



# **AGRICULTURE DIALOGUE**

**Phase 1**

**Keynote Paper 2**

**Budget Efficiency in Agriculture**

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*CABRI Agriculture Dialogue Phase 1*

Keynote Paper 2

Budget Efficiency in Agriculture



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## Acronyms and abbreviations

<b>AAPS</b>	African agricultural planning scorecard
<b>AfDB</b>	African Development Bank
<b>ASTI</b>	Agricultural Science and Technology Indicators
<b>BCR</b>	benefit benefit-cost ratio
<b>CA</b>	conservation agriculture
<b>CAADP</b>	Comprehensive Africa Agriculture Development Programme
<b>CABRI</b>	Collaborative African Budget Reform Initiative
<b>CBA</b>	cost cost-benefit analysis
<b>CGIAR</b>	Consultative Group on International Agricultural Research
<b>DFID</b>	Department for International Development
<b>EU</b>	European Union
<b>FAO</b>	Food and Agriculture Organisation of the UN
<b>FEWS NET</b>	Famine Early Warning Systems Network
<b>IFAD</b>	International Fund for Agricultural Development
<b>IFPRI</b>	International Food Policy Research Institute
<b>IPCC</b>	International Panel on Climate Change
<b>IRDP</b>	integrated rural development projects
<b>IRR</b>	internal rate of return
<b>ISNAR</b>	International Service for National Agricultural Research
<b>IWMI</b>	International Water Management Institute
<b>MTEF</b>	Medium Term Expenditure Framework
<b>PRSP</b>	Poverty Reduction Strategy Papers
<b>PSIA</b>	poverty and social impact assessment
<b>R&amp;D</b>	research and development
<b>ReSAKKSS</b>	Regional Strategic Analysis and Knowledge Support System of
<b>RISDP</b>	Regional Indicative Strategic Development Plan
<b>SACCO</b>	savings and credit co-operative organisation
<b>SADC</b>	Southern African Development Community
<b>SSA</b>	Sub sub-Saharan Africa
<b>SWAp</b>	Sector Wide Approach



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## 1. Introduction

This paper is part of the documentation prepared to inform a dialogue across Africa on budget reform in the agriculture sector. The purpose of the dialogue is to share experience, so that countries can adopt the policies and procedures that are most appropriate to their situation.

The paper aims to identify the main determinants of budget efficiency in the agriculture sector across Africa, so that discussions can focus on those issues that are most important for improving budget efficiency. It does not aim to draw conclusions about which types of intervention are most efficient, since this depends on country circumstances.

The paper reviews African experiences in measuring efficiency in agricultural budgets and in using that information to feed evidence back into future policy and changes in budget allocation and management. The focus of the paper is on what normally are considered the core sub-sectors of government in the agriculture sector, including:

- research and extension, both for crops and for livestock, including use of improved practices;
- market regulation;
- facilitating the growth of rural financial services;
- intervention in markets, particularly in circumstances of market failure;
- land reform and regulation; and
- infrastructure that would not be undertaken by the private sector, including irrigation schemes for smallholders and rural roads.

The paper starts with a review of *technical efficiency*, which measures the extent to which resources are used in a way that minimises the cost of achieving output targets or maximises the outputs achieved from given resources. Technical efficiency is measured through indicators of cost-effectiveness. The paper then considers *allocative efficiency*, which measures whether resources have been allocated to the activities that provide the highest returns. Allocative efficiency is measured through cost-benefit analysis (CBA) and other techniques that accommodate a more qualitative analysis of benefits. A third type of efficiency – *internal efficiency* – refers to the consistency amongst the different elements of expenditure, and measures, in particular, the extent to which an integrated approach to agricultural development is beneficial. Part 5, then, considers how evidence on efficiency can be used for budget prioritisation. The paper concludes by summarising the findings and proposing two specific initiatives.

## 2. Technical efficiency

Technical efficiency measures the extent to which resources are being used in a way that minimises the cost of obtaining set outputs or maximises the outputs from set resources. Cost-effectiveness indicators should provide evidence on technical efficiency that can help managers to ensure that resources are used efficiently, both in terms of geographical spread and in terms of the focus on different crops. Extension indicators are used to try to demonstrate equity and, sometimes, to measure staff performance. However, this is rarely reported and has not been monitored. Research indicators are more problematic, because there is such variety in the quality provided by different research results. Livestock services lend themselves to monitoring cost-effectiveness, but this normally takes place within departments or projects, and there is limited exchange of expertise. Unit costs for irrigation are widely studied and have been used to identify the causes of variations in effectiveness both in sub-Saharan Africa (SSA) and globally.



## 2.1 Measuring cost-effectiveness

Technical efficiency measures the extent to which resources are being used in a way that minimises the cost of obtaining outputs or maximises the outputs per input. It requires measurement of the outputs as well as the resources used to deliver the outputs. Indicators are expressed in terms of outputs divided by inputs, not simply in terms of outputs. In some cases, inputs are defined as costs, while in others it may be useful to use the number of officials, which then helps to focus on the efficiency of those delivering the service. Examples of indicators of cost-effectiveness are shown in Table 1.

**Table 1: Indicators of cost-effectiveness**

<i>Extension</i>	
	Number of new farmer adopters per extension worker
	Area of land cultivated using new techniques per extension worker
<i>Research</i>	
	Cost per new varieties developed/adapted
	Cost per farmer adopting new varieties
<i>Livestock</i>	
	Head of livestock vaccinated per veterinary worker
	Number of farmers adopting breeding practices per veterinary worker
	Volume of medication sold by private veterinary services
<i>Irrigation</i>	
	Cost per hectare of land irrigated
	Proportion of irrigated land maintained
<i>Markets</i>	
	Cost per farmer reached by market information systems
	Cost per farmer reached by new traders
<i>Rural finance</i>	
	Cost per farmer accessing rural financial services
<i>Rural roads</i>	
	Cost per kilometre of road constructed
	Cost per kilometre of road rehabilitated
	Cost per kilometre of road maintained

### *Output indicators*

Most African countries collect basic agricultural statistics that are reported in agricultural yearbooks or in national statistical yearbooks. These statistics are designed primarily to monitor agricultural output and do not focus on efficiency. However, they provide valuable context and can be used to validate information on performance indicators. For example, if the adopters per extension worker are multiplied by the number of extension workers and the expected impact of adoption on yields, then this can be compared with national statistics on crop yields to assess the extent to which the extension service has contributed towards agricultural growth. Such an assessment will also give some indication of the reliability of performance indicators.

Statistics on crop production and yields and livestock numbers are typically reported by officials of the ministries of agriculture. Many countries have price information systems that collect prices in markets around the country, often at least monthly, and report these under a



central system. Most countries also participate in early-warning systems that collect information on the evolving situation with food balance and the risks of food crises. Some countries conduct occasional sample farm surveys, either dedicated to gathering information on farming system or as part of household surveys. A few countries have conducted agricultural census surveys, in which basic information is provided for all farms.

Several initiatives share this information internationally:

- The Food and Agriculture Organisation (FAO) has a network of country offices that gather this information and report it to FAO Rome, where it is compiled in the FAOSTAT database.
- The Famine Early Warning Systems Network (FEWS NET) is a system for sharing information on early-warning indicators from at least 22 African countries.
- The Regional Agricultural Information Management System is an initiative of the Southern African Development Community (SADC) Regional Indicative Strategic Development Plan (RISDP) and has begun planning for the co-ordination of agricultural information amongst member states. It is not yet clear whether this will cover indicators of efficiency as well as outputs. The RISDP itself has targets for the following indicators: area irrigated; fertiliser use; crop yields; adoption rates; animal disease incidence; livestock production; and nutrition.

A recent study by the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) reviewed the possible selection of a set of prioritised monitoring indicators that would facilitate monitoring of the progress in agricultural growth across Africa (Olubode-Awosola et al. 2008). The study proposed ten indicators: total GDP per capita; agricultural GDP per capita; output growth; output/consumption; sales/output; share in regional trade for a product; share in world trade for a product; domestic/total inputs to agro-business; farming/total population; and proximity to and cost of agricultural services. Indicators are expected to be provided by a mix of post-harvest reporting and surveys. The last of these indices relates to the efficiency of public expenditure. Despite these initiatives, there is limited comparative evidence of efficiency indicators.

### *Overheads*

One of the most common concerns about management efficiency has to do with the proportion of expenditure that is used for 'overheads'. There is no standard definition of overheads, but Table 2 and the related box give some indication of how they are normally defined.

**Table 2: Defining overheads**

Clearly overheads	<ul style="list-style-type: none"> <li>• Expenditure in ministry headquarters, including on administration and management of all programmes</li> <li>• Expenditure in central project management units</li> <li>• Formulation of, and advocacy for, agricultural policy</li> <li>• Monitoring and evaluation</li> </ul>
Grey area	<ul style="list-style-type: none"> <li>• Sub-national management of extension and livestock services</li> <li>• Pure agricultural research</li> <li>• Capacity-building for farm groups</li> <li>• Management of rural financial institutions</li> </ul>
Clearly not overheads	<ul style="list-style-type: none"> <li>• On-farm extension advice and adaptive research</li> <li>• Support for input supply, subsidised or not</li> <li>• Veterinary services provided directly to farmers, subsidised or not</li> <li>• Loans and savings services to farmers</li> <li>• Subsidised purchasing of products</li> </ul>



### **Acceptable levels of overheads in agricultural services**

Agricultural projects are typically co-ordinated by a unit which may be connected to the ministry of agriculture, or may be independent. This unit generally accounts for between 5% and 10% of the costs, depending mainly on the complexity of the programme. Field activities, including extension and veterinary services, are usually delivered by government officials. These activities are paid for by the government and typically account for another 5% of the costs. If there are gaps in government capacity, NGOs may be recruited to assist, and these tend to be much more expensive than the government. The budget for monitoring and evaluation would normally be between 1% and 2% of the total.

