0	2.6	13	0.8	0
Mauritius	0.2	55.7	0	49.3	0	0.5	33	0.5	0.4
South Africa (SA)	121.4	82	0	12.1	0	0.4	1,500.00	19.7	0.2
SADC	964.6	43.2	0.2	5.5	0.6	2.2	20,170.70	107.9	0.6

Data source: FAOSTAT (2008)

Three countries, the DRC, Angola and South Africa have the largest total land areas. The DRC is the largest, with a land area almost the size of the next two largest countries combined. Table 3 shows that the DRC has a land area of 226.7 million ha. Following the three largest countries are seven large countries ranging in size from Tanzania at 88.6 million ha to Botswana at 56.7 million ha. The smallest four countries range from Malawi at 9.4 million ha to Mauritius at 0.2 million ha. A substantial proportion of the land areas of all countries is agricultural land with South Africa having the highest proportion at 82%. However, most countries have less than the world average (21%) of arable land. Arable land is agricultural land that can be used for growing crops. Mauritius has the largest proportion of arable land at 49.3% followed by Malawi at 25.2%. South Africa, Lesotho, Swaziland and Tanzania also have appreciable amounts of arable land ranging from 10.3% to 12.1% of their total land areas. However, only Malawi, Mozambique and Angola among these countries have substantial average annual growth in arable land (Table 3).

Inland waters are permanent bodies of water inland from the coastal zone and those areas whose properties and use are dominated by the permanent, seasonal, or intermittent occurrence of flooded conditions. This includes rivers, lakes, floodplains, reservoirs, wetlands, and inland saline systems. These areas constitute a source of water for aquaculture which is a valuable sub-sector of agriculture. The distribution of inland waters is diverse. Only Malawi has about 26% of its total surface area as inland water. Tanzania, the DRC and Botswana have the least inland water while Angola and Lesotho have no inland waters. Irrigation potential is another important agricultural resource. It is highest in the DRC at about 7 million ha. The distribution of irrigation potential is also diverse, with relatively larger potential in six countries, while the others have comparably low irrigation potential. With respect to agricultural labour, the DRC, South Africa and Tanzania have comparably high numbers of their population active in agriculture. Generally, the number of people actively involved in agriculture is exceptional high in South Africa relative to other upper-middle income countries. It is noteworthy that the number of the population actively involved in agriculture is increasing in all the SADC countries except Botswana. This is an indication that agriculture is an important means of livelihood in these countries.

As agriculture involves producing food and fibre using a wide variety of farm practices and management systems, labour productivity is the simplest indicator of agricultural performance (Dorward and Morrison, 2001). More importantly, labour productivity may also affect agricultural production in these countries and has implications for the extent to which agricultural potential could be exploited to meeting the shared goals and targets.

Computing the correlation coefficient for the growth in agriculture income and total income for the period from 2001 to 2006 shows a strong positive correlation across the countries in the region. Agricultural GDP grows fastest in Angola at an annual average of 21.2% with the highest growth in agricultural value added per worker at 11.8%. This may explain why Angola also has the fastest economic growth rate of 12.7% and seems to imply that, as much as the level of agricultural contribution to the economy is important, its growth also matters for general economic growth. Zimbabwe seems to be experiencing economic recession as not only is agriculture shrinking but there is also a decline in agricultural value added per worker (Table 1).

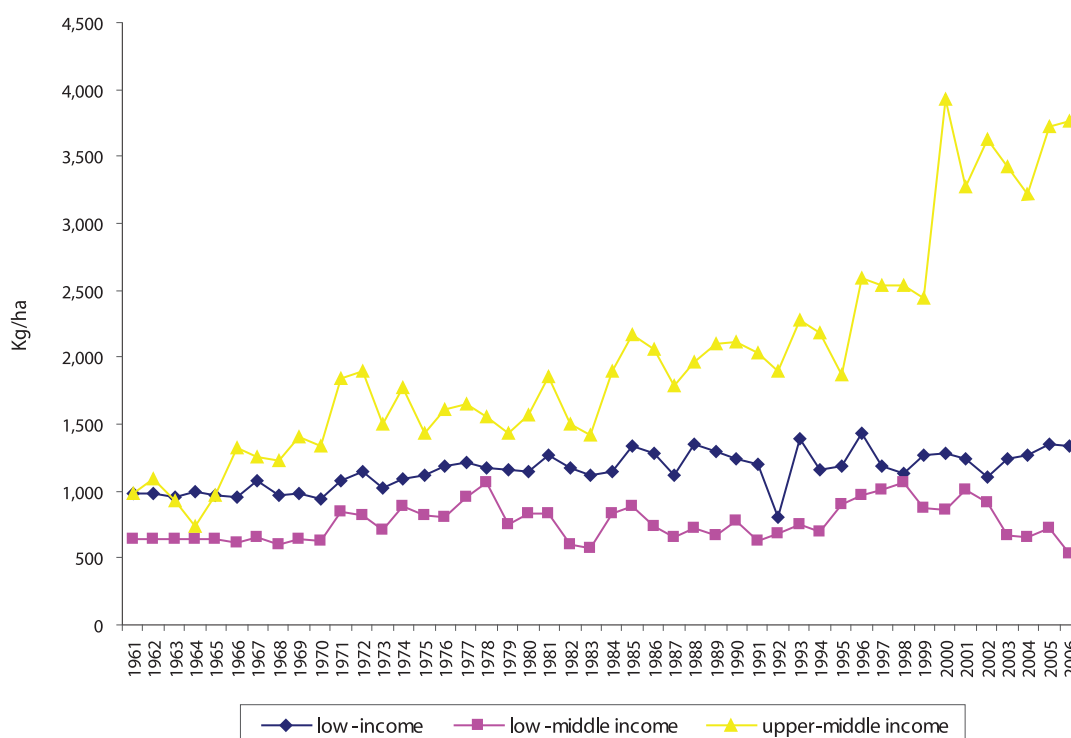
Agricultural value added per worker is highest in two of the three upper-middle countries, namely Mauritius and South Africa. Its growth is also substantial in these countries at 7.2% and 4.0 respectively. Agricultural value added per worker is relatively far higher in Namibia and Swaziland compared to other low-middle income countries and low income countries. However, the actual growth rates of 0.3% and 1.1% respectively are low, and have negative implications for the levels of agricultural value added per worker in the near future.

For other countries, including Botswana, Lesotho, Angola and all the low-income countries, average agricultural value added per worker is markedly low and gives an indication of low agricultural productivity in these countries. This reinforces the concern over the possibility of harnessing agriculture's potential to reduce poverty and hunger, as the largest proportion of the population live in rural area and agriculture is their main economic activity.

