**Module #9**

**Activity 9**

**Group work: Performance indicators**

**Duration: 60’** (of which 30’ group work and 30’ sharing of results)

**Objectives**

You do a critical review of existing performance indicators for the agriculture sector in light of the results of a Strategic Environmental Assessment.

**Instructions**

* Review the main findings of the Strategic Environmental Assessment of Rwanda’s agriculture strategy[[1]](#footnote-1)
* Review the performance indicators used at the national and sector level
* Identify possible modifications in the list of indicators in order to better reflect the environmental and climate change dimensions.

**Synthesis of findings from the SEA for the agriculture sector strategy**

Rwanda’s economy is heavily dependent on the agriculture sector. Agriculture contributes about 34% of GDP, employs about 88% of the economically active population and is the main earner of foreign exchange. Agriculture is identifies as one of the main motors for growth in the country.

The Government of Rwanda is committed to sustainable development in general, and to an environmentally sustainable agricultural policy in particular. This SEA has as its primary objective to identify opportunities to enhance the environmental performance of the agriculture sector, so these may find their way into the next agriculture strategy and national development strategy.

The agriculture strategy’s Specific Objective is:

*“To increase output of all types of agricultural products with emphasis on export products, which have high potential and create large amounts of rural employment; this under sustainable modes of production”.*

The strategy consists of four interrelated programmes: (1) intensification and development of sustainable production systems; (2) support to the professionalization of producers; (3) promotion of commodity chains and agribusiness development; and (4) institutional development.

The SEA identified five Technical Issues and four Systemic Issues that require attention. These are:

* Technical Issues: (i) soil and water conservation; (ii) soil acidity and nutrient management; (iii) crop and variety selection; (iv) pest and disease management; rural feeder roads.
* Systemic issues: (i) monitoring and evaluation; (ii) climate variability and climate change; (iii) Environmental Impact Assessment system; (iv) local capacities.

**1. Technical Issue 1: soil and water conservation**

*Baseline*

Low agricultural productivity in Rwanda is due to several factors, amongst which soil fertility decline is a major challenge due to soil erosion on one hand and continuous nutrient exportation from arable land. Soil erosion has been highlighted with a lot of concern, not only from an agricultural and environmental point of view but also from a national development perspective.

Soil erosion control is, however, but one specific aspect of a wider ‘soil and water conservation’ theme in land husbandry. An integrated approach, covering all dimensions of good land husbandry, should seek to enhance water retention capacities, so as to reduce run-off (and thereby reduce soil erosion and risks of flooding and landslides). Enhancing water retention requires keeping a vegetative cover; this is where agro-forestry plays an important role for on-farm activities, albeit maintaining soil cover in the fields can also be a contributing factor (e.g. mulching).

Ensuring water flows in the hydrological network so ecological services are guaranteed, but also economic services (e.g. for hydroelectricity, irrigation) must also be addressed. In terms of agriculture, this will help ensure water availability for irrigated agriculture, but also has implications for the design of irrigation schemes, so ecological water flows can be respected.

Finally, the integrated soil and water conservation approach must deal with issues of water quality; agriculture has a large potential of contamination, mainly through run-off of fertilisers and pesticides.

Soil loss and soil depth are among the limiting factors for agricultural productivity, to which various factors contribute. According to the FAO about 40% of Rwanda’s land is classified as being under a “very high risk” of erosion and about 37% requiring soil retention measures before cultivation, only 23,4% of the land is not prone to erosion. A high proportion of soils additionally have high acidity that inhibits nutrient buffering capacity.

About 15 million t of soil is lost annually. **This has been translated to represent a decline in the country’s capacity to feed 40,000 people/yr, as well as an annual economic loss of 34,320,000USD, or almost 2% of GDP equivalent**.

Different soil erosion control measures have been implemented in Rwanda. These include afforestation/reforestation, grass strips, progressive terraces and radical terraces. However the focus has been on resource-intensive structures, primarily radical terraces, mainly through large donor-funded projects.