The Protracted Relief Programme (PRP) in Zimbabwe was supported by several bilateral donors and the European Union (EU) and World Bank. It involved expenditure of US\$158 million over four years and was terminated early, partly because donors were concerned about the level of overheads involved in the programme. The PRP spent 34% of resources on overheads, defined as those costs that were incurred by central and district-level management, including advocacy and monitoring and evaluation. The recent impact evaluation concluded that this was, in fact, a reasonable level of overheads, bearing in mind that all field services were delivered through a large network of NGOs.

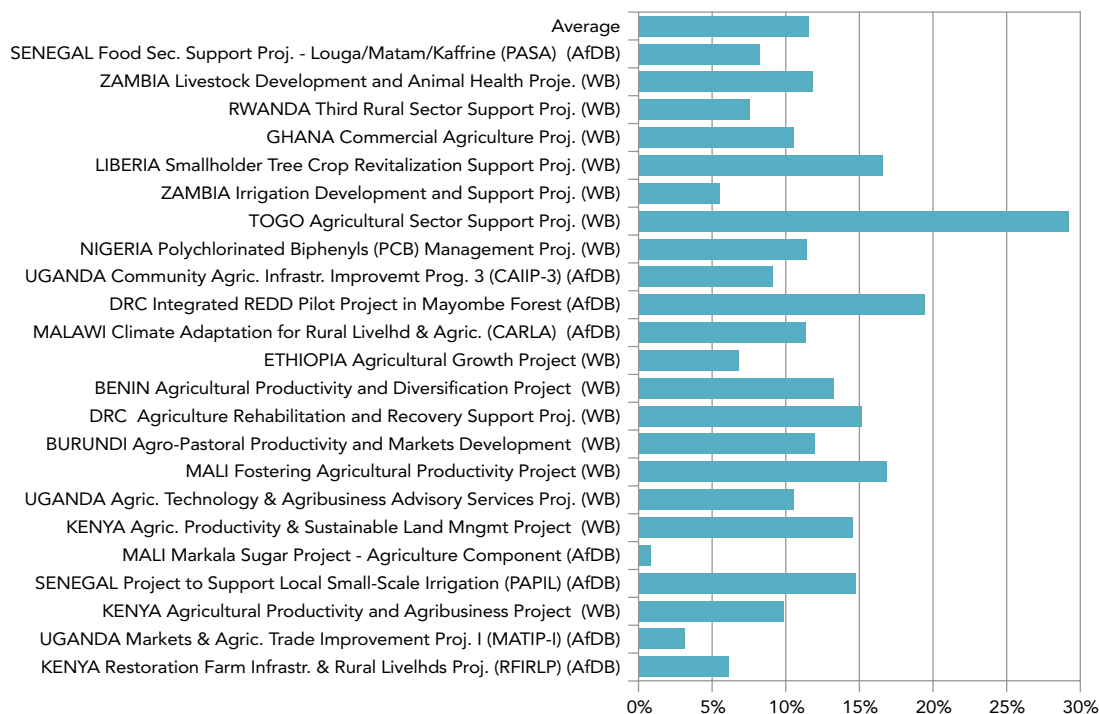
Although not in Africa, the Chars Livelihoods Programme (CLP) in Bangladesh illustrates what can be achieved when a large rural livelihoods programme is delivered through government services. The overheads spent on central management, advocacy and monitoring and evaluation amounted to only 20% of total costs. However, it is important to be sure about what is and is not included when assessing overheads. In the case of the CLP, it is not clear whether this estimate included the sub-national management functions. If it did not, then it is only slightly lower than that of the PRP in Zimbabwe.

An evaluation of the EU LEADER rural development programme found that about 45% of the resources were spent on management, including central administration and the costs of the local community group that managed the programme, with only 55% being delivered as grants to beneficiaries. An even more extreme example is provided by some of the rural livelihoods programmes operating in Palestine, which have broadly defined overhead costs of over 80%.

A review of project appraisal and evaluation documents undertaken for this keynote paper suggests that the component of the project that deals with project management typically varies from 5% to 15% of total project costs, with some outlying cases. There are no obvious reasons for the variation, although there is some suggestion that the share of costs devoted to management is lower for larger projects. The analysis includes only those costs that are defined as central project management and does not include the costs associated with managing components of the project. It is not always clear whether it includes other 'grey areas', such as capacity-building, community mobilisation, policy development and lobbying, public awareness and monitoring and evaluation.



**Figure 1:** Project management costs as a percentage of total project costs



### *Value for money*

Many donors are placing more emphasis on value for money. In theory, this can be achieved by saving on costs or by increasing outputs, but some donors are beginning to focus more on saving costs, which can be neglected if it is not given specific attention.

### *Equitable coverage*

One of the most powerful ways in which cost-effectiveness indicators can be used to improve overall efficiency of public expenditure in agriculture is in ensuring an equitable coverage of services. The number of farmers per extension worker in a district is a typical indicator of coverage. It does not always follow that an equitable coverage is the most efficient, since some expenditure will be more cost-effective in some areas than in others. However, it is a good starting point to assume that an equitable distribution will be associated with overall efficiency, and then to consider the reasons why this might not be the case, in different countries.

## 2.2 Cost-effectiveness in agricultural sub-sectors

### *Extension*

In the post-colonial era, continued use was made in Africa of a model of public extension that had been typical in Europe and America. This evolved into the training and visit (T&V) system, which has been replaced by the farmer field school (FFS) in the last decade. All of these models have been problematic, and most African countries are still looking for a cost-effective solution. Systems involving NGOs and the private sector have also been tried and can be effective on a small scale, but are difficult to scale up to have a national impact. Most countries are now looking to adopt mixed systems that build on the latest experience with FFSs and exploit the best features the different models (Anandajayasekeram, Davis & Workneh 2007).



A recent review of extension systems considered the effectiveness of three models (farmer-to-farmer, demonstrations, and dissemination facilitation) and a range of supporting activities (including workshops and media). The study concludes that farmers think the farmer-to-farmer model is most effective, while the extension services believe that demonstrations are most effective (Lukkainen 2012). The analysis suggested that farmers' opinions on effectiveness were determined by age, gender, isolation and the original source of information.

### *Research*

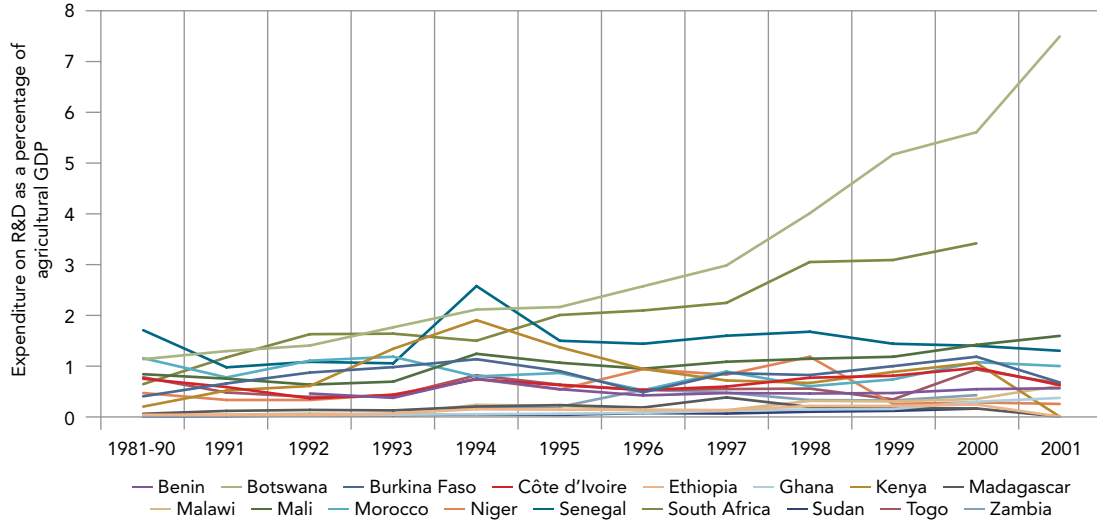
In the first decades after independence, agricultural research in Africa was undertaken primarily by national agricultural research services. However, as funding has become increasingly restricted, and research increasingly globalised, agricultural research in Africa has become linked more and more to the Consultative Group on International Agricultural Research (CGIAR) and the various specialised institutions that comprise the CGIAR. This group has three decades of experience in compiling data on indicators of agricultural research in developing countries, starting with an initiative launched in 1981 by the International Food Policy Research Institute (IFPRI) and the International Service for National Agricultural Research (ISNAR), which led to the Indicator Series Project (ISP), launched in 1984. A second phase of data collection was undertaken between 1993 and 1997, which included universities but had little information on private sector agricultural research. The ISP was renamed the Agricultural Science and Technology Indicators (ASTI) initiative in 2000 and was taken over by IFPRI, when ISNAR closed. The ASTI is currently in the middle of a three-year programme to improve the database, focusing on SSA and South Asia, and a biennial series on the state of agricultural research and development (R&D) in SSA is being prepared.

The ASTI data include information on expenditure on research as well as the content of that research. It suggests that total expenditure on agricultural research increased by more than 20% between 2001 and 2008 in real terms, but that most of this increase was concentrated in a few countries and involved corrections to bring very low salaries up to more competitive levels. There are large variations in expenditure on agricultural R&D as a proportion of total public expenditure (see Figure 2).