Agricultural productivity in southern Africa

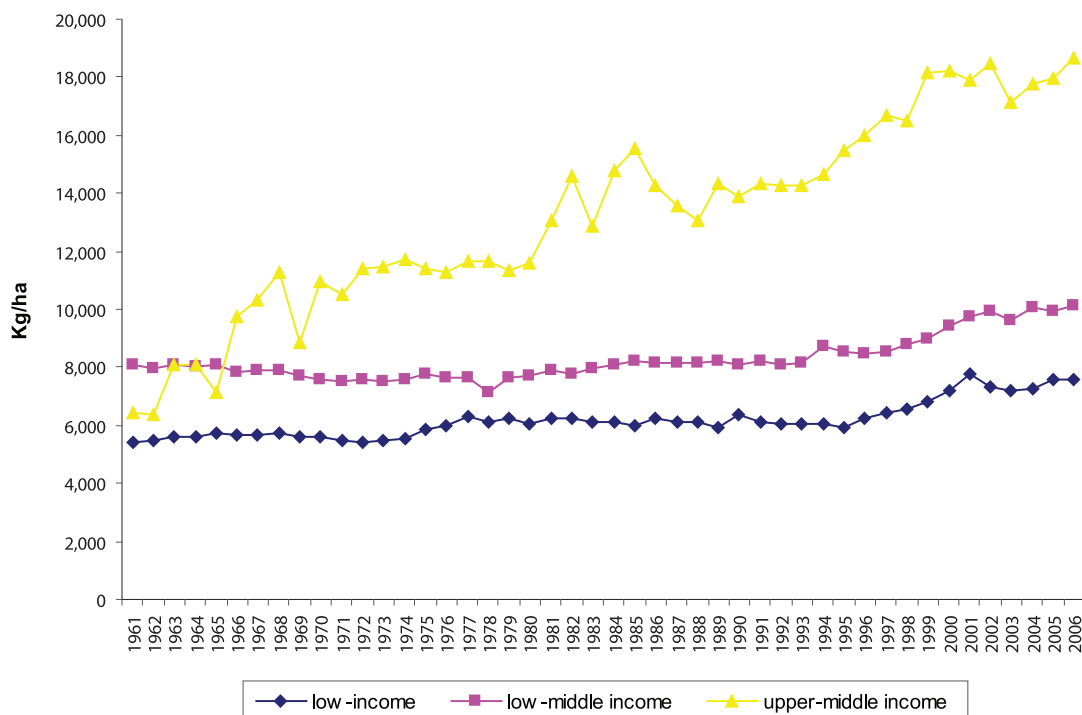
Yield increase is an obvious means to accelerate agricultural growth. As shown in Figures 1 and 2, cereal yield is generally erratic in the region. The low-middle income countries have the lowest average yield which is a slight increase above the 1961 baseline. The average cereals yield among the low-middle income countries is considerably higher than that of low-income countries. The upper-middle income countries have registered a marked upward trend in cereals yield compared to the other two groups. Trends in the average yields of roots and tubers vary less across the income groups of countries. However, low-income countries have the lowest average yield. Both the low and low-middle income countries have slight upward trends in yields, while yields among the upper-middle income countries are more variable but display the fastest upward trends among these groups. These trends have negative implications for the region's agricultural growth rate as reflected in agricultural GDP, and on food security. The trends can be explained in part by climate variability in southern Africa, which is one of the regions most vulnerable to climatic vagaries. The climates of Angola, Botswana, Zimbabwe, Namibia, and South Africa range from semiarid and sub-humid in the east, to hyper-arid in the west, while the climates of Tanzania, Malawi, Mozambique, Swaziland, Lesotho and the five Indian Ocean islands range from semiarid in most parts to sub-humid. This climate variability subjects the region to frequent droughts and uneven rainfall distribution in time and in space (Darkoh, 1989).

Figure 1: Trends in cereals yields in southern African countries.



Data source: FAOSTAT (2008)

Figure 2: Trends in roots and tubers yields in southern African countries.



Data source: FAOSTAT (2008)

Roles of agriculture in the economies of southern African countries

If agriculture is to be used successfully to achieve the shared goals and targets in southern Africa, the fundamental roles of agriculture, which are equally important in economic development and in the transition from one stage of development to another, should include producing:

- food for the teeming population;
- raw materials for emerging industry and
- foreign exchange earnings from agricultural trade.

The last is necessary to raise the income of rural and agricultural populations – the largest proportion of the total populations of countries in the region.

As explained earlier, a well performing agricultural sector is expected to play a primary role in achieving food self-sufficiency by providing enough food for the people. However, for this to happen it may be necessary to intensify agricultural production. Intensified agricultural production has the potential to significantly improve crop and animal productivity, which in turn is necessary to ultimately increase farm family incomes. Agricultural intensification through better use of land and water is a possible means to accelerating agricultural growth. CAADP Pillar I speaks to the importance of sustainable land and water management in achieving the 6% agricultural growth target. Pillar III emphasises the importance of increased production of staple crops and livestock to reduce food insecurity and address malnutrition. One of the targets under the SADC RISDP is to increase

livestock production by at least 4% annually as a means to reduce hunger and malnutrition in the region. CAADP Pillar IV addresses the importance of harnessing the role of science and technology for agricultural and food production. Technologies to ensure the increased production of livestock and sustainable land and water management are essential for increasing agriculture production in the region.

The trends in the index of food production per capita from 1990 to 2006 show that only Angola and Mozambique are making appreciable progress in food production. However, Malawi, the DRC, Namibia, and Zimbabwe are recording relatively huge declines in food production. Food production per capita is decreasing in Botswana, Madagascar, Tanzania and Zambia (Table 4).

Table 4: Trends in the index of food production per capita in selected SADC countries (1990-2006); base 1999-2001.

Countries	Average index		Average annual growth (%)	
	1990-2000	2000-05	1990-2000	2000-05
Low-income				
Congo, Dem. Rep.	126.5	98.1	-4.3	-3.4
Madagascar	110.8	99.2	-1.9	-1.3
Malawi	70.5	86.5	5.4	-2.5
Mozambique	93.4	99.9	-0.9	0.4
Tanzania	105.1	99.4	-1.8	-0.4
Zambia	105.0	100.5	-0.9	-1.1
Zimbabwe	92.2	91.2	-0.3	-4.8
Low-middle income				
Angola	88.4	117.5	2.1	4.9
Namibia	122.7	111.3	-3.5	5.6
Swaziland	113.3	101.7	-2.6	0.3
Lesotho	99.9	101.6	-1.4	1.0
Upper-middle income				
Botswana	124.3	106.5	-3.6	0.9
Mauritius	105.3	103.9	-0.7	0.1
South Africa	98.1	101.1	0.0	0.7

Data source: FAOSTAT (2008)

Equally important is the role of agriculture in increasing the supply of raw materials to industries. Agricultural raw materials exports and imports as a percentage of merchandise exports and imports respectively are used as a proxy for the supply of agricultural raw materials because of the lack of data on the supply of agricultural raw materials. Generally, exports of agricultural raw materials are higher amongst the low-income countries for which there is data. Tanzania and Zimbabwe have a relatively higher proportion of agricultural raw materials imports at 13.1% and 11.8% respectively. Swaziland, though it is a low-income country, has relatively higher exports of agricultural raw materials at 9.0%. Other middle-income countries have relatively lower agricultural raw materials exports. It is, however, notable that six of the seven countries where the value of agricultural raw

material exports is declining, have declining imports of agricultural raw materials. This may imply an increase in value addition with more of the agricultural raw materials produced being processed rather than exported resulting in less demand for imports. Exports of agricultural raw materials are rising only in Madagascar and Malawi at 4.1% and 2.2% respectively. Generally, most of these countries have low levels of imports of agricultural raw materials. Imports of agricultural raw materials are increasing fastest in Madagascar followed by Mozambique and Zimbabwe but declining in most other countries. As expected, imports of agricultural raw materials are declining among the middle-income countries which may imply increasing production in these countries. However, observations are mixed among the low-income countries as some have increasing imports while others show a decline (Table 5).

