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DISCLAIMER

This report is financed by the European Union through the European Commission and is presented by Consortium SAFEGE, Belgium for the Ministry of Agriculture and Animal Resources (MINAGRI) and other stakeholders related to agro-environmental issues in Rwanda and the European Commission. It does not necessarily reflect the opinion of MINAGRI, other National Institutions or the European Commission.

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Table of Contents

<u>Acknowledgements</u>	iii
<u>Acronyms and abbreviations</u>	vii
0 <u>Executive Summary</u>	xiii
1 <u>Introduction</u>	2
2 <u>Approach and methodology</u>	3
3 <u>Agriculture and rural feeder roads strategies</u>	4
4 <u>Policy, institutional and regulatory framework</u>	5
5 <u>Technical issue 1: Soil and water conservation</u>	10
5.1 <u>Introduction</u>	10
5.2 <u>Policy and regulatory framework</u>	10
5.3 <u>Institutional framework</u>	11
5.4 <u>Baseline</u>	11
5.5 <u>Trends</u>	14
5.6 <u>SWOT analysis</u>	15
5.7 <u>Synthesis, proposed specific objectives and required results</u>	16
5.8 <u>Activities proposed, responsible institutions and means</u>	17
6 <u>Technical issue 2: Soil acidity and nutrient management</u>	20
6.1 <u>Introduction</u>	20
6.2 <u>Policy and regulatory framework</u>	20
6.3 <u>Institutional framework</u>	20
6.4 <u>Baseline</u>	21
6.5 <u>Trends</u>	22
6.6 <u>SWOT analysis</u>	23
6.7 <u>Synthesis, proposed specific objectives and required results</u>	23
6.8 <u>Activities proposed, responsible institutions and means</u>	24
7 <u>Technical issue 3: Crop and variety selection</u>	25
7.1 <u>Introduction</u>	25
7.2 <u>Policy and regulatory framework</u>	25
7.3 <u>Institutional framework</u>	25
7.4 <u>Baseline</u>	25
7.5 <u>Trends</u>	27
7.6 <u>SWOT analysis</u>	27
7.7 <u>Synthesis, proposed specific objectives and required results</u>	28
7.8 <u>Activities proposed, responsible institutions and means</u>	29
8 <u>Technical issue 4: Pest and disease management</u>	31

8.1	<u>Introduction</u>	31
8.2	<u>Policy and regulatory framework</u>	31
8.3	<u>Institutional framework</u>	31
8.4	<u>Baseline</u>	32
8.5	<u>Trends</u>	33
8.6	<u>SWOT analysis</u>	34
8.7	<u>Synthesis, proposed specific objectives and required results</u>	35
8.8	<u>Activities proposed, responsible institutions and means</u>	37
9	<u>Technical issue 5: Rural feeder roads</u>	40
9.1	<u>Introduction</u>	40
9.2	<u>Policy and regulatory framework</u>	40
9.3	<u>Institutional framework</u>	41
9.4	<u>Baseline</u>	41
9.5	<u>Trends</u>	42
9.6	<u>SWOT analysis</u>	43
9.7	<u>Synthesis, proposed specific objectives and required results</u>	44
9.8	<u>Activities proposed, responsible institutions and means</u>	45
10	<u>Systemic issue 1: Monitoring and evaluation</u>	46
10.1	<u>Introduction</u>	46
10.2	<u>Policy and regulatory framework</u>	46
10.3	<u>Institutional framework</u>	46
10.4	<u>Baseline</u>	46
10.5	<u>Trends</u>	47
10.6	<u>SWOT analysis</u>	47
10.7	<u>Synthesis, proposed specific objectives and required results</u>	48
10.8	<u>Activities proposed, responsible institutions and means</u>	49
11	<u>Systemic issue 2: Climate variability and climate change</u>	51
11.1	<u>Introduction</u>	51
11.2	<u>Policy and regulatory framework</u>	51
11.3	<u>Institutional framework</u>	51
11.4	<u>Baseline</u>	51
11.5	<u>Trends</u>	52
11.6	<u>SWOT analysis</u>	52
11.7	<u>Synthesis, proposed specific objectives and required results</u>	53
11.8	<u>Activities proposed, responsible institutions and means</u>	55
12	<u>Systemic issue 3: Environmental Impact Assessment system</u>	57
12.1	<u>Introduction</u>	57
12.2	<u>Policy and regulatory framework</u>	57

12.3	<u>Institutional framework</u>	57
12.4	<u>Baseline</u>	57
12.5	<u>Trends</u>	58
12.6	<u>SWOT analysis</u>	58
12.7	<u>Synthesis, proposed specific objectives and required results</u>	59
12.8	<u>Activities proposed, responsible institutions and means</u>	60
13	<u>Systemic issue 4: Local capacities</u>	61
13.1	<u>Introduction</u>	61
13.2	<u>Policy and regulatory framework</u>	61
13.3	<u>Institutional framework</u>	61
13.4	<u>Baseline</u>	62
13.5	<u>Trends</u>	63
13.6	<u>SWOT analysis</u>	63
13.7	<u>Synthesis, proposed specific objectives and required results</u>	64
13.8	<u>Activities proposed, responsible institutions and means</u>	65
14	<u>Recommendations to the GoR to enhance environmental performance of the agriculture sector</u>	67
14.1	<u>Recommendations to be addressed in SPTA3</u>	67
14.2	<u>Recommendations for non-agriculture sector institutions</u>	76
14.3	<u>Recommendations for enhancement of EDPRS2</u>	78
14.4	<u>Recommendations for the CPAF</u>	80
15	<u>Recommendations to the European Commission</u>	82
15.1	<u>Recommendations in the context of the SBS to the agriculture sector</u>	82
15.2	<u>Recommendations in the context of the SPSP to rural feeder roads</u>	84
	<u>Bibliography and references</u>	85

Book 2: Annexes to the SEA Report

Acronyms and abbreviations

ACP	Africa Caribbean and Pacific
AF	Action Fiche
AfDB	African Development Bank
AFSIS	Africa Soil Information Service
AGRA	Alliance for Green Revolution in Africa
AI	Artificial Insemination
AJRS	Agriculture Joint Sector Review
ASWG	Agriculture Sector Working Group
BCC	Budget Call Circular
bn	Billion
BOQ	Bill of Quantities
BTC	Belgian Technical Cooperation
CAADP	Comprehensive Africa Agriculture Development Programme
CBD	Convention on Biological Diversity
CBPP	Contagious Bovine Pleuropneumonia
CCIOU	Climate Change and International Obligations Unit
CDM	Clean Development Mechanism
CEMP	Contractor's Environmental Management Plan
CICA	Agricultural Information and Communication Centre
CIP	Crop Intensification Programme
CPAF	Common Performance Assessment Framework
CRS	Catholic Relief Service
CSO	Civil Society Organisation
DDP	District Development Plan
DFID	Department for International Development (UK)
DFS	District Forestry Service
DMU	Disaster Management Unit
DNA	Designated National Authority
DSU	District Support Unit
EC	European Commission
EDPRS	Economic Development and Poverty Reduction Strategy
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ENR	Environment and Natural Resources
ENRSSP	Environment and Natural Resources Sector Strategic Plan

ENSO	El Niño Southern Oscillation
EU	European Union
EWSA	Energy Water and Sanitation Authority
EWS	Early Warning System
FAO	Food and Agriculture Organisation
FEWS	Famine Early Warning System
FFS	Farmer Field Schools
FMD	Foot and Mouth Disease
FONERWA	National Climate and Environment Fund of Rwanda
FTU	Formazin Turbidity Unit
FY	Fiscal Year
GAA	German Agro Action
GAP	Good Agricultural Practice
GCM	Global Circulation Models
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographical Information System
GoR	Government of Rwanda
gr.	Grams
GWLM	Gishwati Water and Land Management project
ha	Hectares
HACCP	Hazard Analysis and Critical Control Points
HH	Households
HIMO	Haute Intensité de Main-d'Oeuvre
HQ	Headquarters
HR	Human Resources
ICM	Integrated Crop Management
ICRAF	World Agroforestry Centre
ICT	Information and Communication Technologies
IDP	Integrated Development Programme
IFAD	International Fund for Agricultural Development
IFDC	International Center for Soil Fertility and Agricultural Development
IMBARAGA	Rwanda Farmers Federation
IMSC	Inter-Ministerial Steering Committee
INGABO	Rwandan Union of Agriculturalists and Animal Breeders
IOO	Implementation and Operations Order
IPM	Integrated Pest Management
IPPC	International Plant Protection Council