Public expenditure reviews often find that one of the main reasons for the poor performance of public expenditure in Africa is that it neglects operating costs and tends to concentrate on salaries and investment. At the same time, some reviews point out that the quality of public officials is undermined by low salaries. The situation in the agricultural sector is variable between countries. In some countries, the budget for operating costs is the biggest constraint. For example, Zimbabwe has many experienced and motivated extension staff, despite modest salaries, and their effectiveness is constrained by lack of funding for operating costs. In other countries, experienced extension staff have left the public service for other opportunities, and increasing the budget for operating costs would not necessarily improve efficiency. Figure 3 shows that there are large variations in the composition of public expenditure on agricultural R&D, which suggests that there are important underlying differences to be examined, unless there are problems associated with the comparability of data.



**Figure 2:** Share of agricultural research and development in total public expenditure for African countries



Source: Agricultural Science and Technology Indicators, 2010, and World Development Indicators, 2009, in (Rakotoarisoa, lafrate & Paschali 2011).

**Figure 3:** Composition of public expenditure on agricultural research and development



Source: Beintema & Stads (2011).



There is no regular reporting on efficiency, which is difficult to measure, given the variety of different research programmes. However, ASTI data have been used for research into trends and differences between countries in terms of efficiency. The Diffusion of Improved Varieties in Africa (DIVA) project has assessed the impact of new crop varieties, and has helped in producing an analysis of cost-effectiveness (Alene et al. 2011). The project assessed variations in the following indicators:

- *Researcher intensity* is defined as the number of researchers per million tons of product. The DIVA analysis attempted to capture both public and private researchers. In 1998, researcher intensity was highest for Ethiopia, Kenya, South Africa and Sudan, but was very low for Nigeria (at 0.1 for cassava, 0.5 for sorghum, 1.7 for rice, 1.8 for pearl millet and 2.6 for maize). Cassava received consistently lower researcher intensity scores across most countries. Differences in researcher intensity were higher between countries than between crops; in other words, if a country had a relatively low researcher intensity for one crop, this tended to apply to all crops. The DIVA data suggest that there is a statistically significant relationship between researcher intensity and crop production. In 2010, there were improvements in researcher intensity for some crops (including beans and rice) but declines for other crops (including millet, potatoes and sorghum). Some countries, notably Nigeria, saw substantial improvements in researcher intensity, and this tended to occur in both the private and the public sector.
- *Varietal release* measures the number of varieties released per year and, although there are often problems with the quality of data, this provides some indication of the output of research institutions. For most crops in most countries, the varietal release rate is between 0.4 and 1.0. There has been a steady increase in the release of new varieties for beans, cassava and maize in East and southern Africa. Cassava, however, has had far fewer releases than other crops, despite the overall increase. Other crops and other SSA regions saw increases until the 1980s; since then, the rate of release has been fairly static.
- *Varietal adoption* measures the proportion of farmers and/or cultivated areas that use improved varieties. For most crops, the proportion of land using improved varieties is more than 50%, and for some it is more than 80%. However, the number of farmers adopting new varieties is more typically 20% to 40% for most crops, although it is higher for wheat, maize and potatoes.

ASTI data have also been used to assess policy on agricultural research spending. A recent conference organised by ASTI and the Forum for Agricultural Research in Africa (FARA) reviewed the trends, challenges and opportunities for agricultural R&D (Lynam, Beintema & Annor-Frempong 2012). This did not produce quantitative indicators of cost-effectiveness, but did consider trends in expenditure and identified the following challenges to efficiency in this regard:

- lack of government funding and reliance on volatile donor support;
- better co-ordination of donor support with national priorities;
- more regional co-operation; and
- more collaboration with private sector research.

The Technical Centre for Agricultural and Rural Co-operation (CTA) has been promoting a 'systems innovation' approach to agricultural research in African, Caribbean and Pacific countries. This approach has helped to identify a system of 39 indicators for monitoring the performance of agricultural innovation (Daane et al. 2008). This builds on the experience in three initiatives: the Association for Strengthening Agricultural Research in East and Central Africa (ASARECA); the DURAS programme in the Global Forum for Agricultural Research





(GFAR); and the Learning-oriented Monitoring and Planning System run by the International Centre for Development-Oriented Research in Agriculture (ICRA). The indicators cover a range of inputs, process, outputs, outcomes and impacts. None of these explicitly defines efficiency.

### *Livestock*

An example of an assessment of cost-effectiveness of veterinary programmes is provided by the review of the unit costs of the Pan-African Rinderpest Campaign (Tambi et al. 1999). The review covered 10 of the 35 countries involved, and unit costs were roughly similar – between €0.27 and €0.60 per head of cattle vaccinated – despite the wide differences in circumstances.

### *Irrigation*

Most development agencies have considered that irrigation in Africa gives poor returns, with high costs and low results. However, a recent review found that this was not correct and that unit costs were not significantly higher in SSA, after taking account of the size of the scheme, the level of development of the country and the participation of farmers in investment and management (Inocencio et al. 2007). The study reviewed 314 irrigation projects in Africa, Asia and Latin America, funded by the World Bank, International Fund for Agricultural Development (IFAD) and African Development Bank (AfDB). However, the study did find that failure rates were higher in Africa, partly because of a lack of markets for high-value crops and the resulting use of expensive irrigation water for staple crops.

Another study looked at the costs of irrigation schemes, which were US\$500–US\$6 000 per hectare for large schemes and US\$600–US\$5 000 per hectare for smaller schemes (You 2008). Much of the variation in the unit costs of large schemes was explained by the proportion of the scheme costs that could be covered by the generation of electricity. For small schemes, the variation was explained largely by the level of modern infrastructure required.

### *Subsidies*

There are strong debates about the desirability of subsidies. These are driven mainly by concerns about whether the benefits are sufficient to justify the substantial costs, and this is discussed in the section below on allocative efficiency.

In theory, it should be possible to measure the administration costs of subsidies, which would provide useful evidence on efficiency. However, it is often difficult to isolate administration costs from sales and purchasing costs, especially for subsidies involving crop marketing. Other elements of subsidy efficiency may include the extent to which subsidies are available in a timely manner, as they are normally constrained by available budget, and the efficiency of targeting. For example, a Public Expenditure Tracking Survey on the Fertiliser Support Programme in Zambia suggested that delays in the supply of fertiliser undermined the value of the subsidy; there were also concerns that much of the subsidy was being wasted by making fertiliser available in areas where it was not efficient to use fertiliser or where the private sector also supplied fertiliser (De Kemp et al. 2011). The problems with poor targeting were also identified by another evaluation (Jorgensen & Loudjeva 2005).

### *Markets*

The technical efficiency of market information systems (MISs) can be measured in terms of the cost per recipient of market information, or the cost per piece of information received. There is limited comparative evidence on this, partly because the various models of MIS use very different technologies and practices, and because some are obliged to recover all their costs



while others are partly subsidised by the government or donors. An annual subscription fee of US\$25 was recorded in one example (Kizito 2011), which is a significant cost for a smallholder and gives some indication of the value that farmers place on the information.

### *Rural finance*

The technical efficiency of rural finance can be measured by the number of savings and/or loan customers (or the value of savings and/or loans) compared to the costs of supplying the service. While these should be relatively simple indicators, it is rare for rural finance programmes to report such results. This may be because it is common to underestimate the costs of supporting the early stages of rural finance, and managers and funders of such programmes are nervous that management overheads might be seen as too high.

There have been two main strands of support for rural financial services in Africa, one involving the more formal rural banks and the other involving savings and credit co-operative organisations (SACCOs).

Several case studies have been undertaken of individual rural banks, which identify the main challenges that they face. These often focus on ways to minimise default rates, which are the most common cause of problems in rural banks. However, there are no reviews of the efficiency of rural banks across a country or a region in Africa. This may be because the banks are commercial institutions and information on their financial performance is confidential. The fact that individual assessments of banks often identify problems may be because the banks that have commissioned (or have accepted) studies are those that have problems and are looking for ideas and resources to resolve these problems.

SACCOs are widely spread across Africa and are seen as a successful initiative. However, the few evaluations that are available on the efficiency of SACCOs suggest that they may be quite expensive and that it may be more appropriate to view them as temporary initiatives, rather than the beginning of a permanent revolution in rural finance. An evaluation of the Savings and Credit Co-operative League of South Africa (SACCOL) found that a programme costing US\$1.3 million succeeded in increasing SACCO membership by 2 300 and deposits by R5.4 million. The ratio of SACCOL costs to savings mobilised was about 1:1, which suggests a low rate of return, given that the savings would be likely to yield benefits of less than 10% (Cattell & Boaden 1999). A detailed study of SACCOs in Uganda found that, despite the large numbers of SACCOs in the region, most of them had relatively poor financial performance and were unlikely to be sustainable (Okwee 2011). The evaluation of the Protracted Relief Programme in Zimbabwe also found that SACCOs were very popular, but that the scale of operations was quite small and that the lifetime of the SACCOs was probably quite short.

### *Rural roads*

The simplest indicator of cost-effectiveness for rural roads is cost per kilometre. This is useful for setting priorities for different roads in a similar condition. However, the cost per kilometre varies considerably with the topography and the availability of raw materials, which complicates the analysis.