Table 5: Agricultural raw materials trades (% of merchandise trades) in southern Africa (2000-06)

Country	Exports		Imports	
	Average	Growth	Average	Growth
	2000-06	2000-06	2000-06	2000-06
Low-income				
Congo, Dem. Rep.	-	-	-	-
Madagascar	4.8	4.1	0.5	18.5
Malawi	3.3	2.2	1.2	-6.9
Mozambique	5.0	-17.9	1.0	14.8
Tanzania	13.1	-3.7	1.8	-17.2
Zambia	5.3	-7.4	1.6	-19.4
Zimbabwe	11.8	-8.1	1.9	12.5
Low-middle income				
Angola				
Namibia	0.9	-6.6	0.8	-2.7
Swaziland	9.0	-6.4	2.0	-14.2
Lesotho	-	-	-	-
Upper-middle income				
Botswana	-	-	-	-
Mauritius	0.5	0.0	2.2	-2.0
South Africa	2.4	-7.4	1.3	-6.5

Data source: World Bank (2008)

The role of agriculture in economic development is not limited to supplying an increasing amount of food for the people of a country and raw materials for its industries. Once this role is being performed in a sustainable manner a marketable surplus will be available to increase the income of the agricultural population. On a large scale, agriculture is expected to produce high grade or quality products for exports. This will earn the economy foreign exchange to buy capital goods. Table 6 shows that nearly half the countries in the region have a negative agriculture trade balance on average. These include Angola, Botswana, the DRC, Lesotho, Mauritius and Mozambique. South Africa, Namibia, Tanzania, Malawi and Madagascar have positive and relatively large agricultural

Table 6: Average values of agricultural exports, imports and growth in SADC countries

Countries	Exports (\$ million)	Imports (\$ million)	Net trade (\$ million)	Average share of exports (%)	Average share of imports (%)	Average annual growth in Exports (%)	Average annual growth Imports (%)
	2000-2005	2000-2005	2000-2005	2000-2005	2000-2005	2000-2005	2000-2005
Low-income							
DRC	74.7	222.2	-147.4	0.7	3.5	15.9	16.4
Madagascar	569.4	213.3	356.1	5.2	3.4	-3.0	6.9
Malawi	486.5	143.1	343.3	4.5	2.3	4.8	26.4
Mozambique	303.5	308.3	-4.7	2.8	4.9	5.1	11.7
Tanzania	716.2	320.2	396.0	6.6	5.1	10.5	6.9
Zambia	266.7	161.5	105.2	2.5	2.6	18.3	17.7
Zimbabwe	1,077.6	260.9	816.7	9.9	4.1	-11.7	30.7
Low-middle income							
Angola	36.5	883.4	-846.9	0.3	14.0	-6.2	15.2
Namibia	590.2	177.7	412.4	5.4	2.8	-1.2	-35.4
Swaziland	303.3	113.0	190.3	2.8	1.8	-8.0	-46.2
Lesotho	19.9	88.7	-68.8	0.2	1.4	-41.0	-37.4
Upper-middle income							
Botswana	78.8	304.3	-225.5	0.7	4.8	-8.3	-48.1
Mauritius	496.3	600.2	-103.9	4.6	9.5	9.2	5.0
South Africa	5,826.9	2,525.4	3,301.5	53.7	39.9	6.0	8.7
SADC	10,846.4	6,322.1	4,524.4	100.0	100.0	3.5	6.6

Data source: Bahta, Diao and Nin Prat ongoing work (2008)

trade surpluses. South Africa contributed more than half of the regional agricultural trade exports; followed by Zimbabwe, Tanzania, Namibia, Madagascar, Malawi and Mauritius in that order. However, there is general growth in exports with declines only in Angola and Botswana. Import growth seems marginal for most countries except Malawi with a 1.2% growth. In the same vein, South Africa imports most followed by Angola and Mauritius. Imports generally grew amongst the low-income countries. All the low-middle income countries have declining imports except for Angola. The reverse is the case amongst the upper-middle income countries with all countries in this group increasing imports except for Botswana which had a huge decline of 48%.

Looking at overall agricultural production, Table 7 presents an index of agricultural production. Only Angola and Mozambique have consistently increasing trends in agricultural production per capita since the beginning of this decade. Surprisingly, most countries have been experiencing declining per capita agricultural production. This raises the question whether agriculture's potential to contribute to the reduction of poverty and hunger will be realised in the region.

To conclude this section, the southern African region and most of the countries could be defined reasonably as having more or less agricultural economies with diverse agricultural performance. This information should inform the choice of prioritised agricultural performance indicators in these countries given the myriads of indicators of agricultural performance in the literature.

Table 7: Trends in the index of per capita agricultural production in selected SADC countries (1990-2006).

Countries	Index of agricultural production per capita		Average annual growth (%)	
	1990-2005	2000-05	1990-2005	2000-05
Low-income				
Congo, Dem. Rep.	127.4	91.2	-4.4	-3.5
Madagascar	111.5	94.3	-2.1	-1.4
Malawi	80.9	91.1	3.8	-2.9
Mozambique	92.6	98.2	-0.7	0.8
Tanzania	105.8	100.0	-1.8	0.1
Zambia	101.4	95.7	-0.7	-1.1
Zimbabwe	92.6	83.6	0.9	-7.8
Low-middle income				
Angola	89.0	114.0	1.9	4.8
Namibia	121.8	112.8	-3.4	5.5
Swaziland	114.7	97.6	-3.3	0.0
Lesotho			-1.5	1.0
Upper-middle				
Botswana	124.3	102.5	-3.6	0.8
Mauritius	107.2	104.0	-1.0	0.0
South Africa	98.5	103.1	-0.2	0.6

Data source: FAOSTAT (2008)

Prioritised performance indicators for M&E of agricultural performance

Adegeye and Dittoh (1985), having highlighted the prominent roles of agriculture at different stages of economic growth and development, categorise most African countries as agricultural economies and posit that in such countries, policy and development strategies should involve agricultural development. The authors then define agricultural development as essentially rural development, which is part of economic development in general. In an agricultural economy that is liberally endowed with agricultural resources and has less mineral resources, agriculture will be the prime source of rural development and the accompanying increase in socioeconomic facilities. In such an economy agricultural development would imply a response from agriculture to increasing food requirements. To maximise agriculture's contribution to such an economy improvements are needed in infrastructure such as roads in order to get farm produce to market, clean water supply, electricity, and other social amenities for the rural populace. This may lessen rural-urban migration and sustain agricultural production. However, taking cognisance of the dynamic world in which we live with a number of countervailing forces, Dumanski, Terry, Byerlee and Pieri (1998) argue convincingly that it is important that agriculture respond rapidly to capture markets, technological, environmental and other opportunities, and perhaps to challenges, (such as regional integration) in a sustainable manner as the emphasis shifts from food security to reducing rural poverty.

The big picture arising from the above concepts and exploratory analysis is that, although countries have diverse agro-ecological and socio-economic situations, it is nevertheless possible to categorise the region as having a substantial rural and agricultural population, and substantial agricultural resources, and yet having inconsistent agricultural contributions to economic growth. Therefore, the necessary agricultural contributions that will help the transition from one stage of economic development to another should inform the definition of agriculture performance or agriculture development. Agriculture needs to perform complex and multiple roles. Achieving improved productivity requires changes in agricultural production patterns, innovations and the appropriate institutions to facilitate the adoption of such innovations.

Therefore, there seems to be a need to choose prioritised indicators for M&E of agricultural performance. Table 8 presents a list of prioritised indicators emanating from the concepts, analysis and insights in this study. Each indicator can have different dimensions as explained in the table, which specifies units of measurement, along with what is being measured, and probable sources of data. The set of indicators covers a wide range of the diverse roles that agriculture can play in economic development.