ISAE	Higher Institute of Agriculture and Animal Husbandry
ISAR	Rwanda Agricultural Research Institute
ISO	International Organisation for Standardisation
IWRM	Integrated Water Resources Management
JAP	Joint Action Plan
JDC	Joint Development Committee
JICA	Japan International Cooperation Agency
JSR	Joint Sector Review
K	Potassium
kcal	Kilocalories
kg	Kilogrammes
KEPHIS	Kenya Plant Health Inspectorate Service
KWAMP	Kirehe Community-based Watershed Management Project
LBM	Labour-based Methods
LWH	Land Husbandry Water Harvesting and Hillside Irrigation project
M€	Million Euros
M&E	Monitoring and Evaluation
MDG	Millennium Development Goals
MIFOTRA	Ministry of Public Services and Labour
MINAGRI	Ministry of Agriculture and Animal Resources
MINALOC	Ministry of Local Government
MINECOFIN	Ministry of Finance and Economic Planning
MINICOM	Ministry of Trade and Industry
MININFRA	Ministry of Infrastructure
MINIRENA	Ministry of Natural Resources
MIS	Management Information System
Mm ³	Million cubic meters
MOH	Ministry of Health
MOU	Memorandum of Understanding
MRL	Maximum Residue Limits
MT	Metric Tonnes
MTEF	Medium Term Expenditure Framework
MTR	Mid Term Review
MW	Megawatts
N	Nitrogen
NAEB	National Agriculture Export Board
NAPA	National Adaptation Programme of Action to Climate Change
NFS	National Fertiliser Policy

NISR	National Institute of Statistics of Rwanda
NPK	Nitrogen, Phosphorous and Potassium
NR	Natural Resources
NSCCLCD	National Strategy for Climate Change and Low Carbon Development
NUR	National University of Rwanda
OECD	Organisation for Economic Cooperation and Development
OECD DAC	OECD Development Assistance Committee
OIE	World Animal Health Organisation
P	Phosphorous
P&D	Pest and Disease
p.a.	per annum
PADAB	Bugesera Agricultural Development Support Project
PAF	Performance Assessment Framework
PAGOR	Support for Local Governance in Rural Areas
PAIGELAC	Inland Lakes Integrated Management and Support Project
PAIRB	Bugesera Natural Region Rural Infrastructure Project
PAPSTA	Support Project for the Strategic Plan for the Transformation of Agriculture
PC	Performance Contract
PCR	Polymerase Chain Reaction
PDCRE	Smallholder Cash and Export Crops Development Project
PDRCIU	Umutara Community Resource and Infrastructure Development Project
PEI	Poverty-Environment Initiative
PES	Payment for Environmental Services
PHSCS	Post-Harvest Staple Crop Strategy
PM	Prime Minister
POP	Persistent Organic Pollutants
PPP	Public-Private Partnership
PRA	Pest Risk Analysis
PSC	Programme Steering Committee
R&D	Research and Development
RAB	Rwanda Agriculture Board
RALGA	Rwanda Association of Local Government Authorities
RARDA	Rwanda Animal Resources Development Authority
RBS	Rwanda Bureau of Standards
RDB	Rwanda Development Board
REIN	Rwanda Environmental Information Network
REMA	Rwanda Environmental Management Authority
RFR	Rural Feeder Roads

RMS	Rwanda Meteorological Service
RNRA	Rwanda Natural Resources Authority
RSSP	Rural Sector Support Project
RTDA	Rwanda Transport Development Agency
RWF	Rwanda Franc
SAKSS	Strategic Analysis and Knowledge Support
SBS	Sector Budget Support
sec	Seconds
SEA	Strategic Environmental Assessment
SIDA	Swedish International Development Agency
SME	Small and Medium Enterprise
SOTIRU	Société des Travaux Industrielles du Rwanda
SP	Sub-Programme
SPS	Sanitary and Phytosanitary
SPSP	Sector Policy Support Programme
SPTA	Strategic Programme for the Transformation of Agriculture
SWAp	Sector-wide approach
SWG	Sector Working Group
SWOT	Strengths, Weaknesses, Opportunities and Threats
t	Tonnes
TA	Technical Assistance
TAPs	Technical and Administrative Provisions
TB	Tuberculosis
TDS	Total Dissolved Solids
TIG	Works of General Interest
ToT	Training of Trainers
TSS	Total Suspended Solids
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WB	World Bank
WHO	World Health Organisation
WRM	Water Resources Management
WTO-MSU	World Trade Organisation – Michigan State University
WUA	Water Users Association

yr

Year

0 Executive Summary

This is the first Strategic Environmental Assessment (SEA) of the Agriculture Sector in Rwanda and the product of a mission of 9.5 weeks up to 22/12/2011 by a team of three experts from SAFEGE, Belgium under a contract funded by the European Union (EU) and technically guided by the Ministry of Agriculture and Animal Resources (MINAGRI). The focus of work has been issue oriented and at the strategic level, considering EU 2009 Guidelines for Integration of Environment and Climate Change in Development Cooperation¹.

Nine key issues were identified for action. In the earlier period of study they were viewed mainly from the perspective of external effect of agriculture upon environment; by the end of the study they were being treated as to how agriculture and its practices could optimise environmental management and resource use, especially within the farm. Section A of the report provides the general context and description of the methodology, Section B analyses the key issues and Section C offers the recommendations to the Government of Rwanda and the European Commission.

The overall objective of this SEA is to ensure that environmental concerns are appropriately integrated in all sector (agriculture) and sub-sector (rural feeder roads) decision-making, implementation and monitoring processes. Findings of the SEA may influence policy development in the agriculture sector and the rural feeder roads sub-sector.

Rwanda's economy is heavily dependent on the agriculture sector, and is identified as one of the main motors for growth under Vision 2020 and the Economic Development and Poverty Reduction Strategy (EDPRS). The development of the sector is primarily guided by Rwanda's Strategic Programme for the Transformation of Agriculture II (SPTA2), complemented by other strategies, such as the National Post-Harvest Staple Crop Strategy (PHSCS). The European Union (EU) is providing assistance for implementing SPTA2 through Sector Budget Support (SBS), which will shortly be expanded.

The SEA consisted of two key phases: a scoping study and an SEA study. During scoping a preliminary identification of the key environmental concerns in the agriculture sector was made, taking into account both the effects of degraded natural resources in the sector's performance as well as the existing potential impacts on the environment associated to actions in the agriculture sector. The preliminarily identified key issues were discussed and validated in a stakeholders' workshop. During the SEA Study phase all key issues were assessed in detail and options identified to address them. Field visits were made in close coordination with MINAGRI, in order to verify issues at a local level and engage in local level stakeholder consultations.

Rwanda has a comprehensive policy and planning framework at national and sectorial level, where the environmental dimension is integrated, and which serve as a solid reference for further programming. The corpus of policy and planning documents are largely consistent, but there are some aspects of harmonisation that deserve attention with regards to the consistency of environmental objectives; the most relevant aspects of harmonisation are further explored in this SEA.

Rwanda has in place a solid set of institutions dealing with the environmental aspects of the agriculture sector, including arrangements for inter-sectoral and inter-institutional coordination. Issues that deserve attention are mainly related to the strengthening of capacities and the enhancement of coordination, as no aspects of major importance are present (as could be, e.g. important gaps in environmental governance, or important duplication of functions).

The environmental regulatory framework remains weak in Rwanda, although it is subject of attention and advances are gradually being made. Especially challenging are the effectiveness of the EIA regulatory system (associated mainly to enforcement capacities) and the control and management of agrochemical

¹ See <http://www.environment-integration.eu/>

products, and which are aspects subject of more detailed attention in this SEA report. Also of importance in the short-term is the completion of the regulatory framework for the management of water resources (work in progress). The generation of adequate baselines (e.g. water quality and hydrological balance, effluent discharges) remains a challenge that needs to be solved in order to ensure adequate monitoring and enforcement.