There are other indicators that can be used, many of which involve some partial definition of benefits, as shown in Table 3. The table shows that assessments undertaken by the World Bank Transport Department focused on vehicle operating costs, while those undertaken by the Agriculture Department focused on the impact of roads on producer surplus. While the focus on producer surplus might seem to be a more comprehensive indicator of benefits, the implications for vehicle operating costs may be a convenient proxy indicator that captures



much of the variation in producer surplus and is easier and cheaper to estimate.

**Table 3: Techniques used to assess performance of rural roads in World Bank projects**

	Pre-1980		1980–1989		Total	
	AGR	TRP	AGR	TRP	AGR	TRP
Producer surplus	9	6	8	2	17	8
VOC Savings	1	10	1	6	2	16
VOC & producer surplus	5	2	3	2	8	4
Other criteria	11	4	3	1	14	5
Not specified	18	15	14	4	32	19

Notes: AGR = appraised by World Bank Agriculture Division; TRP = appraised by Transport Division; VOC = vehicle operating costs. Some appraisals were for projects not yet approved by the Board.  
Source: Riverson, Gaviria & Thriscutt (1990).

### 3. Allocative efficiency

Allocative efficiency measures the extent to which resources are applied to the programmes that give the best returns and reflect the government’s policies. When allocative efficiency is high, budget systems ensure that any incremental resources are allocated to the sub-sectors that give the best returns. In order to assess which programmes provide the best returns, allocative efficiency takes into account the returns to public expenditure. Given the fact that agricultural expenditure produces benefits that can be easily valued, CBA is the primary tool for measuring allocative efficiency, although other tools may be required to consider other objectives, such as poverty alleviation or improved resilience to climate change. Economic returns to extension are usually high in *ex-ante* evaluations, but have rarely achieved their planned results. Research returns are even higher and there is some evidence that high returns have also been achieved in practice. Although the pace of progress with the green revolution has been disappointing in Africa, the urgency of finding new varieties that are adapted to climate change suggests that there are new opportunities for generating high returns. Returns to irrigation are also high in theory, but are difficult to achieve in practice. Expenditure on market development and rural finance and rural roads can also provide high returns. Finally, expenditure on subsidies is highly controversial and the evidence from analytical studies is inconclusive.

Allocative efficiency measures the extent to which resources are applied to the right programmes, bearing in mind the evidence on the performance of different programmes and consistency with policy priorities. In order to assess which programmes provide the best returns, allocative efficiency takes account of the returns to public expenditure and the resource profile, compared with the policy priority profile. Cost-effectiveness alone is no longer sufficient, because programmes have different outputs and outcomes, and allocative efficiency must use techniques that assess the relative value of benefits. Wider costs and benefits, which are not directly related to the activity in question, can also come into the picture.

Public expenditure in the agriculture sector generally has an impact on the production of crops and/or livestock, with benefits to farmers, consumers and traders that can be valued by applying market prices. This makes it possible for at least some of the benefits of many agricultural programmes to be quantified and for the programmes to be subject to CBA and the estimation of internal rates of return (IRR), net present value (NPV) or benefit-cost ratio (BCR).



### 3.1 Cost-benefit analysis

Most agricultural policy and expenditure is designed to increase the productivity and/or production of crops and livestock. As a first approximation, this increase can be valued by analysing market prices. However, an analysis that takes into account the full economic value of these benefits needs also to take into account that market prices may be distorted by taxes, subsidies and other policies, and that policies that have a large impact on production may also influence market prices.

#### *Extension*

Because agriculture has received little international support in Africa over the past two decades, there is limited recent analysis of the performance of expenditure on extension. However, older reviews suggest that very high rates of return can be achieved. The rates of return found in these reviews are surprisingly high, especially as they were taking place at a time when public support for agriculture was declining:

- IFPRI conducted a review of 294 studies covering agricultural research and extension, which suggested that average rates of return were 73% for all studies, 88% for research, 79% for extension and 45% for both research and extension (Alston et al. 1998). This may have been because the studies of research or extension in isolation claimed all the benefits of the improvements without recognising that they required the other to be achieved. The review found little evidence that returns were significantly different between developed and developing countries or between continents (including between Asia and Africa).
- A review in 1994 examined 57 evaluations of extension in 17 developing and middle-income countries, of which 7 were in Africa (Evenson 1994). About half the studies estimate rates of return: 25 had IRRs of greater than 50% (which is exceptionally high); four had IRRs of 25% to 50%; and four had IRRs of 5% to 25%. The developing countries in the survey, which were predominantly African, did at least as well as other countries.

One of the problems facing extension in Africa is a lack of techniques that are useful to farmers. The green revolution techniques that have been so successful on the intensively cultivated arable lands of Asia are less suitable in Africa, and it has proved difficult to find alternatives. One of the best options is conservation agriculture (CA), which involves many different practices, with the following common principles: little or no tillage; crop rotation; and use of mulch to build up organic matter in the soil. It can be combined with the use of inputs, but successful CA leads to improve soil nutrients and organic matter content, thus reducing the dependency on fertiliser. CA is being adapted and promoted across Africa. Performance reviews have included the following:

- A recent review of experience with conservation agriculture in southern Africa, which concentrated on Zambia and Zimbabwe, concluded that maize yields under CA were 42% higher than for conventional farming techniques in Zambia and 105% higher in Zimbabwe, and that gross margins were three times higher in both countries (Mazvimavi 2011).
- Another review of CA across the whole of sub-Saharan Africa (SSA) found that it has been generally successful in increasing yields (especially in the mid-to-longer term but also, often, in the shorter term), increasing profits and reducing labour (Milder,



Majanen & Scherr 2011). The review quoted global evidence that CA yields are 20% to 120% higher, with African countries (e.g. Kenya, Ghana, Tanzania, Uganda, Malawi and Zambia) often achieving a doubling or trebling of yields.

- There is also some useful experience in Zimbabwe, and a recent evaluation of the Protracted Relief Programme suggested that the BCR for public expenditure on supporting CA was between 1.5 and 2.2 (Twomlow et al. 2008; Marongwe et al. n.d.; IODParc 2013).

Despite such successes, CA is still used on less than one million hectares in SSA and this accounts for less than 1% of the global total use of CA. Most of this use is by commercial farmers, with Ghana and Zambia having the largest numbers of small farmers. A recent review of 26 long-term studies involving no-till practices in rain-fed production considered evidence from the US, Canada, Brazil, Mexico, Nigeria, Zimbabwe, Australia, India, China and Italy (Rusinamhodzi et al. 2011). The study concluded that, for southern Africa, CA needs to be promoted carefully and flexibly, in the right climate and soil conditions, with crop rotation and access to inputs, and with sensitivity to the demands of livestock.

### *Research*

Measuring the benefits of agricultural research should be possible. Research leads to new seeds or techniques and the yields resulting from these innovations can be observed and compared with the yields achieved using conventional practices. The appraisal of many major agricultural development projects includes definition of crop margins with and without innovations and estimates of the number of adopters.

The potential benefits from agricultural research are known to be very high. A review of studies about the impact of research undertaken by the CGIAR considered hundreds of case studies and selected 15 that were considered most reliable (Raitzer 2003). Three of these were for Africa and six were global. The BCR varied from 1.94 under the most conservative assumptions, which included no valuation of benefits after the study period. If benefits were assumed to continue, which seems to have been the case for most new varieties, then BCRs of above 9.0 were achieved, which is exceptionally high. It seems possible that these rates are estimated assuming that all the benefits can be attributed to research. In practice, adoption is likely to require investment in extension as well as in other interventions, including land reform, water supply, market development and rural finance.

In addition to the ASTI indicators mentioned in section 3.1, the CGIAR maintains a system of impact studies, supervised by a Standing Panel on Impact Assessment, and also introduced a performance measurement system (PMS) for the period 2005–2010 (Immonen & Fischer 2012). These help the CGIAR management to understand which areas of activity are generating the best results and, so, to identify examples of best practice.

### *Livestock*

A review of the economics of the Pan-African Rinderpest Campaign estimated the benefits obtained from reduced productivity and losses, and compared these with the costs of about €29m for the ten countries reviewed (Tambi et al. 1999). The review estimated that the BCR was 1.8, with 80% of the benefits going to producers and 20% to consumers, as a result of lower prices arising from improved supplies. A similar review of the economic impact of a programme to control contagious bovine pleuropneumonia in 12 SSA countries gave BCRs ranging from 1.6 in Ghana to 2.6 in Kenya (Tambi, Maina & Ndi 2006). These rates of return are presented as positive in the studies, but they are not strongly positive and suggest that the programmes are



sensitive to costs and that they might require more detailed sensitivity analysis to check that there are no major assumptions that could risk reducing the returns significantly.

It is less easy to find analysis of the economic returns to more local support for livestock. A recent evaluation of the Protracted Relief Programme in Zimbabwe found that the BCR for the livestock component was between 2.7 and 5.6, depending on how long the benefits are sustained (IODParc 2013). This programme included both the provision of breeding animals and support for improved animal health, both of which provided strong benefits.

### *Irrigation*

Appraisals of irrigation projects often quote very high rates of return. For example, the appraisal document for the recent Smallholder Irrigation and Value Addition Project (SIVAP) in Malawi, supported by the Global Agriculture and Food Security Programme (GAFSP), quotes an IRR of 58%. Actual experience with irrigation in SSA has been more problematic. The performance of irrigation projects in many developing countries is dependent on the ability of water users to pay for the operation and maintenance of the schemes, and the existence of institutions that ensure that this happens. Where schemes involve gravity, rather than pumping, the operating costs are generally lower, but the maintenance costs may be higher and it can be particularly problematic for farmers to organise effective maintenance.