According to the most recent JSR for the agriculture sector (09/2011), in 2010 87.3% of land was under some form of soil erosion protection. This is an important improvement with respect to 2010 (80%) and, especially, the 2000 baseline (20%). There are however, several shortcomings regarding the way this indicator is formulated and applied. The indicator currently used for monitoring the proportion of arable land under soil erosion control is highly subjective, and there are concerns that it is not objectively capturing progress made. For a start the methodology specified for applying the indicator is very broadly defined and prone to multiple interpretations: *“the area of land currently surrounded by ‘a terrace, a watershed or any other erosion control* *tool’ as a percentage of total area of arable land”.* There is no definition of what is an ‘erosion control tool’; as well, a ‘watershed’ is a hydrographic delimitation, which is not related necessarily to soil erosion protection (all land is part of a particular watershed!). The indicator is to be measured based on ‘administrative records’ (the Metadata document does not specify which are these ‘administrative records’). These shortcomings have been recognised by all key actors in the sector, and steps have been taken to develop a modified indicator; the review of the soil erosion indicator and assessment methodology has been defined by the sector as a policy action target. As well there is no measure on the sustainability of the soil erosion protection measures (e.g. maintenance of terraces, including ensuring continuous vegetative cover); thus, there is a risk that unmaintained and thus ineffective structures are counted as ‘soil protection’.

Obstacles to adoption of soil conservation measures also have to be addressed. It has been pointed out that farmer investment in soil conservation measures does not depend only on exposure to extension services, but also depends on availability of resources, especially own labour at critical seasons, land tenure security and perception of benefits. This implies that the Ministry of Agriculture should look into aspects such as financing of low-scale soil protection at the house-hold level, and ensure benefits of soil protection are well understood.

In terms of **agroforestry** (closely associated to progressive terracing), there are important gaps in statistical information, as none of the M&E systems are currently monitoring its implementation (data gaps include aspects such as: arable land surface under agro-forestry), so it is not possible to give an indication of the baseline. The activities that have been carried out have to a large extent not been designed taking into account the desired purpose, necessary for crop and variety selection.

**Other soil and water conservation measures** are not receiving significant attention. Farmers traditionally use some conservation practices, e.g. mulching, but data and statistics are not available to ascertain degree of up-take and geographical coverage.

At the moment **water availability** has not been an issue; in the agriculture sector rain-fed agriculture dominates the scene, and irrigation schemes are newcomers. It is not known what is the water balance in the different watersheds and, although Water Users Associations have been formed in some projects, no effective water management is in place. All this is currently in the process of radical change, with the preparation of an integrated water resources management strategy and the foreseen preparation of hydrological water balance.

In spite the indicator on ‘arable land under soil erosion protection’ is likely to be overestimating the degree of improvement, we can be relatively confident that the trend has been an upwards one, due to the efforts that have been carried out in recent years to construct radical and progressive terraces, as well as efforts at soil erosion control promoted by NGOs. However t**rends also depend on how other variables that act as drivers of soil erosion behave, including deforestation and farming practices** (e.g. uptake of Conservation Agriculture practices), for which there is also lack of reliable monitoring data. As well expected **effects of climate change include a very likely increase in rainfall, which will exacerbate soil erosion through run-off, especially in a context of increased deforestation**.

Other GoR policies and actions will prove convergent with the objectives of soil and water conservation, such as improvements in land security through land titling and the enhancement of extension services through traditional means and Farmer Filed Schools, and in partnership with the contracted private service providers.

In terms of water availability, it is recognised that **water is becoming increasingly scarce**. Initiatives in various water-consuming sectors will increase pressure on water resources, added to which the effects of climate change may contribute. Developments in IWRM are underway, and should set up an appropriate system for the management of water resources, including allocation of water rights to different uses and the identification of ecological water flows.

Irrigation potential in Rwanda is 590,000 ha; by mid-2011 some 17,000 ha were under irrigation. The Seven Years Government Plan aims at achieving 100,000 ha under irrigation by 2017, including 65,000 ha of marshlands and 35,000 ha of hillsides. The CIP will exert an important demand on water resources: area under irrigation is expected to increase from 15,000 to 24,000 ha; hillside area irrigated will expand from 130 to 1,100 ha, whilst reclaimed marshland will increase from 11,105 to 31,500 ha.