The key issues to be addressed fall into Technical (T) and Systemic (S) categories. Technical issues relate to specific technical aspects of the agriculture sector, whereas the systemic issues relate to aspects that cut across several technical dimensions and institutions. Technical Key Issues are: (1) soil and water conservation; (2) soil acidity and nutrient management; (3) crop and variety selection; (4) pest and disease management; and (5) rural feeder roads. Systemic Key Issues are: (1) monitoring & evaluation; (2) climate variability and climate change; (3) Environmental Impact Assessment system; and (4) local capacities.

Each issue has been analysed and reported upon with, *inter alia*, coverage of the baseline and current impacts, trends, ‘SWOT’ analysis examining capacities, mitigation and optimisation opportunities, synthesis to determine objectives, required results, actions and inputs; and recommended output/impact monitoring ‘state’ indicators for a three year initial *Performance Review* period to December 2014. For every issue several Results are recommended. They are relevant to the interest of Government of Rwanda (GoR) and the EU alike.

The table below provides an overview of the key issues, indicating the rationale for their selection as key issues and a synthesis of the assessment conclusions.

Rationale	Conclusions
Technical Issue 1: soil and water conservation	
<ul style="list-style-type: none"> • Soil erosion is closely associated to low agricultural productivity • Soil erosion control can only be addressed in terms of effectiveness in wider context of ‘soil and water conservation’ • Agro-forestry has important potential in water and soil retention • Water flows need to be guaranteed to secure provision of services (e.g. agriculture, energy, ecosystems, sanitation) 	<ul style="list-style-type: none"> • Policy needs to change focus on integrated soil & water conservation, implying more attention to agro-forestry • Principles of soil and water conservation have to permeate all related activities, including the Crop Intensification Programme (CIP) • Efficiency and effectiveness considerations call for inclusion of measures besides radical terraces • Associated indicators require attention, including on soil erosion control, agroforestry and water use efficiency in irrigation
Technical Issue 2: soil acidity and nutrient management	
<ul style="list-style-type: none"> • Soil acidity and nutrient management is necessary foundation for crop production and frequently the most sensitive limiting factor in yield optimisation • SPTA2 promoted and subsidises fertilisers • Insufficient attention has been afforded at policy level to correcting soil acidity • Fertilisers are a potential source of water pollution 	<ul style="list-style-type: none"> • The dramatic increase in use of inorganic fertilisers has to be accompanied by rationalisation in its use, to minimise environmental risks, taking into account soil nutrient needs • Soil acidity correction deserves further attention, based on site-specific needs
Technical Issue 3: crop and variety selection	
<ul style="list-style-type: none"> • Crop and variety selection is important in terms of food security, adaptation to climate variability and change and agro-biodiversity protection • A key element of the CIP is determination of priority crops and varieties per area, under coordinated single-cropping. Agricultural inputs are conditioned to planting selected target crops 	<ul style="list-style-type: none"> • Crop and variety selection, as currently arranged, accentuate vulnerability to climate variability and climate change. Flexibility will need to be integrated, building farmers’ capacities to make informed choices on crop and variety selection • Weather-related crop failure insurance should be expanded in the context of the CIP, as a necessary

<ul style="list-style-type: none"> • Crop selection and associated husbandry, including soil conservation, nutrient management and pest risk analysis and mitigation measures, are necessary foundations for optimised production 	<p>climate change adaptation measure</p>
<p>Technical Issue 4: pest and disease management</p>	
<ul style="list-style-type: none"> • SPTA2 promotes the increased use of pesticides, and also promotes (albeit with less emphasis) Integrated Pest Management (IPM) • Use of IPM is emphasised in the context of the National Strategy for Climate Change and Low Carbon Development • Use of pesticides is associated to increased risk of water pollution and health risks 	<ul style="list-style-type: none"> • The NSCCLCD requires mainstreaming of IPM • The FFS programme of RAB is potentially very valuable to secure training on IPM, including rational use of pesticides • The new Law on Agrochemicals is addressing aspects of pesticides management • IPM and Pest Risk Analysis needs to be developed, through the RBS
<p>Technical Issue 5: rural feeder roads</p>	
<ul style="list-style-type: none"> • Rural feeder roads are associated with environmental impacts, especially in absence of appropriate standards for design, construction and maintenance • RFR are associated with other key issues, as roads are necessary for provision of fertilisers and limestone, as well as efficiency of extensionists 	<ul style="list-style-type: none"> • Region-specific climate-proofed feeder roads standards and specifications need to be adopted, in conformity with good environmental practice • Human resources at sector level have to be strengthened to avert dilution of agro-environmental Human Resources and improve dedicated absorption capacity for donor support to RFR
<p>Systemic Issue 1: monitoring and evaluation</p>	
<ul style="list-style-type: none"> • Various M&E frameworks are in place dealing with agro-environmental aspects, including: Vision 2020, EDPRS, SPTA2, ENRSP, ASWG, ENR SWG and Imihigo • Indicators from different frameworks are not always consistent, nor all key indicators are routinely being measured • Reporting frameworks are also inconsistent and access to monitoring data not easily accessible 	<ul style="list-style-type: none"> • Shortcomings of the M&E system centre around: access to monitoring data by institutions; reporting mechanisms to ensure broad access to results; capacities for monitoring at the (especially) local level; absence of proper M&E system for SPTA2, including monitoring and reporting mechanisms; and incomplete harmonisation of indicators. • Solutions are needed of a technological, strategic planning; capacity building and inter-institutional coordination nature.
<p>Systemic Issue 2: climate variability and climate change</p>	
<ul style="list-style-type: none"> • Effects of climate change in Rwanda are not well understood, but predictions indicate increase in rainfall and temperatures • The agriculture sector is highly vulnerable to climate variability and climate change • Rwanda currently has an adaptation gap to climate variability 	<ul style="list-style-type: none"> • Challenges of climate variability and climate change are on the policy agenda • Some aspects are integral to some of the technical issues, including: optimal use of fertilisers, climate proofing of roads, integration of climate change considerations into CIP crop and variety selection • SPTA3 needs to mainstream climate change and build-up opportunities for adaptation
<p>Systemic Issue 3: Environmental Impact Assessment system</p>	
<ul style="list-style-type: none"> • EIA is key tool to minimise environmental impacts of projects, where Environmental Management Plans (EMPs) play an important role • Implementation of EMPs is currently deficient, and REMA enforcement capacities weak 	<ul style="list-style-type: none"> • Effectiveness of the EIA system needs to be enhanced to ensure mitigation measures are effectively implemented and environmental monitoring effectively carried out and reported • There are opportunities available within the existing regulatory framework to enhance REMA's

	enforcement capacities
Systemic Issue 4: local capacities	
<ul style="list-style-type: none"> Decentralisation is a key focus of Rwanda's policy for governance The onus of agricultural policy implementation is at the local level, where, nevertheless, capacities remain low 	<ul style="list-style-type: none"> Adequate capacities for planning, coordination and implementation at local level are critical to guarantee good performance in the agriculture and ENR sectors Districts and Sectors face challenges in terms of capacities, ranging from mere numbers of staffing and levels of experience and academic training, to issues of ambiguous definition of responsibilities, motivational factors, ICT facilities, mobility, etc.

Recommendations distinguish between those addressed to MINAGRI for integration into SPTA3; those addressed to non-agriculture sector institutions; recommendations for enhancement of EDPRS 2; recommendations for the CPAF; and recommendations to the European Commission. These are shown below. An indication is given to categorise recommendations according to: (a) interventions that should be continued; (b) reinforced/increased; (c) modified; or (d) introduced for the first time. As well the give an indication of their priority (top-, high-, or medium-priority).

Recommendations to be addressed in SPTA3

Most of the opportunities to enhance the environmental performance of the agriculture sector should find a place within the scope of SPTA3. The recommendations synthesised here refer only to those aspects that should be reflected in the SPTA3 document; to a large extent they provide a response to changes in policy thinking that have been taking place amongst stakeholders in the sector, but had not yet found an opportunity to be expressed in the relevant strategic and policy documents. In other cases they emphasise policy aspects and activities that were already present in SPTA2, but which have not been given the degree of attention we now believe they deserve due to their potential to contribute significantly to enhance the sector's environmental performance.