However, even when these institutional conditions are in place, the transfer of African irrigation to smallholder management can be successful only if it is matched by complementary supporting activities to ensure that productivity is high (Shah et al. 2002). Another desk review of the effectiveness of irrigation projects also concluded that, to be effective, they need to be combined with other investments, including extension and research, financial services and markets (Van Koppen, Namara & Safilios-Rothschild 2005).

A review of 149 irrigation projects in SSA concluded that about 70% would be profitable, giving a BCR of more than 1.0 (You 2008). For the rehabilitation of large schemes, the BCRs varied from less than 2.0 for Cameroon, Sudan and Ethiopia, to more than 5.0 for Côte d'Ivoire, Tanzania and Nigeria. For large planned new dams, BCRs were less than 2.0 for all countries except Rwanda, Sudan, Tanzania, Côte d'Ivoire and Niger. For smaller scale schemes, almost all countries had BCRs of between 1 and 2, except for South Africa, Niger and Namibia.

### *Markets*

Options for promoting market development in SSA agriculture include market information systems, co-operative marketing initiatives, financial and technical support for financial services supporting entrepreneurs, and voucher systems that subsidise the supply of inputs through market channels in areas where private traders are not operating.

There is a long history of public support for market information systems in SSA and there are many different models. A recent review, based on four case studies in Mozambique, Zambia and Ethiopia, concluded that the outcome was not strongly affected by the model used or by whether it was managed by the private or public sector (Kizito 2011). It is, however, important that it has autonomy and is well managed and reliably funded. The performance of the market information system is determined mainly by data reliability, credibility amongst recipients, which is related to reliability but is also affected by the reputation for independence, accessibility, and timeliness.

The value of the information to recipients of the market messages depends on the products grown and agro-ecological zone, ownership of a radio and existence of mobile phone



reception, distance to a road with public transport, membership of a farmers' association, and level of education. Kizito found that receipt of market information increased the probability of selling products by 34% and increased the price that farmers received by 12%. The BCR of the market information systems was about 6:1, but most of the benefits were received by farmers who were already partly commercialised. Esoko operates in 16 African countries, and evaluations have shown that farmer incomes increase by at least 10% when they receive market information (see <http://www.esoko.com>).

### *Subsidies*

There has been much concern about agricultural subsidies in Africa, based on several key issues: the disruptive effect on public finance; the difficulties of managing effective targeting; the risk of creating incentives for the uneconomic use of inputs; and the crowding out of any private market development. However, this conventional wisdom is increasingly being challenged, with evidence of the importance of input subsidies in Asia, new modalities for delivering targeted subsidies more effectively and, above all, improved economic returns from input use that opens up prospects of having more impact on sustained changes in farming practices (Dorward, Hazell & Poulton 2007).

A recent review of agricultural input subsidies assessed the evidence from four major input subsidy programmes in SSA (Baltzer & Hansen 2012). The Malawi Agricultural Input Support Programme/Farm Input Support Programme (AISP) was subject to three evaluations, which found some evidence that benefits exceeded costs, at least in some years. The Zambia Fertiliser Support Programme (ZFSP) was also analysed by many studies, and the World Bank estimated that the additional maize produced as a result of fertiliser use had cost US\$325 per ton, compared with an import parity price of between US\$295 and US\$406 per ton. The study also reviewed the Ghana Fertiliser Subsidy Programme (GFSP) and the Tanzania National Agricultural Input Voucher Scheme (NAIVS), but was unable to find strong evidence. The review noted that it is difficult to reach clear conclusions. However, there are reasons to believe that the results are more positive than were presented in the review. Firstly, the review points out that it is difficult to judge the extent to which subsidies might influence behaviour in the future; the analyses reviewed in the study considered only one year, but sustained outcomes would improve the benefits, even if only modestly. Secondly, the objective of all the input-supply programmes is not simply to increase production, but to do so in a targeted way that benefits poor farmers whom it would be difficult to reach through other types of support.

Another review of the impact of subsidies was undertaken as part of a review of sector budget support for agriculture in Zambia (De Kemp et al. 2011). Several evaluations have found that the fertiliser subsidy has resulted in increased yields, to varying extents, but none has been able to carry through the analysis to give an estimate of the returns to government from expenditure on the subsidy. The efficiency of subsidies has been a constant source of disagreement between the government and donors in Zambia.

### *Land reform*

The benefits of land reform are difficult to establish and few studies report on the economic benefits of reform. There are various aspects of land reform, but two are of particular interest: the promotion of individual tenure in areas where customary tenure is the normal practice; and redistribution of land from large estates to smallholders and smaller commercial farmers.

During the 1970s, the World Bank took a leading role in promoting the conversion of customary land to individual tenure, arguing that it encouraged farmers to invest in their land and to adopt longer-term farming decisions. This position is now less popular and there are many



examples where customary tenure has proved to be more flexible and resilient than individual tenure. However, some countries and some donors continue to pursue policies promoting individual tenure (Adams 2005). There have been problems in many countries with corruption over land titling, and individual tenure has often harmed the more vulnerable households and has been especially detrimental to women. A range of studies conducted in the 1990s looked at land registration and farm productivity in Kenya, Senegal, Somalia and Uganda and failed to find any evidence that individual tenure led to improved productivity. At present, there seems to be little consensus, amongst governments or donors, about the returns that can be expected from changes in land policy.

To some extent, when reforms result in sustained farming activity on the land, this demonstrates that they have been successful. For example, a major programme of land distribution in Kenya was undertaken shortly before independence. This resulted in large numbers of successful smallholder farmers, who were more productive than their European predecessors. In contrast, most of the land allocated to larger commercial farmers was not successful and ended up being rented to smallholders (Adams 2005). However, such analysis of historical experience renders only limited evidence about what is likely to be successful in the future.

Zimbabwe provides an interesting case study of land reform that involves the division of commercial farms into smallholdings. Early analysis suggested that households that benefited from land allocations had expenditures that were about 45% higher than those on communal land, suggesting that land reform gave high economic returns. These positive conclusions were supported by a review of the impact of land reform on 400 households in Masvingo (Scoones et al. 2010). However, a more detailed analysis suggests that households that benefited from land allocation were also significantly larger than those that did not and that the returns to reform were actually much more modest, with an IRR of less than 10% (Deininger, Hoogeveen & Kinsey 2002).

### *Rural finance*

Assessing the benefits of rural financial services is more complicated than simply assessing the technical efficiency of the institutions, because it requires consideration of the benefits derived by savers and borrowers. The fact that financial institutions survive is an indication that the benefits to customers are greater than the costs, but it provides no evidence of the level of benefits that customers derive and so cannot be used to assess cost effectiveness. Estimates of the level of benefit to society are required for governments to assess the relative value provided by public expenditure in support of financial services and, hence, to assess whether the share of resources allocated to this support is appropriate. No studies have been found that explore this.

### *Rural roads*

There is long and detailed experience with the use of CBA for prioritising road construction. This builds on the unit cost evidence reviewed above and adds information on the frequency and nature of road usage. For example, a recent review of rural feeder roads in Ethiopia estimated an IRR of 12% to 34% (Stifel, Minten & Koro 2012).

The ILO has conducted a series of reviews comparing the benefits of labour-intensive rural road construction with techniques using machinery. These reviews take into account that expenditure on labour costs may have additional social benefits if it is part of a policy to reduce poverty.

In addition to this tradition of CBA, in the last ten years there has been a trend towards a more mixed approach to evaluating rural roads that embraces a variety of techniques for assessing the full range of benefits, including social benefits, as described in the following section.





### 3.2 Wider benefits

CBA is a powerful technique for assessing the performance of expenditure that generates benefits for which prices exist. These prices may need to be adjusted for market distortions and for taxes and subsidies, but there are well-established techniques for this. Even when benefits are not traded on markets, there are sometimes techniques that can be used to give evidence of value. For example, contingent valuation can provide evidence of the value that society places on environmental benefits, and estimating 'disability adjusted life years' (or DALYs) can give evidence of the value of health benefits. The further that benefits are from markets, the more difficult it is to compare different types of benefit. However, it is often useful to provide illustrative valuations, if only to ensure that the wider benefits are not neglected, simply because market-related benefits are the easiest to value.

If programmes have significant wider benefits, more mixed techniques may be useful, including the following:

- poverty and social impact analysis;
- various multi-criteria techniques;
- participatory techniques, including interviews, semi-structured questionnaires, focus groups and expert opinions; and
- beneficiary impact assessment, which also uses interviews.

#### *Poverty reduction*

There is no agreed practical technique for assessing the relative value of benefits that accrue to poor people, compared with other economic benefits, although there are some theories about how this could be done. Thus, CBA is not very successful in estimating the success of programmes that have mixed benefits for poor and non-poor households and that also have mixed objectives for wider economic growth and poverty reduction. Many agricultural programmes fall into this category.

For example, an *ex-post* evaluation of support for feeder roads in Zambia attempted to assess the longer-term impact of rural feeder roads by observing changes in incomes in areas that had roads, compared with those that did not (Kingombe 2011). The quantitative evidence was inconclusive, but focus-group interviews suggested that nearly half of the people who had seen an improvement in livelihoods attributed this mainly to the construction of rural roads. The study concluded that it was necessary to triangulate results from a variety of quantitative and qualitative evidence. A review of the different techniques used in impact evaluations of rural road programmes supported by the World Bank reached similar conclusions (Van de Walle 2008).