Table 8: *Prioritised indicators for M&E of direct agriculture performance*

s/n	Indicator (definition)	What is being measured	unit	Possible sources
1	Level and growth in total GDP per capita	Level of improvement in living standard and average household income	\$, %	National account
2	Level and growth in agricultural GDP per capita	Level of improvement in living standard and average agricultural/rural/farm household income	\$, %	Household survey
3	Quantity/value and share of with growth in domestic output of an agricultural commodity	The extent to which domestic outputs are traded. The extent of agricultural exports production. The extent of market access.	Ton, \$, %	Agricultural census Post harvest surveys
4	Quantity/value and share of with growth in domestic output of an agricultural commodity as proportion of total consumption	The extent of self-sufficiency in production for a commodity	Ton, \$, %	Agricultural census Post harvest survey
5	Quantity/value and share of with growth in domestic output of an agricultural commodity that is sold nationally	The extent to which domestic outputs are traded. The extent of agricultural exports production. The extent of market access.	Ton, \$, %	Agricultural census Post harvest survey
6	Quantity/value and share of with growth in agricultural exports in the regional exports for an agricultural commodity	The extent to which domestic outputs are traded. The extent of agricultural exports production. The extent of market access.	Ton, \$, %	Agricultural census Post harvest survey
7	Quantity/values and share of with growth in agricultural national exports in the world exports	The extent to which domestic outputs are traded. The extent of agricultural exports production. The extent of market access.	Ton, \$, %	Agricultural census Post harvest survey
8	Quantity/values with growth in domestic supply of agricultural raw materials for agro-based industries	The extent to which supply of agricultural raw materials are been met	Ton	Agricultural census
9	Proportion and growth in farming population as percentage of total population	The extent of reduction in the number of the people engaged in farming and an increase in the productivity of those that remain engaged in farming	Number, %	Demographic survey
10	Index of proximity to and cost of services (e.g. marketing cost, water, etc.)	The extent of rural development	Km, \$/unit	Demographic survey

CHAPTER FOUR

SELECTED INDICATORS FOR M&E OF THE SHARED REGIONAL GOALS AND TARGETS

Based on the literature review of existing and proposed indicators of the shared goals and targets in CAADP, the SADC RISDP, the MGD1 and the SADC AIMS questionnaire, this section presents a short list of indicators for goals and targets. The indicators are developed and organised into a number of data domains. The importance or relevance of the indicators to the subject matter is briefly discussed in the sections that follow. Tables 9 to 13 summarise the selected indicators showing what they measure or estimate, the unit of measurement and the shared regional goals which each indicator is intended to evaluate.

Poverty and hunger indicators

As discussed earlier in this report, each of the fundamental roles of agriculture directly or indirectly contributes to poverty and hunger reduction. A well performing agricultural sector will raise household income, living standards, and ultimately rural development. Food security has been a major development thrust for salvaging the deplorable standards of living in African countries including those in southern Africa. This is why accelerated agricultural and economic growth have been considered necessary for achieving the MDG1 targets. Table 9 presents a number of indicators for measuring the incidence and prevalence of food security or insecurity, hunger, malnutrition and poverty and inequality. Each of the indicators is briefly explained in the following paragraphs.

Poverty and inequality

According to Maxwell (1999), it seems that there remains a lack of consensus on the measurement of poverty. This problem is worsened by growing inequality that can be attributed to a number of measures introduced to end poverty and hunger. A number of poverty indicators including rural poverty, head count poverty and poverty gap indicators are employed by the MDG1 as indicators for the target of halving poverty (United Nations, 2007). These indicators are useful as they can give much more comprehensive information on the trends of poverty in the southern African region.

The region shares two MDG1 targets, one of which is to halve the proportion of the population living on less than US\$1 per day between 1990 and 2015. The international poverty line of US\$1 a day is a simple and universal measure easily used to measure the incidence of poverty (Maxwell, 1999). For this target, the trend in the proportion of the population living on less than US\$1 per day can be monitored. The poverty head count ratio is a measure of poverty incidence based on the proportion of the population whose income is less than 1\$ a day (Coudouel and Hentschel, 2000). This indicator can be constructed on an annual basis and trends towards achieving the MDG1 target of halving the proportion of people whose income is less than 1\$ a day by 2015 can be examined.

The poverty gap indicator is a measure of the mean shortfall from the poverty line of 1\$ a day while the income gap indicator is a measure of the shortfall below the poverty line and the average of incomes below the poverty line. These indicators can be constructed for a given national poverty line which may be converted to a dollar equivalent. The indicators can also be constructed separately for rural and urban areas and for farm households in a country. The trends in the indicators will give the level of improvement or otherwise in the living standards of people of different stratas (for example farm households and non-farm households) in a country, thereby giving an indication of agricultural growth performance.

The prevalence of inequality in income distribution could also be measured using the income gap indicator. The target is to achieve an equitable distribution of wealth within a country. Progress towards this target could be measured in terms of income poverty as a lack of sufficient income to meet minimum consumption needs. This can be measured as the difference between the poverty line and the average income or consumption of the population living below the poverty line. It gives the incidence of inequality in income distribution as the amount of income that would be required to bring every poor person exactly up to the poverty line. This is measured in the local currency and converted to an equivalent \$ per day per person.

Hunger and malnutrition

The second target of the MDG1 is to halve the proportion of people who suffer hunger between 1990 and 2015. This goal and target is incorporated in the SADC RISDP which targets increasing the daily per capita dietary energy and protein intake from 2,160 kilocalories (kcal) to 2,700 kcal and 49g to 68g respectively by 2015. Annual trends in the average daily per capita dietary energy and protein intake and the proportion of the population receiving the required daily per capita dietary energy and protein intake can be aggregated from national trends. Other target on the SADC RISDP of food security is to halve the proportion of people who suffer from hunger by 2015. This is in line with the target 2 of the MDG1. Therefore indicators such as measures of incidence of underweight children under five years of age and prevalence of under and malnutrition as the proportion of population below minimum level of dietary energy consumption can be constructed and aggregated at regional level.

The incidence of malnutrition and of underweight under 5 year children could also be used to monitor performance towards the third target of halving the proportion of people who suffer from hunger by 2015 under the MDG 1. The indicator gives an indication of incidence of malnutrition as the population below minimum level of dietary energy and protein consumption. These indicators generally give an indication of agriculture's contribution to food self security in term of food utilization for healthy living. Annual trends of these indicators can be measured against the target of halving the proportion of people who suffer from hunger by 2015.

Household income distribution by source

Household income is an indicator of a household's ability to meet its needs. The distribution of household income by source may be used to measure the income range and farm household income. The distribution showing the proportion of income from farming activities will show whether farming is a profitable means of earning a livelihood. A disproportionate amount of income from farm and non-farm activities could leave the farm household open to vulnerability and shows poor performance of agriculture.

Domestic food gap

Even though there is an emerging shift of emphasis from food security to reduction of poverty (Dumanski *et al.*, 1998), one of the fundamental roles of agriculture in the earlier stages of development is food production. The domestic food gap measures the food shortfall from domestic production. This indicator provides information about how the agricultural sector performs in meeting the food self-sufficiency level in an economy. Information from the food balance sheet could be used in constructing this indicator. The food balance sheet is a widely used tool for analysing a country's food import requirements. However, the methodology is still being perfected. Ideally, the indicator should include various food groups but data limitations may limit this measure to important food groups such as cereals (maize, sorghum, rice, wheat) and root and tuber crops (sweet and Irish potatoes, and cassava).

Food aid

The proportion of the population receiving food aid represents the head count of the total population who are unable to sustain adequate food consumption using all sources at their disposal in a given consumption season. Likewise, we intend to estimate the proportion of population skipping a meal and those disposing of production assets as a coping strategy for meeting daily food requirements. This is to capture the coping strategies used by households to minimise the risk of food insecurity. The larger the proportion of households adopting irreversible or undesirable coping strategies the more severe is the food access problem. Since different households tend to adopt different coping strategies when they run out of food, the indicator has a special focus on irreversible or undesirable coping strategies. Irreversible or undesirable coping mechanisms fall into three main categories, those that:

- compromise the household's capacity to produce (such as disposal of productive assets);
- sacrifice the nutritional status of the individual (skipping meals); and
- affect future coping strategies (such as those that damage the environment).

These strategies predispose household members to a range of social and economic problems in the future.

Whereas natural disasters are generally regarded as rare phenomena, the Integrated Regional Information Networks (IRIN) of the United Nation (2007) reports that there have been repeated natural disasters in a number of southern African countries, namely Mozambique, Lesotho and Swaziland. This justifies food aid in these countries. However, trends in the volumes and value of food aid may be a measure of the performance of agriculture in meeting the food needs of such economy. Like food prices, the food aid indicator could serve a dual role. An increase in food aid and cash transfers suggests a lack of access to food at household level. It also shows a lack of physical availability of food on local markets. It is acknowledged that within a country, food production may be adequate but availability in certain areas of the country may be problematic – a classic case is North and South Mozambique. In such cases, efforts will be made to examine the regional dimension of this indicator within such a country. If food aid increases when the food balance sheet shows that food is available, this indicates a worsening of access. If the food balance sheet shows a large deficit, an increase in food aid reflects the overall unavailability of food.