General principles

- Efficiency (best use possible of limited resources) and effectiveness (best strategy to achieve results) must always guide the selection of activities.
- Objectives are often best achieved by the selection of strategies whose components have amplifying effects, rather than individual measures.
- Empowering farmers through participatory engagement (farmer field schools and other training means) to make informed decisions should be a constant element to secure effectiveness and develop capacities.
- The development of skills and the availability of the resources required to make use of increased knowledge and capacities should always be promoted where necessary.
- Progress should be measurable. SMART performance indicators must be developed for the most critical expected results.

Soil and water conservation (Technical Issue 1)

- SPTA3 should promote soil and water conservation as an integrating policy focus, and it should be *effectively implemented as an integrated approach*. [modified - top-priority]
- Water scarcity is not yet a major concern for the agriculture sector; however, it is becoming a concern at an inter-sector level, and water use efficiency should be incorporated into the irrigation subsector. [introduced for first time - medium priority]

- Focus should be on activities that are the most cost-effective (e.g. in relation to less resource-intensive soil erosion control), and serving a purpose (e.g. species and varieties for agro-forestry must be selected based on the choice purpose. [reinforced/increased – top priority]
- It is critical that monitoring of soil erosion control gives an objective account of progress, with comparable reporting across the country. [continued – top priority]

Acidity correction and nutrient management (Technical Issue 2)

- Soil conditions for improved yields cannot rely solely on increasing the application of inorganic fertilisers, however necessary these may be. From the perspectives of optimal use of scarce resources (soil), minimisation of environmental risks and impacts, and building resilience for climate variability and climate change adaptation, the focus should change to one of increasing yields with optimisation in use of inputs. [modified – top priority]
- Two main dimensions to consider in SPTA3 are: managing acidity (an important limiting factor for crop yields) and optimising use of fertilisers. In response to this, SPTA3 will need to dedicate more efforts to secure acidity correction. [reinforced/increased – top priority]
- As well, and very importantly, the focus on increasing use of inorganic fertilisers needs to be changed to one of application of fertilisers based on nutrient needs. Such change will require fundamental changes in monitoring. [reinforced/increased – top priority]
- The focus on efficient use of fertilisers requires the necessary training and capacity building, always keeping in mind the principle of empowering farmers to make informed decisions. [reinforced/increased – high priority]

Crop and variety selection (Technical Issue 3)

- Choice of crops and varieties is central to CIP, and of key importance to secure livelihoods and food security. The CIP is the cornerstone strategy relevant to this issue. However, and in spite of the dramatic increases in crop yields associated, various aspects of the focus currently given to the CIP are increasingly being questioned (e.g. on aspects of resilience to climatic shocks, social acceptance, economic feasibility).
- SPTA3 offers a key opportunity to re-shape the CIP in order to better secure its objectives in an environmentally sustainable manner. More specifically the following aspects should be given due consideration and effectively incorporated:
 - do not set aside the possibility of inter-cropping, which can be highly beneficial in terms of pest and disease management and nutrient management (reducing inorganic fertiliser requirements); [introduced for first time – high priority]
 - build flexibility for decision-making of crops and varieties by farmers, developing farmers' know-how and skills to make informed choices – flexibility is important for adaptation to climate variability and climate change; [introduced for first time – high priority]
 - build adaptation capacities to climate variability and climate change by requiring all CIP schemes to be accompanied by weather insurance – important in a farming system that increases farmers' vulnerability to climatic shocks. [reinforced/increased – high priority]

Pest and disease management (Technical Issue 4)

- The approach to pest and disease management so far has been centred on the increase in use of pesticides, to the extent that the amounts of pesticides used is taken as an indication of performance in the sector. Considering the environmental and health risks associated to the use of pesticides, this
-

focus is inconsistent with the principles of environmental sustainability and optimal use of scarce resources.

- SPTA3 should change the focus to one where environmental and health risks are minimised. This means using pesticides only when necessary and only in the amounts necessary, as well as fomenting cost effective measures that reduce the need of pesticides. [modified – high priority]
- Various aspects related to safe management of pesticides are to be addressed by other institutions (e.g. RBS), but MINAGRI should be concerned with the review of manufacturers' instructions so they are suitable for local conditions and labelled in Kinyarwanda. [modified – high priority]

Rural feeder roads (Technical Issue 5)

- MINAGRI can contribute to enhance effectiveness in this sub-sector by providing guidelines to District Development Committees on criteria for prioritising feeder roads, such that ICM orientation is taken into account. [reinforced/increased – high priority]

Monitoring and evaluation (Systemic Issue 1)

- Apart from specific environment-agriculture indicators, which are recommended under some of the technical issues, there are some overarching aspects related to MINAGRI's own M&E system that require attention in order to ensure M&E can contribute effectively to planning and decision-making.
- Inter-sectoral coordination is fundamental, as different sectors and subsectors have objectives and indicators that relate to the agriculture sector. It should be MINAGRI's role to coordinate these different actors and agree on a harmonised set of indicators (and their associated methodologies). [reinforced/increased – high priority]
- An important shortcoming is that monitoring data and information is not readily available for all authorities concerned; such a harmonised reporting framework should be promoted by MINECOFIN, but MINAGRI is to make an important contribution. [reinforced/increased – high priority]
- Progress of SPTA2 has not been measured in a systematic basis. This should not be repeated under SPTA3, where proper monitoring and reporting mechanisms should be defined as part of the strategy and all key indicators should be SMART, supported by Metadata and have a defined methodology to measure them. [modified – high priority]

Climate variability and climate change (Systemic Issue 2)

- Many of the strategies and activities promoted in the agriculture sector have benefits in terms of climate change adaptation. However there are some approaches that may be reducing adaptation capacities (e.g. in relation to CIP crop and variety selection, see above), and there are also further opportunities to enhance climate change adaptation and the contributions to climate change mitigation (e.g. in relation to rationalisation in use of fertilisers, increased weather crop insurance).
- The NSCCLCD sets the way forward to Rwanda's green growth. Importantly, two of the strategy's Programmes (on 'sustainable intensification of agriculture' and on 'agricultural diversity in local and export markets') are to be led by MINAGRI, and thus mainstreamed into SPTA3.
- MINAGRI should make climate change one of its key concerns; for this it will need to generate knowledge and capacities to better understand how the agriculture sector in Rwanda relates to climate change. Activities should include modelling of crop yields under different climate change scenarios, contributions to upgrade and use the EWS, favour climate resilient crops and farming methods

(including the protection of agro-biodiversity) and further promote farmers' weather insurance. [reinforced/increased – high priority]

Recommendations for non-agriculture sector institutions

Important opportunities were identified to enhance the environmental performance of the agriculture sector that are best addressed by institutional actors outside the agriculture sector.

MINIRENA and RNRA

- Being the government institution in charge of environmental policy aspects, and also responsible for implementing and monitoring the ENRSP, MINIRENA should play a key role in coordinating with MINAGRI in all matters related to the environmental dimensions of SPTA3. [reinforced/increased – high priority]
- MINIRENA, together with the RNRA, should take primary responsibility for the development of an indicator measuring soil erosion, which will be key to monitor the effectiveness and, (especially) impact of soil erosion control measures. [reinforced/increased – medium priority]
- RNRA is already developing the system for monitoring of water quality. They should ensure that variables that give an indirect measure of soil erosion are included (i.e. TSS, TDS, turbidity). [reinforced/increased – medium priority]
- In terms of water use efficiency, the water balance study in charge of MINIRENA will be fundamental to determine availability of resources. Setting up the mechanism of water use allocations will be important to ensure good management of resources in the context of increasing water demand and climate change. [reinforced/increased – high priority]
- RNRA, with the possible support of NUR, should take in charge the regular monitoring of surface and groundwater quality to check for fertiliser and pesticide residues. [reinforced/increased – medium priority]
- MINIRENA should revisit the National Biodiversity Strategy, and devise appropriate measures for the protection of agro-biodiversity, which is potentially imperilled by the CIP, and which is important also in terms of climate change adaptation. An associated indicator would be useful in this context. [reinforced/increased – medium priority]

REMA and RDB (acting on behalf of REMA)