#### *Nutrition*

In many parts of Africa, at least half of the production of crops and livestock is consumed on the farm. Although many agricultural policies may be targeted at small farmers, in practice, it is difficult to reach subsistence farmers

In most economic assessments, the crop that is consumed on the farm is valued at the farm-gate sale price for households that have a surplus and at the farm-gate purchase price for households that are net purchasers of the product. This applies both to the preparation of national accounts and to CBA of public investment. This is a sensible approach but may underestimate the full social value of production.



### *Water and energy*

A review of irrigation projects in SSA reached the following conclusions and recommendations:

- contrary to popular opinion, irrigation projects can be successful in Africa;
- larger projects tend to be most successful, and there is a strong case for investing in water storage;
- within large programmes supporting a range of schemes, it is the support for smaller schemes that is often the most successful;
- investment in institutions is as important as investing in infrastructure;
- strong farmer participation in design and management is essential;
- irrigation should normally be used for high-value crops, rather than for staple crops;
- reliability of water supply is essential, and it can be useful to combine groundwater sources with surface water; and
- irrigation is often most successful if it is part of an integrated rural development project, which may require international collaboration. (Inocencio et al. 2007)

### *Gender*

A study of the benefits provided by irrigation to women concluded that special attention was needed to ensure that women benefited from irrigation investment (Van Koppen et al. 2005). Participation in operation and maintenance is particularly critical.

## **4. Internal efficiency**

Internal efficiency concerns complementarity and consistency amongst policies and programmes. The importance of having balanced support across all of these has long been understood, although it is now recognised that this should come through the co-ordination of specialised departments and decentralised delivery of services, rather than through integrated projects. This means that, if one element of the support is failing, it cannot be neglected and will need to receive additional attention. However, the optimum balance between the various sub-sectors of agriculture depends on national circumstances. The analysis of technical and allocative efficiency should provide the evidence to help identify which sub-sectors and programmes are receiving too little support.

### *Sub-sectoral balance*

The allocation of expenditure to agricultural sub-sectors should be guided by policies and strategies, which, in turn, should be informed by the performance of the expenditure. In theory, the policy review and formulation process should identify the constraints that are having the greatest impact on the overall effectiveness of agricultural expenditure and should ensure that reforms and resources are devoted to solving those constraints.

Figure 4 shows that there are large variations in the allocation of investment expenditure to agricultural sub-sectors in four African countries. Investment expenditure would be expected to show more variation than recurrent expenditure, but equivalent figures for recurrent expenditure are not available. There are several possible explanations for this high level of variation:

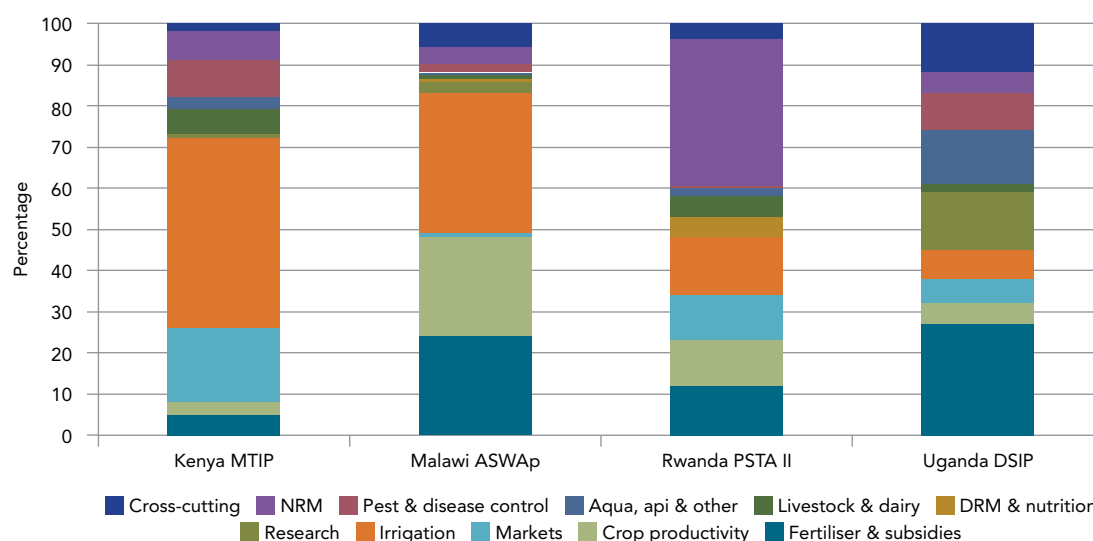
- If the budgeting system is working well, then the variations between countries should reflect the country circumstances and the latest evidence on which sub-sectors need most attention and which provide the best returns to expenditure. Given the relative



similarity of the four countries involved, the reasons for the differences between the countries in expenditure on agriculture are not immediately obvious. It is not obvious, for example, why Kenya should choose to devote 45% of agricultural investment to irrigation, compared with less than 10% for Uganda, or why Malawi should choose to spend 25% on crop production and productivity, compared to between 3% and 12% for the other three countries.

- It is possible that the content of the agricultural investment plans has been influenced by the recent history of support and the need to compensate for neglect in some areas, or to exploit funding opportunities in other areas. Ideally, an agricultural investment plan should take a balanced view of the medium-term priorities, which should provide some stability to the sub-sectoral allocations. However, in practice, this is not always possible and some practical decisions are required (for example, to complete investments that have been started or to participate in regional initiatives).
- There may also be some issues with terminology. In particular, this could affect the categories dealing with food security, disaster risk management, natural resource management and sustainability, all of which could include elements of other sub-sectors.

**Figure 4:** Composition of public expenditure



Notes: Cross-cutting includes monitoring and evaluation (M&E) and capacity-building; natural resource management (NRM) includes sustainability; aqua and api includes all minor agricultural enterprises; disaster risk management (DRM) includes food security; markets includes infrastructure. Source: Benin et al. (2010). Calculations based on national agricultural investment plans: Medium-Term Investment Plan (MTIP) of Kenya (ASDS/MTIP 2010); Agriculture Sector-Wide Approach (ASWAp) of Malawi (MoAFS 2010); Strategic Plan for Agricultural Transformation (PSTA II) of Rwanda (MAAR 2009); Development Strategy Investment Plan (DSIP) of Uganda (MAAIF 2010).

### *Integrated rural development projects (IRDPs)*

In the immediate post-colonial era, international aid for agriculture concentrated on large infrastructure projects, including irrigation, and on continued support for research and extension. Problems with infrastructure projects led to recognition that farmers in developing countries face many constraints and that progress in one area is unlikely to be successful unless there is also progress on all constraints. IRDPs, therefore, emerged in the 1970s as the main vehicle for agricultural and rural development. Internal rates of return of 20% to 40% were common at appraisal, based on large increases in yields and incomes.



However, a review of six IRDPs in Africa found that results were far below what was expected (Morris et al. 2003). The reasons for this were specified as follows:

- most countries had unfavourable economic circumstances, with overvalued exchange rates making imports cheap, and with severe constraints on government revenue that made continued funding of operation and maintenance costs impossible;
- poor knowledge of farming systems, with short project timescales that did not allow for an accumulation of experience or for on-farm testing;
- over-optimistic assumptions about the level of yields to be obtained and the rate of adoption;
- inadequate attention to farm labour and to household work patterns, and frequent undervaluing of farm labour, leading to poor incentives for farmers;
- unrealistic assumptions about the size of extension services that could be sustained using government revenue and the level of benefits from extension; and
- overloading of project management by a large range of activities and lack of sustainability of project management units.

IRDPs have now largely been replaced by sectoral approaches. Lessons learnt from IRDPs were as follows:

- more attention is needed for agricultural research, using adaptive on-farm techniques and ensuring that new practices are financially attractive to farmers;
- phasing and piloting of projects are essential, over a period longer than five years;
- favourable policies need to be in place for markets and prices;
- while co-ordination across sectors and projects is important, individual projects should be less complex and focus on a limited number of objectives and activities;
- projects should work with existing institutions rather than create new institutions; and
- monitoring and evaluation needs to include more effective feedback from farm experience.

### *Rural roads*

There has been continuous debate about the appropriate balance between agricultural support and support for rural roads. Whenever there is new evidence of the challenges in providing agricultural services, this leads to calls for public expenditure that more clearly provides public goods, and roads are often amongst the top candidates for such expenditure. Support for agricultural services often registers lack of market access as a major constraint to agricultural development; investment in rural roads, thus, clearly complements expenditure on agricultural services. However, many of the benefits associated with rural roads arise from growth in agricultural production and, so, support for agricultural services also complements expenditure on rural roads.



## 5. Using efficiency for budget prioritisation

In the early years after independence, it was not feasible for most SSA countries to think in terms of efficiency-based budgeting, as all programmes were new to each country and they had to rely on external agents who frequently brought in their own ideas and priorities. It is only in the last decade or so that most SSA governments have had a sufficiently long implementation track record and the capacity to begin to engage in efficiency-based budgeting. Even in this more recent period, however, most of the work on budget reform has been promoted by external agents, such as the World Bank and a collection of bilateral donors including the Department for International Development (DFID). Reforms have included 'programme budgeting' and the development of 'medium-term expenditure frameworks', supported by 'performance-assessment frameworks', including a range of techniques for impact assessment.

### 5.1 Alignment of budget with policy

In theory, national strategies and development plans should provide guidance for shifts in the share of expenditure due to agriculture, and budget strategy papers and Medium Term Expenditure Frameworks (MTEFs) should provide the tools to deliver those changes. The Comprehensive Africa Agriculture Development Programme (CAADP) seems to have been influential in promoting an increase in agriculture's share of the budget.