Rwanda also has plans to expand its electricity production through hydroelectric power plants; the

objective under Vision 2020 is that at least 35% of the population will be connected to electricity. Electricity from hydropower is increasing from 69MW (2009) to 130MW (2012). The National Hydropower Atlas project identified 333 micro- and mini- hydropower sites in the country with a combined capacity of 96 MW22 and exploration of other potential sites for small and large-scale multipurpose dams is underway.

According to the National Policy and Strategy for Water Supply and Sanitation Services, rural water supply is expected to increase to 85% by 2012 and 100% by 2020. Other developments will also be competing for water resources, including expansion of agro-industrial activities, agro-forestry and livestock development.

**2. Technical Issue 2: soil acidity and nutrient management**

*Baseline*

Cultivated lands represent some 1.205 million ha (or 46% of the country), with around 59,000 ha of major cash crops (coffee, tea and sugar cane). Rapidly rising rural population and the need to maximize food production to accommodate the 50% rise foreseen in the next 15 years are relevant linked issues and these are embraced by GoR commitment to MDG 1 to avert hunger. Soil acidity and nutrient management is a necessary foundation for all crop production and frequently the most sensitive limiting factor in yield optimization; moreover its relationship with zero-grazed livestock production is symbiotic.

The agriculture sector strategy actively promotes and subsidises fertiliser use as to some 50% in CIP (Crop Intensification Programme) staple crops; the fertilizer budget accounts for 80% of CIP expenditure. In some regions cultivation of traditional crops and their ‘landrace’ varieties, which often cope well with scarcity of soil nutrients, is discouraged by the Ministry of Agriculture whose policy is to increase the participation of farmers in the market economy with production that is suitable for intra-regional trade and for the national food security reserve.

Consultations carried out in the field regarding CIP implementation suggest that insufficient economic and technical attention has been afforded at the policy level to correcting soil acidity in the naturally acidic soils that cover over one half of Rwanda, mostly in the Eastern sector: buffering capacity of such soils needs to be reinforced so that, under an inorganic fertiliser or mixed fertiliser regime the amount of unmineralised, exchangeable nutrients may be maximized. In this way it may be possible to make considerable gains in absolute output and efficiency of the application of CIP. Meanwhile RAB continues running a limited number of on-farm trials for a number of crops and varieties to determine optimum fertilizer application rates in defined land systems.

Relevant performance indicators as identified below are set at different levels and in different sectoral strategies. Based on a the CATALYST assessment that revealed low crop yields nationwide due to lack of fertility, the National Fertiliser Policy was designed to support the CIP with input indicators for the use of fertilisers for which commensurate increases in staple crop yields were projected. The targets are defined in various policy and strategy documents as follows:

* Under the National Development Strategy 40% of farms to be using inorganic fertilisers by 2012; under the Agriculture Strategy, 25% (from 12%), with increase t of fertiliser imported from 14,000 to 56,000 by 2012, and the number of farmers organisations trained in fertilisers would rise to 70% by 2012.
* 25% of farms (from 7%) to be using organic fertilisers by 2012.
* Under the Agriculture Strategy, a modest target of the No. of fertiliser demonstration plots increased to 12 by 2012.

Intensity of inorganic fertiliser use is the main ‘pressure’ measure of success; this undermines efficiency of resource use dimension, which is essential in terms of environmental sustainability and on minimising GHG emissions associated to fertilisers. Optimisation in use of fertilisers is also required for correct mainstreaming of the National Climate Change Strategy.

Although soil acidity has been mapped for all land systems, soil nutrient levels of major land units for optimised cropping/land use have not yet been nationally determined and classified although this is intended under NFS (see below).

Good regional and local experimentation in fertility management was done by the IFDC/CATALIST partnership with the Ministry of Agriculture but the results and recommendations have not been thoroughly analysed. Soil nutrient research continues through the new pilot Fertiliser Recommendations Project. Linkage of One-Cow programme to organic manuring and cultivation of nitrogen-fixing legumes has been recognised by the Ministry of Agriculture and is a cornerstone of the organic manuring programme under the agriculture strategy.