- The enhancement of the EIA system is fundamental to guarantee the environmental sustainability of agriculture sector development projects, especially with regards to the adequate implementation of EMPs and the strengthening of REMA's enforcement capacities. This exercise should include the integration of climate change considerations where and as appropriate.
- It is recommended that REMA undertake a comprehensive effectiveness assessment of its EIA system, in order to identify appropriate measures to strengthen it. [reinforced/increased – high priority]
- The EIA regulatory framework, including the EIA Guidelines, are well developed and powerful instruments; REMA and RDB should make better use of them. In particular the indication – in the EIA Certificates – that developers should submit annual monitoring reports to REMA will strengthen REMA's enforcement capacities, and also put more pressure for compliance on developers. [reinforced/increased – high priority]
- REMA, in coordination with MINIRENA, should clarify who is considered to be the 'developer' (for purposes of monitoring, reporting and for all other legal ends) in the case of long-term

operation of agricultural projects (e.g. rice field development/irrigation system handed over by donor-funded project to a farmers cooperative). [reinforced/increased – high priority]

MINALOC and Districts

- Districts will play a very important role in the implementation of most recommendations, normally in coordination with MINAGRI/RAB. Especially important, they should take a leading role in training of farmers, with a view to empower farmers to be able to make informed decisions on best farming practices. [reinforced/increased – high priority]
- MINALOC, in coordination with Districts should take a leading role in measures aimed at enhancing local capacities, including the clarification of job descriptions for agronomists and infrastructure officials and providing the necessary training. In some organograms will have to change to incorporate new structures and hire new personnel (e.g. Sector Infrastructure and Land Officers). Freeing up agronomists from non-agricultural and ENR functions will be key to enhance local capacities for environment-agriculture. [introduced for the first time – top priority]
- MINALOC is recommended to consider ways to enhance local capacities, including with regards to reducing the high levels of staff turnover. [reinforced/increased – top priority]
- MINALOC should be able to contribute significantly, in coordination with MINECOFIN (and other sector line ministries) to define a harmonised reporting framework for the M&E system, whereas the data/information MINALOC collects from the local level can be easily accessible to MINAGRI and MINIRENA. [reinforced/increased – high priority]

Rwanda Bureau of Standards (RBS) and Ministry of Health (MOH)

- RBS is to play an important role in setting up an adequate framework for the safe management of pesticides, including aspects of product standards, labelling, residues analyses. [reinforced/increased – high priority]
- The MOH should take an interest in the spot-checking, detection and quantification of pesticide residues in user blood samples. This is important to verify adequacy of the framework established for safe management of agrochemical products. [reinforced/increased – medium priority]

Rwanda Transport Development Authority (RTDA)

- Most recommendations to the RFR sub-sector are addressed to the RTDA. These concern especially the adoption of the necessary environmental standards, training of key actors in good environmental management practices, and contribution (in coordination with Districts) to create the job description for the new post of Infrastructure and Land Officer at the local level. [introduced for first time – high priority]

Recommendations for enhancement of EDPRS2

A key recommendation for the preparation of EDPRS is to shift the policy focus from increasing the amount of inorganic fertilisers applied, to one of increasing the amount of inorganic fertilisers applied AND that such application responds to soil nutrient needs.

Secondly from the time the EDPRS was written, the institutional level of awareness on climate change, and the corresponding policy focus have matured; climate change adaptation is now rightly recognised as an important aspect to address, especially due to the high level of vulnerability to climate change of the agriculture sector.

This SEA has shed light on important opportunities available to improve the environmental dimension of the agricultural sector. Although all recommended actions are considered important, some specific actions deserve special attention due to their particular potential to contribute significantly to increase the environmental performance of the agriculture sector in Rwanda. These deserve to be highlighted in the EDPRS2 ‘policy actions matrix’, especially as these actions are meant to serve as triggers for the release of budget support funds.

Three key recommendations for enhancement of the environmental dimension of the EDPRS with regards to the agriculture sector are synthesised below.

- 1 Modify the indicator on intensity of use of fertilisers (in the intermediate indicators matrix), to one that clearly reflects the optimisation in its use. An appropriate measuring methodology should be developed. Some possible formulations to consider are:
 - ‘number of farmers using acidity correction and fertiliser application based on nutrient needs assessment for their specific land unit’;
 - ‘tonnes of inorganic fertilisers/ha/yr applied based on estimation of soil nutrient needs’; and/or
 - ‘% of total inorganic fertilisers applied whose application is based on estimation of soil nutrient needs’.
- 2 Make explicit reference in the SPTA3 document to the vulnerability of the agriculture sector to climate change, and the importance of adaptation.
- 3 Integrate, as part of the ‘policy actions matrix’, the following:
 - Develop and implement a purpose-based agro-forestry strategy;
 - Develop SPTA3 in line with recommendations made in the Strategic Environmental Assessment (SEA) of the agriculture sector in Rwanda.

Recommendations for the CPAF

Currently the CPAF contains only the following three indicators relevant to the environment-agriculture interactions¹: (1) ‘land portion protected against soil erosion (%)’; (2) ‘% of farming households using improved farm methods’; and (3) ‘% of water resources complying with water quality standard’. As for the second indicator on up-take of improved farm methods, on examination of the methodology to measure the indicator, it is identified that ‘improved farming methods’ is related exclusively to the use of fertilisers (chemical and organic)².

The concept of ‘improved farm methods’ should be much wider than merely applying fertilisers; it should include the up-take of an Integrated Crop Management (ICM) approach, including aspects of up-take of agro-forestry and Integrated Pest Management (IPM). In any case, the use of fertilisers should be matched to the soil nutrient needs after any necessary correction of acidity.

A re-defined methodology for ‘% of farming households using improved farm methods’ will not be provided here, as it will require further discussions amongst the agriculture SWAp community. However it is important that the aspects highlighted in the above paragraph are taken into account, especially the rational use of fertilisers. One possible formulation is: ‘farming households that make use of soil acidity correction measures and fertilisers based on the assessment of soil nutrient needs, and which engage in ICM’.

In addition, or as a complement, to the above indicators, it is recommended that the following indicators be integrated into the CPAF:

- No. of farmers using acidity correction and fertiliser application based on nutrient needs assessment for their specific land unit;
- ha of farm land under agro-forestry;
- No. of farmers exposed to Farmer Field Schools, with an ICM focus;

- No. of Districts where Infrastructure and Land Officers are functional (relieving agronomists of those functions);
- % of cultivated land under CIP with weather insurance.

Recommendations to the European Commission

General conditions for disbursement of tranches

The general conditions for disbursement of all tranches are linked to a set of general eligibility conditions. From the point of view of adequacy of the sector policy (in this case the SPTA), it is necessary that it is environmentally sustainable. When re-assessing for future disbursement the appropriateness of the sector policy, budget, monitoring systems, sector coordination and institutional capacities, the implementation of the recommendations drawn by the present Strategic Environmental Assessment (SEA) should be taken into account.

Performance Indicators for the disbursement of variable tranches

The most pressing environmental concerns in the agriculture sector should be reflected either in the performance indicators for the disbursement of variable tranches or at least be present amongst the issues to be raised in the on-going policy dialogue. It is recommended that the EC, within the context of the SBS Programme, gives special emphasis towards the following six indicators. The rationale is given in the right column.

Performance Indicator	
1	No. of farmers using acidity correction and fertiliser application based on nutrient needs assessment for their specific land unit
2	ha of arable land under agro-forestry
3	No. of farmers exposed to Farmer Field Schools, with an ICM focus
4	Law of Agrochemicals enacted and Registrar of agro-chemicals and inspection team functional
5	No. of Sectors where Infrastructure and Land Officers are functional (relieving Sector Agronomists of those functions)
6	% of cultivated land under CIP with weather insurance

Policy dialogue

There are some recommendations which are necessary to enhance the environmental performance of the agriculture sector, but which are beyond the sole responsibilities of the agricultural institutions. For this reason they have not been included in the aforementioned list of top priority agro-environmental performance indicators, but they should indeed be pursued in the wider policy dialogue of the EC and other Development Partners in Rwanda. Those issues should include, *inter alia*:

1. Harmonisation of environmental indicators relevant to the agriculture sector.
2. No. of annual monitoring reports submitted to REMA in context of EMP implementation
3. Development of a common ICT platform for M&E enabling effective computer access by all relevant Government institutions to M&E data and information under common formats.