However, it is acknowledge that while the above indicators point to hunger and poverty generally; they may also occasionally give an indication of an emergency or temporary situation. Therefore it

should be stated that there are temporary situations where low farm-household income, or disproportionate farm-household income, hunger, malnutrition and domestic food shortages may not reflect an under-performing agricultural sector but rather an emergency situation. For example, natural disaster is a rare phenomenon; however drought and some political disturbances that distort food production or accessibility have been common in a number of southern African countries. This can result in under- and malnutrition notwithstanding a performing agricultural sector. In addition, consumption habits within households may affect dietary energy intakes in spite of the availability of food.

Table 9: Selected indicators to monitor trends in poverty and hunger

Indicator	Definition	Units	What is being measured	Goals and targets
Poverty head count	Percentage of population whose income is less than 1\$ a day.	%	Poverty incidence	MDG 1 target 1 SADC RISDP target 2
Poverty gap	Mean shortfall from the poverty line of 1\$ a day	\$	Improvement or otherwise in the living standard of people	MDG 1 target 1 CAADP target 4
Income gap	Shortfall between poverty line and average of incomes below poverty line	\$	Prevalence of inequality in income distribution	MDG 1 target 1 CAADP target 4
Farm income	Proportion of farm income in farm household income	%	The average proportion of farm income percentage of total average farm-household income for a given calendar year	MDG 1 target 1 CAADP target 4
Hunger and malnutrition	Percentage of children under five years that are underweight Percentage of population below minimum dietary energy/protein intake	%	Malnutrition and hunger	MDG1 target 2 SADC RISDP target 9
Food aid	Proportion of food aid as percentage of total food consumed Percentage of population receiving food aid	% %	Food security	MDG1 target 2 CAADP target 1
Domestic food gap	Proportion of value of domestic food production to food demand/ consumption in percentage	%	Food self-sufficiency	MDG1 target 2 CAADP target 1

Agricultural production indicators

The SADC RISDP includes a number of targets towards achieving the set targets in agricultural growth and overall economic growth. This requires a number of indicators to measure technical efficiency and the productivity of resource use in the agricultural sector and to monitor agriculture's contribution to economic growth. Table 10 presents a set of selected indicators for this purpose.

Agricultural growth

Under the SADC RISDP target 1 for food security is to attain at least a 7% GDP growth rate per year in the region. This is in line with target 2 under the NEPAD CAADP which aims at improving agricultural productivity in order to attain a 6% annual agricultural growth rate. An obvious

indicator of the agricultural growth rate is the the growth rate of agricultural GDP. Performance towards these targets could be simply measured using trends in the country and regional GDPs and projecting them into the future. While agricultural GDP is expected to reduce as a proportion of overall GDP as an economy develops, its value is expected to continue to rise in absolute terms. This rise depends on total factor productivity (efficiency and technical change) in agriculture.

Farm resource productivity

Indicators such as those presented in Table 10 could be constructed to measure agricultural productivity in terms of agricultural value added per worker or the productivity of other farm resources used. This set of indicators will give an indication of the efficiency of resource use. Efficient use of agricultural resources will affect agricultural trade and profitability, which in turn will reflect on agricultural growth performance.

Table 10: Selected indicators to monitor trends in agricultural production.

Indicators	Definition	Unit	What is being measured	Goals and targets
Agricultural growth	GDP agriculture as percentage of total GDP	%	Agricultural growth rate	CAADP target 1 SADC RISDP target 1
Farm resource productivity	Ratio of gross value of agricultural production to total paid farm workers.	\$/man-hour	Value marginal productivity of farm resource use	CAADP target 2
	Ratio of gross value of agricultural production to volume of irrigation water used	\$/m ³		
	Ratio of gross value of agricultural production to area irrigated	(\$/ha)		
Agricultural yield	Quantity of crop/animal output per ha/LU	Ton/ha Unit/LU	Growth in crop yield and animal off-take rate Technical progress over time	RISDP target 5
Agricultural mechanisation and intensification	• Percentage of total area that is irrigated	%	Agricultural intensification and mechanisation as means of technical progress	CAADP target 5 RISDP targets 3 and 4
	• Rate of total fertilizer used	Kg/ha		
	• Rate of improved seed variety used	Kg/ha		
	• Number of tractor hour used	Hour/ha		
	• Rate of pesticide used	Kg or l/ha		
	• Number of animal stock per farm household	%		
Farm technology adoption	Number of animal stock per farm household	Number/unit	Livestock intensification and growth in livestock production activities	RISDP target 8
			Rate and intensity of technology adoption	

Agricultural yield

Yield increase is an obvious means to accelerate agricultural growth. It is therefore necessary to monitor the status and trends in technical progress in agricultural production for each country and the region as a whole. Crop yield and animal off-take rate indicators can be constructed for a

series of crops to estimate the gain in technical efficiency measured as output generated per unit (ha or livestock unit) of inputs. This will help to monitor progress towards SADC RISDP target 5, which is to increase cereal yields in kg/ha from an average of 1,392 to 2,000 (the world average) by 2015. It will reveal changes in resource or sector productivity and signal the need for resource development or otherwise for a particular sub-sector or a specific crop or type of livestock.

Agricultural mechanisation and intensification

Agricultural intensification, effected by producing more agricultural goods with the same amount of resources, such as land and water, is a means of accelerating agricultural growth. Agricultural intensification indicators, as presented in the Table 10, give an indication of technology intensity in agricultural production. This could also be interpreted as an indication of the level of agricultural potential that is being exploited to meet the food and export demands of a country. Each of the measures could be computed for a specific arable crop. Target 5 for the agricultural sector under CAADP is to harness the role of science and technology for agricultural and food production. A set of agricultural intensification indicators, as presented in Table 10, is a measure of the commitment to, and the impact of, public spending in agriculture to harness the role of science and technology for agricultural and food production.

In addition, target 3 of the SADC RISDP for food security is to double cropland under irrigation from 3.5 to 7 as a percentage of the total by 2015. The set of indicators can be used to identify trends in the proportion of cropland under irrigation at regional level. For monitoring purposes target data needs to be collected on total cropland and cropland under irrigation in both hectare and percentage terms.

Target 4 is to increase fertiliser use from 44.6 kg/ha of arable land to 65 kg/ha of arable land by 2015 (world average is 98.8 kg/ha). Trends in average fertiliser use measured in kg/ha can be identified using the rate and intensity of fertiliser used at regional level. The indicator will be a good measure of the improvement in fertiliser use in the region as this is expected to have a positive correlation with agricultural growth in each country and in the region as a whole.

Likewise, a livestock intensification indicator will reveal the progress towards target 8 under the SADC RISDP for food security, which is to increase livestock production by at least 4% annually. A livestock intensification indicator could indicate progress towards meeting this target. The indicator can be constructed at national level and aggregated at regional level. It also needs to be constructed for each type and species of farm animal and livestock such as beef cattle, dairy cattle and chicken broilers. The trends in livestock numbers and in the number of animals slaughtered should provide an indication of progress towards intensified livestock production.

Agricultural intensity can also be monitored by tracking gross farm receipts per ha of land farmed. This indicator will provide both an indication of the prosperity of the agricultural industry based on economic returns to farmers, and the intensity of the use of agricultural land. The indicator can measure the total value of gross farm receipts by agro-ecological zones within a country, normalised by the land area that is farmed. Total gross farm receipts would exclude sale of forest products.