Fertiliser use is generally considered too low at the moment to be a significant risk to the environment, although the sector needs to build appropriate environmental safeguards for the expected increase in fertiliser use. Targeted fertiliser subsidy support and related application rates recommended under CIP need to be verified for run-off/contamination risk in defined soil/slope conditions. The distribution of fertilisers under the CIP is a massive operation. In 2010/11 44,000 MT of fertilizers were imported.

Water body contamination by fertilisers (and pesticide residues) is not monitored but a pilot programme is developing routine detection and analysis methods that may be fed into formulation of IWRMP; the programme’s analytical methods reveal dissolved nitrates sometimes close to upper limit for safe human consumption.

In the case of **inorganic** fertilisers, the 50% subsidised fertiliser distribution programme under CIP and actual application rates recommended by private service providers mostly follow directed ‘one-size-fits-all’ approach due to lack of measured soil acidity and nutrient status. It is understood too that CIP NPK fertiliser application recommendations are not modelled on actual soil acidity/buffering capacity and the environmental impacts and economic effectiveness of the current CIP fertiliser strategy are yet to be determined. In its 2010 report, IFDC noted *“Measures……are needed to reduce* *the costs of fertilizers and to help adapt fertilizer recommendations to the crop and soil needs in order to bring them within* *the reach of the farmers.”*

**3. Systemic Issue 3: climate variability and climate change**

Rwanda is located astride two key climate regions, and its climate can be described as complex, showing wide variations across the country and with a strong seasonality. Climate variability in Rwanda depends on a number of factors, amongst which the El Niño Southern Oscillation (ENSO) events are particularly important. Climate variability gives rise to climatic disasters, such as flooding, landslides and droughts, with considerable impact on livelihoods, mainly due to decreased agricultural productivity or crop failure. There is a wide gap for climate variability adaption.

Global Circulation Models (GCM) predict an increase in rainfall as well as increase in temperatures, which will have effects primarily in the agriculture sector, and for which Rwanda must develop capacities to adapt.

Rwanda often experiences disasters related to climate variability that impact on agricultural productivity, especially floods and droughts. Floods have increased in frequency over the past decade, such as the flood events of the Nyabarongo and Akanyaru rivers and its tributaries in 1963, 1979, 1998, 2001, 2002, 2006 and 2007. Droughts are especially a threat in the east and southeast of the country, mainly triggered by a prolonged dry season or a delay in the onset of the rainy season. Recurrent drought incidence over the past decade, between 1998 and 2000 and annually from 2002 to 2005 has had significant impacts on food security. Seasonal yield losses have also been directly attributed to climatic variances (e.g. coffee reduction by 26% in 2009/10 and significant maize losses in eastern districts in the 2010B season).

The impacts and economic costs of current climate variability and events are already significant, and likely to increase with climate change.

The effects of climate change are very difficult to predict for Rwanda due to its geographical position (between two important climate regions); in addition there is a large gap in historical meteorological data due to the destruction of meteorological stations during the times of conflict. Continuous records are only available for the meteorological station in Kigali airport. At the moment there are only 13 synoptic stations and 5 automatic stations, along with 26 rainfall stations and 38 more planned for installation; also, MINAGRI operates 88 stations for agro-meteorological purposes.

Climatological observations indicate, however, that climate change is very likely happening in Rwanda. Expected outcomes of climate change in Rwanda include increased rainfall (up to 20% by the 2050s and 30% by the 2080s), increases in mean annual temperature (up to 3.25ºC for the region by 2100) prolonged periods without rain and an extension of the dry season.

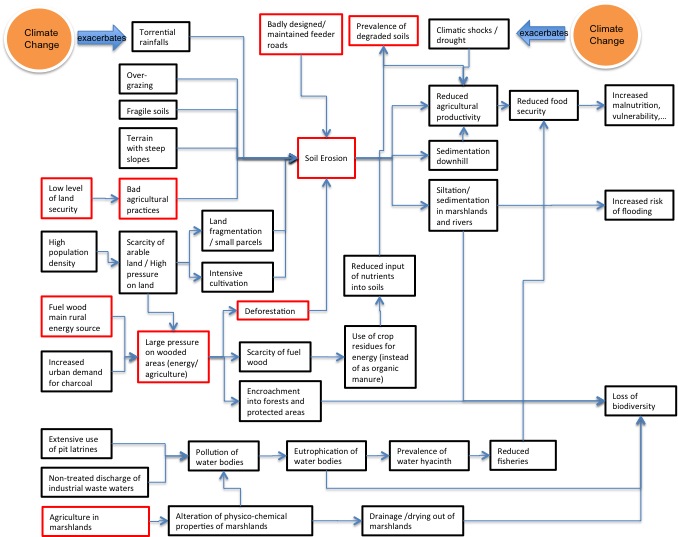
The effects of climate variability and climate change are especially felt in the agriculture sector, which is highly vulnerable. Changes in rainfall intensity and patters, floods, drought and changes in temperature can all affect agricultural productivity in a significant way, especially in countries like Rwanda, which rely primarily on rain-fed agriculture.