Recommendations in the context of the SPSP to rural feeder roads

Dialogue was established by with the formulation team for RFR SPSP, with Ministry of Infrastructure (MININFRA) and the Rwanda Transport Development Agency (RTDA). Preliminary recommendations for integration of environment into the draft documentation offered for RFR SPSP formulation were provided to the RFR SPSP formulation team as follows based on the agreed condition of no significant change to RFR carriageway width (+/- 4 metres):

1. The Code of Practice and actual management systems of A) Supervising Engineers and B) Road Rehabilitation and Maintenance Contractors would need to incorporate Environmental Capability including capability related to the issues set out at 2 and 3 below;
2. The adopted Road Standard(s) would have to incorporate rigorous guidance and specifications for Vegetative Protection of Water Courses, Verges, Embankments and Cuttings and other earthen structures associated with RFR rehabilitation and maintenance, according to soil type and other geological and hydrological considerations;
3. Minimum road specifications applied to the respective implementation would require climate-proofing road design, so that roads and associated structures would be capable of sustaining greater intensity of rainfall as indicated by officially recorded trends.

The Table below synthesises the main indicators suggested for EDPRS2, CPAF and SPTA3. The indicators referred to for SPTA3 are only indicative, based on the activities suggested in this SEA report (NB: they may not be explicitly suggested as indicators in Sections 5-13 although, if actions are integrated into SPTA3, associated indicators would probably assume a wording similar to what is suggested in this table). The SPTA3 document will certainly include a broader range of indicators.

Proposed Indicators	EDPRS2	CPAF	SPTA3
<ul style="list-style-type: none"> • No. of farmers using acidity correction and fertiliser application based on nutrient needs assessment for their specific land unit; AND/OR • Tonnes of inorganic fertilisers/ha/yr applied based on estimation of soil nutrient needs; AND/OR • % of total inorganic fertilisers applied whose application is based on estimation of soil nutrient needs. 	✓	✓	✓
Policy action:	✓		✓
<ul style="list-style-type: none"> • Develop and implement a purpose-based agro-forestry strategy 			
Policy action:	✓		
<ul style="list-style-type: none"> • Develop SPTA3 in line with recommendations made in the SEA of the agriculture sector in Rwanda 			
<ul style="list-style-type: none"> • ha of arable land under agro-forestry 		✓	✓
<ul style="list-style-type: none"> • No. of farmers exposed to FFSs, with an ICM focus 		✓	✓
<ul style="list-style-type: none"> • No. of districts where Infrastructure and Land Officers are functional (relieving agronomists of those functions) 		✓	✓
<ul style="list-style-type: none"> • % of cultivated land under CIP with weather insurance 		✓	✓
Policy action:			✓
<ul style="list-style-type: none"> • Devise and adopt Soil and Water Conservation Strategy 			
Policy action:			✓
<ul style="list-style-type: none"> • Devise and adopt National awareness programme (farmers' awareness of benefits of soil and water conservation measures) 			✓
<ul style="list-style-type: none"> • No. of extensionists trained on purpose-based agro-forestry 			✓
<ul style="list-style-type: none"> • Water use efficiency for irrigation (Mm³/ha/yr or Mm³/t/yr) 			✓
<ul style="list-style-type: none"> • No. of acidity correction trials completed for major land units 			✓
<ul style="list-style-type: none"> • No. of nutrient management trials completed for staple crops in major land units 			✓
<ul style="list-style-type: none"> • No. of extension workers including ToR and FFS trainers inducted into and tested for knowledge on acidity control and nutrient management 			✓
<ul style="list-style-type: none"> • % coverage of early warning system 			✓

• No. of crops for which IPM/Pest Risk Analysis protocols, field scouting frequencies and roguing practices are completed			✓
• No. of crops for which manuals on OPM/PRA have been developed			✓
• No. of farmers trained on climate change awareness			✓
• Indicators (as yet undefined) measuring protection of agro-biodiversity			✓
• % farming households covered by weather-related crop failure insurance policy			✓
Indicators proposed to be WITHDRAWN/MODIFIED	EDPRS2	CPAF	SPTA3
• % of farm households using inorganic mineral fertilisers	✓		✓
• % of farm households using organic fertilisers	✓		✓
• % of farm households using insecticides	✓		✓
• % of farming households using improved farm methods (definition of 'improved farm methods' to be modified)		✓	
• land portion protected against soil erosion (%) (measurement methodology to be modified so it reflects 'effective protection' and monitoring data can be comparable across the country)		✓	✓

SECTION A

BACKGROUND

Section A presents the background to the analytical components of the SEA. Chapter 1 provides a brief introduction to the agriculture sector in Rwanda in the context of the wider national development policy and the current and envisaged support to these strategies by the European Commission; it provides the rationale for carrying out this SEA, in light of the environmental sensitivity of the sector. Sector 2 describes the approach and methodology used in this particular SEA. Chapter 3 provides a description of the key sector (agriculture) and sub-sector (feeder roads) strategies. Chapter 4 describes the policy, institutional and regulatory framework relevant to the agriculture sector and the environment-agriculture interactions.

1 Introduction

Rwanda's economy is heavily dependent on the agriculture sector. Agriculture contributes about 34% of GDP (Rwanda SAKSS, 2011), employs about 88% of the economically active population (albeit much of it is seasonal) and is the main earner of foreign exchange, accounting for up to 80% of exports¹. Agriculture is identified as one of the main motors for growth in Rwanda under Vision 2020 and the Economic Development and Poverty Reduction Strategy (EDPRS), due to its current contribution to the economy and its potential for growth.

The development of the agriculture sector is primarily guided by Rwanda's Strategic Programme for the Transformation of Agriculture II (SPTA2), complemented by other strategies, such as the National Post-Harvest Staple Crop Strategy (PHSCS). SPTA2 is currently under MINAGRI self-assessment and a Road Map has been established for planning of its successor SPTA3 (2013-17), which will feed into EDPRS2.

The European Union (EU), represented by the European Commission (EC), is providing assistance for implementing SPTA2 through a Sector Budget Support (SBS) Programme. The programme focuses on decentralisation in the sector and has a financial commitment of 20M€. A top-up of an additional 20M€ to the programme will also give special attention to aspects of food security, nutrition and environmental sustainability. The additional budget is also meant to contribute to implementation of the PHSCS, MINAGRI's contribution to implementation of the National Multi-sectoral Strategy to Eliminate Malnutrition in Rwanda, and to reinforce the institutional framework and capacities for fiscal decentralisation in the agriculture sector. As well, the EC will provide support to the rural feeder roads subsector in the form of a Sector Policy Support Programme (SPSP) indicated at 40 M€.

Agriculture is an 'environmentally sensitive' sector in three main respects. Its performance is highly linked with the quality of natural resources and strategies for its development can generate negative environmental externalities; however, such strategies can also provide opportunities of convergence to improve the state of the environment and contribute to climate change adaptation and low carbon development.

The Government of Rwanda's (GoR) is committed to sustainable development in general, and to an environmentally sustainable agricultural policy in particular. This Strategic Environmental Assessment (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 SPTA3 and the revised EDPRS. The SEA also provides recommendations for the EC to better integrate the environment in the formulation of its support to the agriculture sector and the rural feeder roads subsector.

Other donors will also find the findings from this SEA useful to prepare or mainstream their own support programmes to the agriculture sector from an environmental point of view. Due to the cross-cutting nature of the environment, the findings will not only be of use and interest to the agriculture sector institutions, but may find wider applicability in other sectors, including Environment and Natural Resources (ENR), local government, infrastructure and energy.

The findings of this SEA conclude into recommendations for the improvement of the environmental sustainability of SPTA-3 including, *inter alia*, with respect to the focus of Crop Intensification, giving special emphasis to soil acidity and nutrient management, pest and disease management, soil and water conservation and crop and variety selection. They also highlight opportunities to enhance environmental performance through actions concerning systemic issues such as agro-environmental M&E, mainstreaming of climate change and development of local capacities.