Technology adoption

New technologies need to be developed and introduced to farmers for adoption to ensure a performing agricultural sector. The fast growing population in the southern African region calls for rapid adoption of new technologies that will produce enough to feed the growing population. There is,

therefore, a need to monitor the trends in technology adoption in the agricultural sector (World Bank, 2006). This is necessary for the transition from subsistence to commercialised agriculture. The final indicator in Table 10 is a measure of the rate at which agriculture is capable of meeting increasing demand as a result of increasing population and income, which increases the taste and demand for high quality agricultural products including organic products. The indicator can be constructed for the adoption or use of improved seed varieties, innovative water management, pest and disease management, and so on. Target 6 under the SADC RISDP is to double the adoption rate of proven technologies such as improved seed varieties, and management of water and land by 2015. This can be measured using the technology adoption rate. Trends in the adoption rate in terms of volume of improved seeds varieties used and the proportion of farming households adopting technology can be measured at national level and aggregated at regional level. In order to monitor this target, it is necessary to collect data on actual usage of improved seed by farmers.

Agricultural trade and investment

Trends in agricultural trade and profitability also need to be monitored with a set of indicators, as this might give feedback on growing or declining incentives for investment in agricultural production and on agricultural growth in the short- and long-run. Table 11 presents a proposed set of indicators for this purpose.

Trends in staple food price

In the simplest price-supply relationship the trend in the price of a commodity determines the trends in its supply. Food price trends that compare current food prices with baseline food prices could be constructed to give an indication of food accessibility. This indicator tries to measure increasing or decreasing food availability. It is important, however, to identify the sources of food availability as an influx of food imports could also mean increasing food availability. If such food imports have a negative impact on domestic food production, they could signal poor performance of agriculture in the economy concerned.

Changes in food prices in local markets can confirm whether an estimated food shortage is realistic or not, especially if trends in the current year are compared to those of previous years. Food shortages in local markets will push prices up as these prices move towards import parity. On the other hand, if the shortage is not huge, prices on local markets are likely to remain more or less stable. The indicator will capture the actual price of the various food items included in the national food basket on local markets. The food price index (FPI) gives an indication of the price change in identical items over time. It is however, often difficult in practice to capture price movements due to changes in quality as opposed to price movements due to changes in quantity.

Terms of trade in agriculture

In an open economy agricultural performance may bear indirectly or directly on food production, which is also dependent on agricultural prices relative to general prices. The commitment of resources to agriculture, or investment in agriculture, also depends on relative prices or the relative return to agricultural production. An indicator of relative agricultural prices is also a measure of food accessibility. In general, the agricultural price index is the price of a basket of agricultural products, while the overall price index could be the GDP deflator, which is a measure of the change in prices of all new, domestically produced, final goods and services in an economy. This indicator attempts

to measure the terms of trade between agricultural products and non-agricultural products. It also gives an indication of the returns to factors engaged in agricultural production, because besides total factor productivity (TFP), terms of trade in agriculture also affect the returns to factors of production. It is acknowledged that changes in terms of trade will always have a significant effect on the output of the sector. According to Shane, Roe and Gopinath (1998), a number of other factors may result in falling terms of trade in agriculture in a global context, Productivity growth may shift supply to outpace demand, thereby resulting in declining prices. In addition, low prices and income elasticity of demand for food may also lead to declining prices.

Food imports

Increasing food imports, except in the case of imports to counter occasional food shortages due to natural disaster, should give an indication of decreasing, stagnant or increasing agricultural production that does not meet with demand. A food import indicator is a measure of the performance of agriculture in meeting the food needs of an economy. The indicator will monitor the proportion of food demand that is met through imports. A one-time status of this indicator may be evaluated vis-à-vis current climatic conditions for agriculture, while a trend will raise some questions about the competitiveness of domestic food production in an economy. A separate indicator can be constructed for staples (maize, sorghum, rice, wheat, sweet and Irish potatoes, and cassava) and pulses (beans, cowpeas and nuts). It is acknowledged that importing for re-export is possible. Therefore, this indicator will be interpreted pragmatically for each country. For example, there are times when food imports may be driven by factors other than production. In such cases, increasing food imports may not be an indication of an under-performing agricultural sector.

Table 11: Selected indicators to monitor trends in agricultural trade and investment

Indicators	Definition	unit	What is being measured	Goals and targets
Food price	Trend in food price	-	Trends in food supply	CAADP targets 1 and 3
Agricultural terms of trade	Ratio of agricultural price index to overall price index	-	terms of trade in agriculture and increasing or decreasing food availability rate of return to investment in agricultural production	CAADP target 2
Food imports	Percentage of the value of food consumed that is imported	%	Food self-sufficiency	CAADP target 1
Market access indicators	<ul style="list-style-type: none"> • Transportation cost • Percentage of public spending on transportation channels • County's export as percentage of regional export • Regional exports as percentage of world export • Country's export as percentage of total production 	<ul style="list-style-type: none"> \$/ton/km \$ % % 	<ul style="list-style-type: none"> Marketing cost with regard to transportation cost Derived incentives for export 	CAADP target 3
Agricultural expenditure	<ul style="list-style-type: none"> • Percentage of annual public spending on agricultural • Amount allocated for agriculture as a whole 	<ul style="list-style-type: none"> % local currency 	<ul style="list-style-type: none"> Share of agriculture expenditure in the national budget Amount agriculture expenditure 	CAADP target 5

Public spending in agriculture

As economies expand and the share of agricultural GDP in total GDP declines, there is a tendency for governments to give less priority to agriculture in favour of services and industrial sectors. However, agriculture remains the mainstay of most southern African economies and deserves pride of place, both in terms of favourable policies and public expenditure. An agricultural spending indicator can be constructed for both recurrent and development spending in agriculture to measure whether countries are meeting their commitment to agricultural development by investing at least 10% of their national budgets in agriculture under the Maputo declaration. As SADC has adopted the NEPAD definition of agriculture, expenditure data will be focused on those government functions falling under this definition in terms of the classification of functions of government in agriculture (COFOG). Agriculture, according to this definition, includes expenditure on crops and livestock production, forestry, fishing and hunting.

In the same vein, the Dar es Salaam Extra-Ordinary Summit (May 2004) recommended that member states allocate at least 25% of the agricultural budget for water management and irrigation. The trends and level of this indicator will also show the proportion of agricultural spending allocated to science and technology. Previous work by AU/NEPAD, SADC AIMS and pilot studies by ReSAKSS-SA in Malawi, Mozambique and Zambia are potential sources of data for constructing this indicator. This will give an indication of progress towards CAADP target 5 of harnessing the role of science and technology for agricultural and food production. In a broader sense, financial support for agriculture will express the commitment to developing agricultural potentials and contributing to food security and poverty eradication.

Market access indicators

Efficient market access is a necessary pre-requisite for increased production, which in turn is necessary for agricultural development. Equally important is access to farm supplies and equipment. Productive resources must be available or easily accessible to the rural and agricultural areas at prices that producers can afford. A number of measures can give an indication of market access as an indication of the extent to which a country's domestic outputs are traded in local, national, regional and international markets. These include agricultural sales and exports as proportions of total production and exports as a percentage of regional and international exports. An increase in the volume and value of agricultural exports within and outside the region could also give an indication of increasing market access in relation to the removal of trade barriers.

Target 3 for food security under CAADP is to achieve improved market access for small- and large-scale farmers. Progress towards this target can be measured with the trends and variability in transportation costs measured in \$/ton/km for various means of transportation and within rural and urban areas in a country. It could also be measured by cross-border transportation costs within the region. As countries vary in the level of infrastructure development between urban and rural areas, it is more meaningful to compare median transportation costs. A stable decrease in transportation costs will give an indication of improvement in market access for small- and large-scale farmers. Another measure of the improvement in market access could be increasing public expenditure on means of transportation. In this case, the indicator for improved market access could be measured as a proportion of public spending on transportation channels. Public spending on transportation channels could be disaggregated to railways, roads (paved and unpaved), merchant marine (ships, containers, tankers and so on), ports and terminals.