Sector strategies should guide the allocation of resources to departments in the same way that national strategies guide allocations between sectors. To be effective, they require budgets to be made at department level, ideally as a formal part of the national budget, but, if this is not possible, then as part of the management practices within the relevant ministries.

### 5.2 Programme budgeting

Programme budgeting emerged in the 1970s as part of a wave of reforms that started in New Zealand and spread to many developed countries over the following 20 years. The reforms covered transparency, efficiency and performance (including the use of performance indicators, multi-annual perspectives and decentralisation). Experiences in developed countries were shared with developing countries, and many countries in Africa started experimenting with programme budgeting in the 1980s. Table 4 describes a typology of programme budgeting.

**Table 4: Typology of programme budgeting**

A	<i>Departmental budgets.</i> Each functional unit of government has a separate budget. This is the normal situation in countries where the budget goes into details below the level of ministry.
B	<i>Performance based budgeting.</i> A + indicators of results that are used to assess performance and highlight problems that need addressing or successes that can be expanded. Examples: Uganda (including 'performance contracting'); Mali since 1997 (as an annex to the budget); Ethiopia (pilots building up since 2005)
C	<i>Log-frame programme budgets.</i> B + a hierarchy of related inputs, outputs and outcomes. Examples: South Africa since late 1990s; Mauritius since 2010.
D	<i>Cross-departmental programme budgets.</i> Budgets are assigned to policies that are delivered by a range of departments. Examples: Australia from the 1980s; USA.



In the immediate post-colonial era, it was the UN system that provided advice to newly independent governments on how to establish efficient and effective budgets, through the use of programme budgeting. More recently most of the work on budget reform has been promoted by the World Bank and a collection of bilateral donors, including the DFID. In contrast, the IMF has tended to advocate a 'basics first' approach, which has concentrated on sound basic budgets (Schick 1998). Recent reviews of budget reform tend to support this approach and suggest that most initiatives in programme budgeting and, indeed, in MTEFs have not been sustainable and may have pulled scarce skills in ministries of finance away from the core function of producing a strong basic budget (Wescott 2008; Allen 2009). However, there is also evidence that benefits are generated by programme budgeting (Wynne 2005; World Bank 2008), but it is difficult to assess the importance of these gains. One of the main conclusions from experience with budget reform is that it takes several decades to achieve the sort of institutional reforms necessary to make major changes, especially for the expenditure side of the budget.

### **Programme budgeting in Mauritius**

The government of Mauritius introduced the current programme-based budgeting (PBB) system in 2006. The system allocates the whole budget to programmes and sub-programmes on a three-year rolling basis. Each programme has defined outputs and outcomes and the budget reforms are complemented by changes in the chart of accounts and in the financial management information system. The 2006 initiative follows the failure of an attempt in 2003 to introduce PBB in six pilot ministries.

Much of the challenge in implementing the PBB has come from efforts to promote coherence between programmes and organisational structures. Many ministries have tended to define programmes to follow organisational structures, because they feel that this will facilitate the management of the programmes. The Ministry of Finance and Economic Empowerment (MoFEE) has encouraged line ministries to take the opportunity of reviewing their strategic objectives and the way in which these are managed.

The Ministry of Agro-Industry and Food Security (MAIFS) now has six programmes: policy and strategy; competitiveness in sugar cane; development of non-sugar cane; livestock; forestry; and biodiversity and conservation. The largest programme (sugar cane) has two sub-programmes. The budget is approved at the sub-programme level. The organisational structure of MAIFS includes four principal assistant secretaries, each of whom is uniquely responsible for either one or two programmes, along with a range of other activities that are not always included in the description of the programmes. There is, thus, a convenient alignment of the budget programmes with management responsibility in the ministry, which helps to ensure that the programme objectives give strategic orientation to resource management.

The policy direction is achieved through a budget structure that builds on log-frame approaches. Each of the MAIFS programmes contains up to three priority objectives with a single outcome, and one or two indicators with a baseline figure for 2011 and targets for 2013, 2015 and 2022. Programmes have up to seven 'major services', which define the activities to be undertaken. Most services have one associated indicator of achievement, with a baseline for 2011 and targets for 2013, 2014 and 2015. The budget for each programme is then broken down into the usual economic categories (i.e. salaries, goods and services, grants, etc.). It is the responsibility of the principal assistant secretary in charge of each programme and sub-programme to ensure that the services are delivered and the indicators are achieved, while also fulfilling the other tasks included in the organisation structure.



### *MTEFs and national strategies*

Programme budgeting is particularly effective if it is combined with multi-annual budgeting, such as by means of the MTEFs that have been adopted in many African countries. These ensure that significant changes in resource allocation can be made in a planned way over a period of several years.

Ideally, an MTEF should be supported by national and sector strategies or development plans. These provide some further orientation to expenditure without the strict constraints of resource availability that are involved in budgets and MTEFs. However, national strategies should always be grounded in realism and should adopt techniques of phasing and contingency planning to ensure consistency with the hard resource constraints involved in budgeting.

### 5.3 Donor support

Traditionally, donor support for agriculture has been provided through investment either in a specific project or in integrated, area-based projects. Donors have also supported national projects associated with specific government programmes or activities, such as market information or crop storage. The Paris Declaration (2005), and the move towards alignment of aid with government priorities and systems, has led to some examples of donor support through a more sectoral approach, building on the experience gained in sector-wide approaches (SWAp) in the education and health sectors. In most SWAps, donor funding is provided through the budget against a range of policy commitments from the government. Examples of SWAps in African agriculture include the following:

- In Mozambique, PROAGRI 1 ran from 1998 until 2003 and involved pooled donor funding but was not implemented through the budget. It was based on three objectives: institutional strengthening, improved productivity, and the sustainable use of natural resources (Cabral, Shrivastava & Muendane 2007). The first phase was criticised for focusing too much on institutional development, especially at the central level, with little impact on farmers. PROAGRI 2 involved renewed commitment to a SWAp by donors, with resources being disbursed through the budget. It continued the support for institutional strengthening and attempted to address the criticism of phase 1 through the introduction of results indicators set out in a performance assessment framework agreed to with the donors. However, results were still disappointing and several of the main donors have pulled out of the SWAp. Towards the end of PROAGRI, the government also demonstrated its frustration with the difficulties of achieving results in the field by introducing the Action Plan for Agricultural Production (PAPA), which included a more ambitious and interventionist approach to getting results in the field. PROAGRI 1&2 were followed by the Strategic Plan for Agricultural Development (PEDSA) (2010–19), which is aligned with the CAADP and shifts the focus more towards productivity and infrastructure. Some pooled donor funding is still present, but the support is reverting to targeted activities within PEDSA, and its investment instrument, the National Agrarian Sector Investment Plan (PNISA) for the period 2013–2017.
- In Uganda, there is a Joint Assistance Framework (JAF) that has made significant progress in co-ordinating donor support. This progress concentrated on four priority sectors, to which the majority of budget and sector budget support is committed. Although agriculture is not one of these sectors, donors have created a joint donor group that supports the National Agricultural Advisory Services (NAADS) programme. Initially, this was launched by the government to attract sector funding



from donors. However, donors were cautious about providing support and wanted to see government services being responsive to farmers' demands, while the government was keen that the NAADS also addressed poverty more directly, including through the provision of implements, livestock and inputs.

- In Zambia, donors provided general budget support (GBS) to allow the government to pursue its own policy priorities in agriculture, although the following three indicators in the GBS Performance Assistance Framework related to agriculture: consistent budget management in agriculture; increased area to irrigation; and new legislation on rural markets and finance. The budget for agriculture has grown rapidly in recent years, reflecting strong government commitment in national policy documents, but has failed to reach the levels in the National Development Plan (Kemp et al. 2011). Some donors have continued to provide one-third of the funding for agriculture through lumpy and unpredictable project support. Subsidies accounted for two-thirds of public expenditure in the early years of this century, despite the opinions of some donors that subsidies are not an efficient use of public funds. A detailed economic assessment of the impact of the subsidies was unable to come to firm conclusions (Chiwele et al. 2010).

The experience of Mozambique, Uganda and Zambia suggests that SWAPs in agriculture may be effective in building institutional capacity, but that it is difficult to ensure that this leads to benefits in the field, even when substantial support is provided over an extended period. In theory, the adoption of efficiency-based budgeting should help to ensure that newly capacitated institutions deliver results, but the experience with SWAPs suggests that there are major issues of inertia in public expenditure systems that make it difficult to achieve the results.

#### 5.4 Policy evaluation and impact assessment

Budgets are guided by policy statements, including sector strategies and national strategies. Typically, these are made or revised every three to five years, or when a new government introduces major policy reforms. The process by which national and sector strategies influence the budget is complex and varied. Often, the national strategy is used to influence negotiations in the Cabinet about which matters should receive the highest priority. In many countries, there is also a democratic process involving the media and public debate about the value of different policies and evaluations can be influential in shaping public debate.

Evaluations may be *ex-ante*, assessing the likely future impact of new policy initiatives, or they may be *ex-post*, reviewing past experience and, hence, influencing future policy. Ideally, the *ex-ante* evaluations are based on *ex-post* evidence, where this is available.

In many African countries, national strategies over the last twenty years have taken the form of Poverty Reduction Strategy Papers (PRSPs). After a decade of experience with PRSPs, an evaluation by the PRSP Joint Implementation Committee of the World Bank and IMF concluded that PRSPs were not sufficiently based on evidence. As a result, a programme of poverty and social impact assessments (PSIAs) was introduced, and there are now many hundreds of policies for which PSIAs have been undertaken. PSIAs built on the well-established principles of evaluation, with the particular requirement of focusing on the distributional impact of policies.