The SEA distinguishes for each proposed action leading and contributing agencies, and identifies other opportunities to enhance environmental performance in the agriculture sector that are better handled by the ENR competent authorities, including the strengthening of the Environmental Impact Assessment (EIA) system and opportunities to enhance environmental enforcement capacities.

2 Approach and methodology

This approach and methodology of the present SEA was based on international best practices as evidenced by the consideration of the guidance provided by the EC (EC, 2009), the OECD DAC (OECD DAC, 2006) and the Rwanda Environmental Management Authority (REMA, 2011b), as well as the team's own specific SEA experience. The methodological approach used is presented in the following paragraphs; a more detailed description is provided in Annexes A2a and A2b.

This SEA consisted of two key phases: a scoping study and an SEA study.

The **scoping** phase was oriented at making a preliminary identification of the key environmental concerns in the sector, taking into account both the effects of degraded natural resources in agricultural performance as well as the existing and potential impacts on the environment associated to actions in the agriculture sector. Based on these findings elements for the organisation of the main SEA study phase were identified, including the key issues that would deserve specific attention, the baseline information required and the areas targeted for site visits. The concept of **Key Issues** is critical to the SEA, as it allows focusing efforts and recommendations on those aspects that are really important, i.e. aspects that need to be solved to achieve a significant improvement in the environmental performance of the sector.

This preliminary identification of key issues was based on: (a) a comprehensive examination of all relevant policy and strategic documents (primarily SPAT2); (b) a mapping of the environment-agriculture interactions; (c) consultations with key stakeholders; (d) a field visit that allowed visiting a large agriculture development project and consultation with local actors; (e) the development of a Leopold-type matrix for the identification of potential environmental impacts and opportunities associated to SPTA2 implementation; and (f) a preliminary analysis of indicators from the main M&E systems to verify consistency and potential environmental implications associated to their use.

The preliminarily identified key issues were discussed and validated in a stakeholders' scoping workshop, attended by 41 participants from relevant government institutions and donors. Key Issues were prioritised based on expert judgement; findings of the scoping workshop; and determination of significance using a risk-focus assessment (see Annex A2a for a more detailed account of issue prioritisation).

The **SEA Study** phase assessed the key issues in detail and identified options to address them, i.e. options that would minimise environmental impacts and make best use of opportunities to enhance the state of the environment and the opportunities for climate change adaptation and mitigation. The analysis took into account the policy and regulatory framework, the institutional settings and the existing capacities.

The SEA Study made use of a combination of qualitative tools and methods, including:

- (a) focused stakeholder consultations from a mix of actors (e.g. central and local level, farmers' organisations, donors, CSOs);
- (b) field visits in the five Provinces, aimed at consulting with local level stakeholders, verify focus and effectiveness of projects and other agriculture initiatives at the local level, and obtain an appreciation of the challenges on site (see itinerary in Annex D3);
- (c) consistency analysis of sectoral indicators across different M&E systems (consistency matrix);
- (d) expert judgement; and
- (e) a series of *ad hoc* supporting analyses (e.g. for M&E reporting flows; determination of staffing at local level; determination of budget allocations from different sources to specific environment-agriculture areas of attention; spatial analysis; appraisal of a sample of EIAs and their accompanying EMPs and EIA Certificates).

All activities were carried out in close coordination with MINAGRI. Field visits were organised in conjunction with RAB personnel; MINAGRI¹ (and sometimes RAB personnel) always accompanied the SEA team in field visits, allowing opportunities to verify findings with central level experience and also providing an opportunity to strengthen SEA-related capacities within MINAGRI.

Efforts were made to regularly consult with and brief the ENR sector. Regular communication was kept with MINAGRI to coordinate SEA activities² and cooperation was established with the team of consultants formulating the EC's SPSP for rural feeder roads.

Outputs from the application of some of these tools are available in Annex A2b, as well as the itinerary for the field visits (Annex D3). Synthesis of stakeholder meetings is found in Annex D5.

3 Agriculture and rural feeder roads strategies

Sector Programme for the Transformation of Agriculture – Phase II

SPTA2 (2009-12) builds up from the previous SPTA1. It integrates new policy developments, especially the Decentralization Policy of 2000, but also taking to account alignment with the EDPRS, the national long-term Vision 2020 and the National Investment Strategy.

The *Overall Objective* of SPTA2 is:

“Agricultural output and incomes increased rapidly under sustainable production systems and for all groups of farmers, and food security ensured for all the population”.

Its *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 backbone of SPTA2 consists of four interrelated Programmes, which are divided into 20 Sub-Programmes (SP). The Programmes and their objectives are shown in Table 1 below.

Table 1 SPTA2 programmes and their objectives

<p>Programme 1: Intensification and development of sustainable production systems</p> <p>Objectives: (i) create needed soil & water management structures; (ii) demonstrate to farmers and villagers the benefits of soil fertility-enhancing technologies; (iii) increase ownership of livestock and improve and intensify animal husbandry practices; and (iv) improve cultivation practices and develop sustainable production systems.</p> <p>Programme 2: Support to the professionalization of producers</p> <p>Objectives: (i) strengthen the sector's social capital base; (ii) provide producers with the organisational frameworks necessary to develop commercial linkages and function as entrepreneurs; and (iii) strengthen the entities in the sector charged with the development of productive technologies, applied knowledge and imparting this knowledge to farmers.</p> <p>Programme 3: Promotion of commodity chains and agribusiness development</p> <p>Objectives: create, through institutional reforms, investments and incentives, and environment which is favourable for farmers and agro-entrepreneurs to develop high-value products, including processed products, and to access the markets which will justify the investments in those areas.</p> <p>Programme 4: Institutional development</p> <p>Objectives: strengthen the institutional framework through which the public sector supports agricultural development.</p>
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SPTA2 is implemented through a sector-wide approach (SWAp), for which an MOU was signed in 2008 between the GoR and the main development partners, who form part of the Agriculture Sector Working Group (ASWG). Main partners in agriculture include the EC, the World Bank, IFAD, JICA, USAID, AfDB, FAO and BTC.

Progress indicators for the agriculture sector are contained primarily in: SPTA2; EDPRS; the Common Performance Assessment Framework (CPAF); Vision 2020; Donor PAF frameworks (e.g. under the EC's SBS Programme); agriculture-sector indicators contained in the Five Year Strategic Plan for Environment and Natural Resources (ENRSSP); and the recently-approved National Strategy for Climate Change and Low Carbon Development (NSCCLCD).

Progress is measured primarily through the bi-annual Joint Sector Reviews (JSRs), based on Vision 2020, EDPRS/CPAF indicators. The March JSR is backward-looking, whilst the September JSR is forward-looking.

Rural feeder roads planning

Under SPTA2, the PHSCS has the fundamental vision "to reduce food insecurity through an efficient post-harvest private sector system delivering staple foods to the people of Rwanda". Strategic Axis 2 is "Efficient and equitable transport systems across staple crop producing areas". In the PHSCS Action Plan, the overall target outcome of Axis 2 is defined as "reduced transport costs", with the following sub-objectives:

- 2.1 Investigate transport component of staple crop marketing costs;
- 2.2 Reduce road transport costs between production and secondary aggregation points in high potential areas; and
- 2.3 Address prioritized 'soft' constraints.

Activities foreseen include building and/or rehabilitating prioritized feeder roads, and demonstrating the impact of building or rehabilitating feeder roads. An indicator "improved feeder roads" has been set with specific targets (in the approved document "not less than 80 km feeder roads improved per year").

The EU has indicated willingness to coordinate joint monitoring, to be carried out with GoR and the other Development Partners active in the domain of rural roads (currently the Netherlands, USAID and WB) alongside the implementation of the SPSP and other programmes in place, with the aim of a performance assessment under an integrated approach.

Seven Districts have been identified to be targeted under the initial phase of EU SPSP for Rural Feeder Roads as follows: Bugesera, Huye, Muhanga, Ngoma, Ngororero, Rubavu and Rulindo. The respective Verifiable Indicators of Achievement may include cross-cutting measures including degree of utilisation of labour-intensive methods; participation in and leadership by women (e.g. in road maintenance contracts); and environmental sustainability compliance measures based on guidance offered by this SEA study.