The implied impacts of improved transportation channels could be measured with indicators such as the proportion of regional exports that a country's agricultural exports account for, the proportion of world exports that a country's agricultural exports account for and the proportion of a country's total production that its agricultural exports account for. In constructing this set of indicators and interpreting them the possibility of imports making up a proportion of what is exported will be considered, however, this possibility in itself is a good indication of market access.

Natural resource base

Target 6 under CAADP deals with harnessing and managing natural resources. Progress towards this target can be measured using a number of indicators listed in Table 4. This set of indicators tries to measure the sustainability of the resource base, which bears on agricultural production potentials. It expresses the capacity of the land for production and directly affects the income potential of those whose livelihoods depend on the land. The consequences of unsustainable resource use range from declining yields through higher input needs, to having to resort to lower-value land uses, which may in turn reduce growth in agricultural productivity.

Monitoring trends in the depletion or conservation of protected areas is very important for sustainable agriculture. The greater the area being set aside to retain habitat value and the greater the interconnectedness of these protected areas, the higher the potential to preserve habitat and wildlife resources. Research shows that larger areas and areas close to each other can sustain more complex plant communities and provide alternative opportunities for wildlife if one area becomes compromised. Protected areas and parks include lands owned or designated that are managed primarily to protect natural or recreational resources. These include city parks (with a natural focus), regional parks, federal parks, federal conservation areas, lands owned by non-governmental nature trusts, and provincial wildlife management areas. The protected area indicator describes the total extent and the percentage of total land area set aside for parks and protected natural areas in each country. It includes parks, and protected areas managed by all levels of government, and areas that are managed to protect ecosystems such as conservation areas, wildlife management areas and land owned by private institutions. Generally, the larger a park or protected area, the greater the habitat value. Conversely, small parks or protected areas generally have less habitat value. Geographic information system (GIS) technology will be useful to treat such data at national level and aggregate it at regional level.

Sustainable natural resource management indicators

Using and managing natural resources such as farm land, and ground and surface water has a direct implication for sustainable agriculture, which is reflected in both short and long-term agricultural performance. Resource degradation is widely considered to be a major threat to global food security and environmental quality. Loss of potentially productive agricultural land through land degradation and deforestation has serious consequence for decreasing food supplies and increasing poverty levels (Pimentel, Harvey, Resosudarmo, Sinclair, Kurz, McNair, Crist, Sphpritz, Fitton, Saffouri, and Blair, 1995). Specifically, it is usually arable lands that are lost due to deforestation. Deforestation is common in tropical countries as a result of commercial over-exploitation of tropical forests. At times, deforestation can be so extreme that it leads to desertification, or the total loss of arable land. This has occurred in portions of the central highland plateau of Madagascar following extensive slash-and-burn activity. Therefore, sustainable agricultural production that is economically viable

and does not degrade the environment over the long term is also an important factor in determining the extent to which agricultural land is being preserved and will be reflected in the availability of agricultural land now and in the future.

Indicators such as the areas of land that are protected can be used to monitor trends in the sustainability of agricultural land. An indicator for areas of protected land would describe the total amount and percentage of agricultural land that is protected in each country. This can include parks at national, district and sub-district level, and areas reserved for agricultural purposes only, such as conservation areas and wildlife management areas. Generally the larger an agricultural protected area, the greater the habitat value and the agricultural production potential. The rate of deforestation is another indicator of sustainable natural resource management that can show how much agricultural land is being protected. A deforestation rate will give an indication of the rate of removal of trees by cutting and burning to provide land for residential or industrial building sites, roads and other amenities if it is not shortly followed by reforestation. This has the potential to cause global warming, loss of biodiversity, soil erosion and loss of habitat for some animal and plant species, all of which have a long term impact on the diversification and potential of agricultural production.

Indicators of sustainable natural resource management should prepare the minds of policy makers to identify agricultural and wildlife reserve areas, particularly those limited areas with fertile land and an ideal climate for agriculture. Identifying such areas and monitoring trends in them will help to counter the pressure of urban development that threatens agricultural land. In addition, the livestock/grazing capacity of grassland, range or pasture is an indicator of how the livestock sector will perform. This in turn has direct implications for the nutrition or under-nutrition status of the population. A livestock/grazing capacity indicator as an estimate of the ratio of livestock unit equivalents to the total grazing area will give an indication of the available livestock production potentials in an economy. This indicator can be aggregated as livestock units (LUs) or further disaggregated into various animals such as cattle, donkeys, sheep and goats.

In the same vein, the protection of riparian areas is important for slowing storm water runoff, protecting water quality, and providing habitat for aquatic and terrestrial organisms. Retaining vegetation in a natural state along riparian corridors helps ensure that these and other important ecosystem functions continue. A riparian area is a stream-side protection and enhancement area. The definition of a stream includes a watercourse, whether it usually contains water or not, a pond, a lake, a river, creek, or brook, and, a ditch, spring or wetland that is connected by surface flow to a watercourse, pond, lake, river, creek or brook that provides a habitat for fish.

Plant and animal health

Target 7 of the SADC RISDP is to reduce the incidences of trans-boundary animal diseases (TADs), particularly foot and mouth disease, by half by 2015 with the ultimate objective of eliminating it. Monitoring regional progress towards this target can be done using a number of indicators listed in Table 13.

Disease outbreak and severity

A disease outbreak indicator measures the frequency at which outbreaks of disease occur to arrive at a measure of the rate of incidence of disease outbreaks. It will give an indication of plant and animal health status and trends, as these might have significant implications for livestock productivity.

Table 12: Selected indicators to monitor trends in the natural resource base

Indicators	Definition	Unit	What is being measured	Goals and targets
Sustainable agricultural land and water use indicators	• Area and proportion of total land reserved and protected for agricultural purposes.	Ha, %	• The amount of area that has been set aside to retain habitat value for agricultural production purposes.	CAADP target 6
	• Depletion of forest land	Ha	The rate of land area protection	
	• Ratio of livestock unit equivalent to total grazing land area	LU	• The rate of deforestation	
	• Volume of freshwater use to total freshwater potentials per annum	m ³	• Grazing land conservation	
	• Volume of water withdrawal to total renewable water resources	m ³	• The proportion of streamside riparian areas that is protected as a park or other protected area.	
	• Volume of groundwater abstractions to total groundwater recharges	m ³	• Amount of land protected or in riparian corridor	
			• The percentage of streamside riparian area that is protected as a park or other protected area	
			• Rate of fresh water preservation or conservation	

Table 13: Selected indicators to monitor trends in plant and animal health

Indicator	Definition	Unit	What is being measured	Goals and targets
Disease outbreak	Number of times a disease outbreak occurs	Number	Frequency of a disease outbreak	SADC RISDP target 7
Disease severity	Percentage of animal death due to disease outbreak	%	Severity of disease outbreak	SADC RISDP target 7

The indicator will capture the years in which outbreaks of disease occurred over a period of years, and the number of times a disease outbreak occurred in a single year. The indicator could be constructed for a series of different diseases such as foot and mouth disease, avian flu and so on.

In addition, the vulnerability of a country to outbreaks of disease could be estimated as the number of diseases outbreaks within a country in a given time period, or the number of livestock affected by each disease outbreak, while the proportion of animals that die due to sickness or disease can be used as an indicator of the severity of the attack. The indicator could be constructed to cover a specific period for each country and mapped over the region. The prevalence of each disease can be measured by computing the number of sick and dead animals as a proportion of the total number of animals.