A multi-donor trust fund was set up in 2010 to fund PSIA work related to World Bank operations. According to the World Bank PSIA website, 12 PSIA studies have been undertaken in Africa, of which one covers the agricultural sector. In addition, a PSIA in 2004 on the Ghanaian agricultural strategy FASDEP I led to changes in FASDEP 2, with more emphasis on food security (Zimmermann et al. 2009).





### **Poverty and social impact analysis – a technique for assessing efficiency**

In common with many Africa countries, the Zambian PRSP stresses the role of smallholder productivity in reducing poverty. The World Bank has supported a PSIA in Zambia that assessed the potential for poverty reduction and considered whether the agricultural reforms contained in the PRSP were the most efficient ways of using scarce public resources. The study focused on three policies: land, input subsidies and rural roads.

The policies on land involved converting customary tenure to state title. The PSIA concluded that land is not a binding constraint for most Zambians and that access to inputs, technology and infrastructure is more important. Furthermore, the PSIA found that state title did not necessarily improve security of tenure and that, while customary land can be open to abuse, state titling is also insecure, especially given the high risks involved in farming in Zambia and the likelihood of losing a title in bad years, if it is used as collateral. The inefficiency of the Ministry of Lands was also a major constraint on effective implementation of land reform.

The PSIA review of fertiliser subsidies found that the reduction in subsidies in the 1990s led to a drastic reduction in fertiliser use. Two recent targeted subsidy schemes have been introduced and, despite some operational problems, have stimulated increased use of fertiliser by smallholders, with the additional side benefit of improved community-based organisations and co-operatives. However, greater clarity is needed to avoid undermining the emergence of a private sector fertiliser trade.

The Road Sector Investment Programme (ROADSIP) of support for rural roads involves some substantial reforms in government institutions, moving responsibilities from ministries to agencies. The PSIA found that the impact of the reforms had been 'positive, though not massive' and suggested that more attention should be given to communities, local government and the private sector to contribute to road maintenance, if the expenditure on reforms is to be efficient.

*Source: Jorgensen & Loudjeva (2005).*

### **Top ten dialogue points**

1. The value of making management information on technical efficiency more publically available, which could help in the exchange of experience but could be misleading and create issues of demotivation.
2. The circumstances in which an equal distribution of services is not efficient, and whether there are formulae that can help to determine a modified equality, based on factors like population density, incomes and natural resources.
3. The level of detail that is required to make comparative analysis of overhead costs meaningful, and whether a review of these costs would help to ascertain when overhead costs are too high and when they are too low.
4. How to assess whether efficiency will be improved by increasing the share of spending that is allocated to salaries or to operating costs.
5. The extent to which CBA, and related techniques of quantitative evaluation, can be relied on as the primary source of evidence on the relative efficiency of different programmes and projects, and the appropriate way of taking wider impact into account.



6. The value of integrated approaches to rural development, and the appropriate institutional arrangements to ensure co-ordination, while also limiting the risks of dependency and inequity that were associated with IRDPs in the 1980s.
7. The relative contributions of routine results-based budgeting and of more in-depth evaluation to reviewing and improving efficiency.
8. How best to ensure that donor support for the pursuit of improved efficiency is integrated into government systems for managing efficiency.
9. How to ensure that budget support for agriculture is used efficiently and achieves a good balance between institutional strengthening and benefits to farmers and others.
10. The potential value of establishing a structured system of sharing experience in improving the efficiency of agricultural services (e.g. through an African agricultural planning scorecard).

## 6. Conclusion

### 6.1 Evidence on the efficiency of agricultural expenditure

#### *Technical efficiency*

Most departments in ministries of agriculture keep some sort of management information to check on the efficiency of services. This includes information that is designed to ensure that the coverage of services is equitable, given the nature of the demand for these services across the country. However, this information is rarely published and there is no compiled evidence about the use of such management indicators. The gradual expansion of programme budgeting may help to promote a more transparent use of indicators. However, the indicators used for programme budgeting often focus on outputs and outcomes, without requiring an explicit estimation of efficiency. Increased concern from governments and donors about value for money may help to raise the importance of monitoring cost-effectiveness in the future.

#### *Allocative efficiency.*

CBA is used widely to estimate the returns to policies, programmes and projects in the agricultural sector. It is convenient because it provides a framework within which individual initiatives can be assessed without requiring a comprehensive application system. As a result, the resources devoted to the analysis can be matched to the importance of the initiative, and this avoids the risks of bureaucratic overload that can be associated with more ambitious systems.

However, there are also problems with techniques for assessing allocative efficiency. In particular, quantitative analysis often results in widely varying scenarios. The process of exploring the sensitivity of results to assumptions is a highly informative part of the design of policies, programmes and projects. In particular, such sensitivity analysis should help in incorporating risk management into programme design. However, the wide range of results obtained means that it is not easy to draw direct comparisons across agricultural sub-sectors, without a detailed understanding of the assumptions behind the analysis.

#### *Internal efficiency*

There is widespread agreement that agricultural support needs to cover a range of sub-sectors, including extension and research (for both crops and livestock), market facilitation, water resources and land. Rural roads are also important, although not the main focus of this paper.



There is no comparative evidence of national expenditure patterns amongst these sub-sectors, which makes it difficult to provide any guidance as to the optimum balance. However, it seems clear that there will be wide variations between countries in the optimal allocation of resources to agricultural sub-sectors. Information on the allocative efficiency of expenditure in the sub-sectors is an important source of evidence for identifying sub-sectors that offer the most potential for expanded funding and those where funding may need to be reformed or reduced.

## 6.2 Towards an African library of budget efficiency

This paper has trawled the available evidence on technical and allocative efficiency and has found only limited examples. More examples surely exist, especially of systems for assessing cost-effectiveness that are built into routine management and have not been compiled or published. There is a valuable opportunity to establish a library of comparative experience across Africa in using efficiency to manage and assess new policies, programmes and projects. This could start with information about the way in which African ministries of agriculture use management indicators, including the following:

- adoption of farmers per extension worker;
- cost per new crop variety introduced;
- vaccination rates;
- cost per hectare of irrigated land;
- cost per farmer reached by new market information systems;
- management costs for subsidies as a percentage of total expenditure;
- management costs for rural financial services as a percentage of loans provided;
- cost per kilometre of rural roads; and
- overhead costs for projects.

In addition to evidence on the above management indicators, a library of studies on the benefits achieved from agricultural expenditure would be valuable. The core of this collection of studies would be based on examples of CBA applied to agricultural expenditure. However, the library could also include examples of the increasingly popular use of more mixed techniques that attempt to capture wider benefits.

## 6.3 Results-based budgeting

Results-based budgeting requires all agricultural departments to define their objectives and then also to define indicators and targets that can be used to assess the extent to which these objectives are achieved. This enables budget resources to be delegated to department heads to manage, while also providing the mechanism to ensure that they are used well. The indicators used for targets should be ones that are central to the assessment of allocative efficiency.

If departments have clear objectives and targets, this provides a framework within which to apply the evidence available on efficiency. The broader targets and expenditure information can provide general yardsticks for performance against which to compare the expected results of individual initiatives. There should be no expectation that this type of analysis will lead automatically to decisions on resource allocation, but it provides a framework and a set of norms to guide political decisions.

## 6.4 Towards an African agricultural planning scorecard (AAPS)

This paper has reviewed the efficiency of African public expenditure in agriculture, the methods employed for assessing efficiency, and use of the evidence to influence budget allocation. Good systems include the following features:



- A clear and separate funding for each department involved in delivering agricultural services;
- B changes in departmental budgets are clearly influenced by evidence-based policy;
- C simple performance indicators for departments that are actually measured and taken into account when budgets are prepared;
- D calculation by departments of the economic efficiency of major investments (e.g. cost-benefit or cost-effectiveness);
- E a national agricultural strategy that is consistent with the national development plan;
- F clear statements about the role of the government for each department;
- G medium-term resource allocations for all priorities in the agricultural strategy, with constraints on resources that ensure that total projected expenditure exceeds the MTEF expenditure for agriculture by only a modest amount;
- H effective feedback between the government and farmers for all activities; and
- I co-ordination with cross-sectoral policy (including food security, gender, environment and climate change) but without duplication of funding between sector and cross-sector.

A scorecard system can be used to rate these features on a scale of 1–4. The scoring would normally be done by a group of experts covering the central economic ministries and those ministries involved in providing agricultural services. This exercise has been done in an illustrative fashion for Uganda and Ethiopia, on the basis of the personal opinions of a single expert (see Table 5). The purpose of the AAPS would not be to rank countries, but rather to help them to focus on those areas where they need to make more progress and to provide an easy reference of comparative experience in other countries, which would allow countries to identify possible examples of best practice.

**Table 5: Illustrative African agricultural planning scorecard for Uganda and Ethiopia**

		Uganda	Ethiopia
A	Separate budgets for departments	4	4
B	Budget revisions influenced by policy	4	3.5
C	Use of performance indicators by department	2	3
D	Cost benefit analysis for major initiatives	2	2
E	Existence of an up to date national agricultural strategy	4	4
F	Clear role of government for each department	3	4
G	Realistic medium term resource allocations in strategy	3.5	3
H	Feedback from farmers to government	2	2
I	Coordination with cross-sectoral policy	4	2
	<b>Average score</b>	<b>3.1</b>	<b>3.1</b>

Note: 1 = not in place; 2 = in place in theory, but not active in practice; 3 = in place, but needing improvement; 4 = fully functioning.



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