Positive effects on crop yields could also be experienced, associated to the increase of CO2 levels or to warmer conditions in the highlands. However there is a myriad of complex relationships that are yet difficult to establish due to the lack of baseline data and modelling, such as drop in crop yields due to temperature increases and increase in pest incidences.

A weather insurance system, operated through the Banque Populaire, is available to farmers, albeit yet to a limited extent, but under expansion. Weather insurance is potentially very powerful as a climate variability and climate change adaptation measure.

The GoR has developed a high degree of awareness on the challenges from climate variability and climate change, which is already reflected in the institutional set-up and in the approval of the National Climate Change Strategy. As well there are various initiatives in progress that will allow Rwanda to narrow the gap for climate variability and climate change adaptation. These initiatives include projects aimed at rehabilitating meteorological stations, which will permit better weather forecasting, as well as the further development of an Early Warning System. The rehabilitation of the network of meteorological station will complete a basic element needed to address climate variability and climate change adaptation. The expansion of the weather insurance for farmers will increase their adaptation to climate variability and climate change.

## Cause-effect diagram of key environment-agriculture interactions in Rwanda



**Performance Indicators**

|  |  |
| --- | --- |
|  | **PERFORMANCE INDICATORS IN THE AGRICULTURE STRATEGY** |
|  | **Soil erosion** |
| 1 | Land portion protected against soil erosion (%) |
| 2 | Ha of existing terraces protected and rehabilitated (including protection of new terraces) |
| 3 | Land protected by trenches and progressive terraces |
|  | **Forestry / agro-forestry** |
| 4 | % of farm HH trained in seed technology, tree management and post harvest |
| 5 | Increase in number of tree nurseries |
| 6 | Number of trees planted |
| 7 | Increase in number of trees planted annually per household |
| 8 | Increase in number of trees planted per annum |
|  | **Agrochemicals** |
| 9 | % of farms using inorganic mineral fertilisers |
| 10 | % of farms using organic fertilisers |
| 11 | % of farms using pesticides |
| 12 | No of fertiliser demonstration plots / Increase % of farmers organisations trained in fertilisers |
| 13 | % of farms practicing IPM |
|  | **Marshland development** |
| 14 | Complete marshland development plan |
| 15 | Marshlands developed with irrigation and drainage systems and farmer training, after EIAs |
|  | **Improved seeds / drought resistant varieties** |
| 16 | % of farm households using improved seeds |
|  | **Irrigation** |
| 17 | Policy framework for irrigation and soil management completed |
|  | **Livestock** |
| 18 | % of livestock in intensive systems |
| 19 | Increase in number of farmers associations trained in improved animal husbandry practices |
|  | **Water-catchment management** |
| 20 | Increase in the water retention capacity of watersheds |
|  | **Climate variability warning systems / insurance** |
| 21 | Early warning capability for food shortages |
| 22 | Weather insurance programme functioning |
| 23 | Plan for rehabilitating meteorological stations and strengthening networks |
|  | **Other aspects** |
| 24 | Assessment of training needs and technical capacity building in the agricultural public sector |
| 25 | No. of new products with export market certifications for organic production and other quality attributes (Support given for organic and other quality certifications) |

1. NOTE: Only excerpts from the original SEA document have been selected for training purposes. This may give an incomplete picture of a more complex reality, and the exercise is thus not meant to review Rwanda’s actual agricultural policy. Names of policy documents and institutions have been simplified. [↑](#footnote-ref-1)