CONCLUSION

Agriculture has diverse but not exclusive roles in economic development. Which role is prominent may depend on the stage of economic development, while agriculture is also affected by a number of factors ranging from vagaries in climate to whether technology is available and policy measures. Therefore, harnessing the roles of agriculture in achieving the shared goals and targets in the MDG1, the AU/NEPAD CAADP and the SADC RISDP is a daunting task, which necessitates monitoring agriculture performance. Monitoring agricultural growth performance towards the achievement of the shared regional goals of food security, poverty reduction and economic growth in southern Africa in particular should be a topic that deserves continued attention.

Monitoring in this context should involve repeated observation of the status of, and trends in, agriculture performance, especially to identify and signal progress towards the shared targets and goals. This will inform whether each member state, and the region as a whole, have made substantial progress towards the achievement of the regionally shared goals and targets. This type of monitoring may benefit from the use of performance indicators. Broadly, relevant performance indicators are needed to show stakeholders:

- the current performance of agriculture in an economy;
- trends that may need to be reversed and
- current courses of action that may improve the performance of agriculture within the economy or region.

This can be done by using performance indicators.

However, the concept of agricultural performance is broad and agriculture can play many roles in a given economy. Similarly, monitoring can be done from different perspectives and for different purposes. It is therefore of paramount importance that in monitoring agricultural performance those involved should consider the diverse roles that agriculture can and should play in economic development in a particular context. This study identifies the southern African region as a whole and most countries in the region as having a mainly agricultural economy marked by diverse agricultural performance across countries. This informs the choice of prioritised agricultural performance indicators in these countries given the many different indicators of agricultural performance in the literature. Equally important is the monitoring of each country's progress towards achieving the shared goals and targets. As NARs and international agencies are using many different indicators, a comprehensive pool of such indicators might be necessary and should be organised into different data domains to address different topical enquiries and monitoring needs.

There are bound to be some challenges in the collection of data for monitoring progress towards SADC agricultural and socio-economic goals and targets. The collection of statistical data needs to be harmonised within SADC and between SADC and the international community. This will prevent duplication of effort. For the initial study, the commonly available databases from institutions such as FAO, World Bank, and AU may be used. A pilot survey may also be carried out in selected countries.

In monitoring progress towards the shared goals and targets, a relevant but objective base year should be chosen. This depends on the availability of consistent data for each country. It also depends on consistent baseline data that allows comparison or assessment of the impact of the growth commitment or strategy, as well as providing a reference point for monitoring change. Although

the choice of any base year is hardly neutral, the expected impact of the policy intervention or programme needs to be taken into consideration in choosing a base year. A number of questions need to be answered in reporting on agricultural performance and progress towards the selected goals and targets using indicators. These questions include:

- What is being measured?
- What is the relevance of the indicator?
- How far is each country in addressing the status and trends of the indicator?
- How do countries compare?
- What is being done?
- What can stakeholders do?

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APPENDIX

A STANDARD PROCEDURE FOR EMPIRICAL ANALYSIS OF AGRICULTURAL PERFORMANCE

Analytical technique

Indicators are tools that can be used to track changes over time and are a yardstick for measuring future change relative to a baseline. These indicators can be expressed as indices (Harper, 1991). An index is a single figure used to summarise a series of figures over years. It shows how much a figure for one year differs from that for another year. To explore the rate of change in the index over years, a chain index could be computed by using the previous period as a base for each current year's index computation. A chain index shows whether the rate of change is rising (rising numbers),

$$\text{Chain index} = \left(\frac{\text{index}_1}{\text{index}_0}, \frac{\text{index}_2}{\text{index}_1}, \dots, \frac{\text{index}_n}{\text{index}_{n-1}} \right) \quad (2)$$

falling (falling numbers) or constant (constant numbers) as well as the extent of the change from year to year. The formula to compute a chain index is as follows:

Where n = the number of years over which the indices were compared.

$$\text{Average annual percentage change} = 100 \left(\sqrt[n]{\text{Index}_i - \text{Index}_j} - 1 \right) \quad (3)$$

Further, to observe the average annual percentage change over the years, the average annual percentage change could be computed as follows:

where index_i = base year index; index_j = last year index and n = number of years over which the trend is studied (Harper, 1991; Olubode, 2003).

Data and sources

There are bound to be some challenges in the collection of data for monitoring progress towards SADC agricultural and socio-economic goals and targets. The collection of statistics needs to be harmonised within SADC and between SADC and the international community. To avoid duplication, data collection effort at country level should complement the efforts by the World Bank, FAO and ADB. Some national statistical offices have better capacities to provide the required data while others are under-resourced.

When examining the indicators to be used in the monitoring and the evaluation of a policy, project, programme or progress towards a target, it is of utmost importance to consider how each of the

indicators will be measured using primary and secondary data sources. Potential sources of data to be used in this kind of monitoring include survey or primary data as well as secondary data such as FAOSTAT and World Bank databases. For the initial study, the construction of the proposed indicators will be based on commonly available databases from institutions such as FAO, World Bank and AU, as these data sets allow for a number of standard analyses and cross-country comparisons. Pilot surveys may also be carried out in selected countries. Where data is not available at the regional level, country level data will be aggregated.

Base year

In monitoring agricultural growth performance for southern Africa, year 2000 or a subsequent year could be chosen as a base year for each country and for the region as a whole. This depends on the availability of consistent data for each country. It also depends on consistent baseline data that allows comparison or assessment of the impact of the commitment or growth strategy as well as providing a reference point for monitoring change. Although the choice of any base year is hardly neutral, the expected impact of the policy intervention or programme needs to be considered in choosing a base year. Whichever year is taken as the base year, subsequent annual data should be compared with the base year data. The bottom line is to choose a year that will allow evaluation of how specific national or regional commitments or growth strategies in the form of policies, programmes, or projects have been performing with respect to agricultural growth since they have been in place. However, it must be borne in mind that choosing a recession year as the base year would probably overestimate performance in subsequent years.

Reporting format and template

Two reporting formats may be followed; an annual agricultural growth performance report and a regular-year report (depending on resources) taking into consideration the rolling plans of each country or of the region as a whole. Taking the SADC RISDP into consideration, agricultural growth performance could be reported for the year 2008, 2010; 2014, 2015 and 2016 as base years to evaluate the performance with respect to each of the RISDP targets. The write-up for the report could include a short description of the indicators, a concise statement on the status of the indicator using a chart with historical trend data for simple data sets or a snapshot in time for more complicated indicators.

The status is then measured against what the stakeholders may have put in place in terms of policies, projects, programmes, incentives and so on to improve agricultural growth. It may be helpful to compare the current status along the trend to examine the course of change which can inform the stakeholders about progress or alert them if there is cause for alarm. In reporting, agricultural growth performance could be compared with other sectors within the economy or with the performance of agricultural sectors in other countries. This can provide information on strategic options for governments on what should be done or what to improve in order to accelerate agricultural growth.

A well-focused and easily manageable monitoring effort that allows for cross-country comparison is the rationale for prioritising and selecting some indicators that can be used in the short term. They should be sufficient to monitor the progress of SADC and its member countries towards the RISDP goals that align with the MDG1 on hunger and poverty reduction and CAADP goals for achieving food security through accelerated agricultural growth. Hence, immediate analysis will

focus on the limited set of indicators presented in Table 6. A number of questions will be answered in analysing and reporting on the monitoring of agricultural growth performance towards the selected goals and targets using each indicator. These questions include:

- What is being measured?
- What is the relevance of the indicator?
- How far is each country in addressing the status and trends of the indicator?
- How do countries compare?
- What is being done?
- What can stakeholders do?

The Regional Strategic Analysis and Knowledge Support System (ReSAKSS) is an Africa-wide network that provides analysis, data, and tools to promote evidence-based decision making, improve awareness of the role of agriculture for development in Africa, fill knowledge gaps, promote dialogue and facilitate the benchmarking and review processes associated with the AU/NEPAD's Comprehensive Africa Agriculture Development Programme (CAADP) and other regional agricultural development initiatives in Africa.



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