4 Policy, institutional and regulatory framework¹

Policy framework and key strategy documents

Key national policies are the Rwanda Vision 2020 and the EDPRS, to which all sector strategies must contribute. These policies establish the transformation of agriculture as a key pillar for development, especially through the increase of productivity. Their M&E systems give evidence of a focus on intensification and increase in use of inorganic fertilisers and pesticides; they also give evidence that soil erosion is a key concern to be addressed.

The most relevant sector policies from an environment-agriculture perspective are: the National Agriculture Policy (2004); National Environmental Policy; National Land Policy (2004); National Seed Policy (2007); National Forestry Policy (2010); National Policy for Water Resources Management (2011); Sector Policy on Water and Sanitation (2004); and National Decentralisation Policy (2000). Additionally the following must also be considered: Organic Law N° 08/2005 of 14/07/2005 determining the Use and Management of Land in Rwanda, Organic Law N° 04/2005 of 08/04/2005 determining the modality of protection, conservation and promotion of environment in Rwanda; Ministerial Order N° 004/2008 of 15/08/2008 establishing the list of works activities and projects that have to undertake an environmental impact assessment; Ministerial Order N° 005/2008 of 15/08/2008 establishing modalities of inspecting companies or activities that pollute the environment; and Ministerial Order N° 003/16.01 of 15/07/2010 preventing activities that pollute the atmosphere.

These policies are to a large extent consistent and supportive of each other with regards to environmental aspects of agriculture. Thus, for example, policies on agriculture, environment, land, and water resources management emphasise aspects of soil erosion protection and water conservation. Other points of

convergence are found in areas such as the promotion of agro-forestry (e.g. environment, forestry, agriculture). Also some policy documents (e.g. environment, forestry, land) establish objectives and indicators directly relevant to the agriculture sector.

There are, however, also some conflicting objectives; e.g. objectives related to intensification in use of pesticides and fertilisers can conflict with objectives on improving water quality; as well, objectives for marshland reclamation may conflict with objectives on wetlands protection. These potential conflicts have to be carefully examined.

Of an overarching nature, the National Decentralisation Policy deserves to be highlighted, as it establishes responsibility for implementation of actions in agriculture and ENR (amongst others) at the local level.

The way policies are implemented is specified in a series of sector strategies. The most relevant from an agriculture-environment perspective are: SPTA2; PHSCS; National Agricultural Extension Strategy (2009); 5-Year Strategic Plan for the Environment and Natural Resources Sub-Sector (ENRSP); National Strategy for the Conservation of Biodiversity in Rwanda; and National Climate Change and Low Carbon Development Strategy (NSCCLCD).

These strategies show similar points of convergence as for their corresponding policies. The specific case of the NSCCLCD deserves special attention, as its first Programme relates to Sustainable Intensification of Agriculture, which will have to be addressed in SPTA3. Protection of agro-biodiversity is highlighted in the National Strategy for the Conservation of Biodiversity, in line with commitments under UN Convention on Biological Diversity (CBD). Also the agricultural extension strategy is important as it may be a vehicle for implementation of certain SEA recommendations requiring the strengthening of farmers' know-how and capacities.

Rwanda has a comprehensive policy and planning framework at national and sectorial level, and where the environmental dimension is integrated, and which serve as a solid reference for further programming. The corpus of policy and planning documents are largely consistent, but there are some aspects of harmonisation that deserve attention with regards to the consistency of environmental objectives; the most relevant aspects of harmonisation are further explored in this SEA.

Institutional framework

The key sector authority dealing with agriculture is the Ministry of Agriculture and Animal Resources (MINAGRI). From an ENR point of view, key strategic-level institutions are: Ministry of Natural Resources (MINIRENA), dealing with policy aspects; Rwanda Environmental Management Authority (REMA), which is the regulatory agency; and Rwanda Natural Resources Authority (RNRA), in charge of implementation.

Other relevant institutions include: the Ministry of Local Government (MINALOC); the Ministry of Infrastructure (MININFRA); the Ministry of Trade and Commerce (MINICOM); the Rwanda Agriculture Board (RAB); the Rwanda Development Board (RDB); and the Ministry of Finance and Economic Planning (MINECOFIN). At local level key institutions are Districts and Sectors. The approach to environmental mainstreaming² includes the secondment of REMA staff to key ministries (including MINAGRI) as environmental mainstreaming officers.

District Councils and Mayors³ are elected at local level, and constitute the key institutions for planning and implementation, being responsible for implementing measures in agriculture and ENR. The Province level is reportedly being strengthened to help in coordination of M&E of District activities in concert with MINALOC. **Environmental Committees** are established at District, Sector and Cell levels, and assume responsibilities on certain environmental aspects, including on monitoring of forestry activities, soil erosion control measures and general environmental management.

There are five main fora that provide significant opportunities for mainstreaming the environment into the agriculture sector: (1) Integrated Development Programme (IDP); (2) Sector Working Groups (SWG); (3) Budget Call Circular (BCC); and (4) Imihigo.

Integrated Development Programmes (IDP) are “implementation frameworks for significant components of EDPRS which will be implemented almost exclusively at the local community levels and engage a wide range of stakeholders”. IDP is overseen by an Inter-Ministerial Steering Committee (IMSC) chaired by MINALOC. **Sector Working Groups (SWG)** are established by the GoR and provide a forum for dialogue between different government institutions and donors. There is a SWG on agriculture as well as one on ENR.

The different ministries submit their budgets to MINECOFIN based on the **Budget Call Circular (BCC)**. The BCC includes “sector specific guidelines for environmental mainstreaming” (Annex 17), with environmental objectives and indicative guidance on prioritised actions for environmental mainstreaming for the agriculture sector⁴.

A key tool for reinforcing local government is the performance-based approach, “**Imihigo**”. Through Imihigo local governments articulate their objectives and develop strategies to achieve them, in the form of **Performance Contracts (PC)**, which are signed annually between districts and central government and between districts and lower-level local governments.

Rwanda has in place a solid set of institutions dealing with the environmental aspects of the agriculture sector, including arrangements for inter-sectoral and inter-institutional coordination. Issues that deserve attention are mainly related to the strengthening of capacities and the enhancement of coordination, as no aspects of major importance are present (as could be, e.g. important gaps in environmental governance, or important duplication of functions).

Regulatory framework

Rwanda has a limited corpus of environmental legislation, and is in process of developing new laws and regulations. Key pieces of legislation include Laws addressing land management (N°08/2005), environmental protection (N°04/2005) and conservation, protection and management of water resources (N°62/2008). Other relevant regulations, in the form of Ministerial Orders, address issues related to EIA procedures; procedures for environmental inspections; prevention of atmospheric pollution; and protected animal and plant species. Prime Ministerial Orders address the organisation of environmental committees, and establish a list of banned chemicals and other pollutants.

With regards to environmental regulations, this is based primarily on the EIA system, coupled with enforcement capacities through inspections and audits. The Organic Law on the environment establishes responsibilities on the state for soil erosion and pollution control; establishes responsibilities for environmental management at the local level; together with other pollution control provisions.

The Prime Minister’s order N° 26/03 of 26/10/2008 determined the list of chemical and other prohibited pollutants. In addition, the **Law on Agrochemicals** recently approved by Cabinet awaits publication in the Official Gazette. It establishes environment- and health-related safeguards. MINAGRI’s Directorate of Inspection Services will need to quantify ‘baselines’ and maximum residue limits of chemicals based on internationally credible practices in nearby African nations. Soil erosion control measures have been in force since 1982; the revised bill for the **Soil Erosion Law** is at Cabinet for review. Ministerial guidelines for district officials for implementation of the soil erosion law are already in circulation. Environmental **standards** have been adopted at a national level for effluent discharges.

Rwanda is also party to a number of international and regional **multilateral environmental agreements** that establish compromises for environmental protection. These include UN conventions: on Climate Change (UNFCCC) (and its associated Kyoto Protocol); on Biological Diversity (CBD); on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention); and to Combat Desertification (UNCCD).

The environmental regulatory framework remains weak in Rwanda, although it is subject of attention and advances are gradually being made. Especially challenging are the effectiveness of the EIA regulatory system (associated mainly to enforcement capacities) and the control and management of agrochemical products, and which are aspects subject of more detailed attention in this SEA report. Also of importance

in the short-term is the completion of the regulatory framework for the management of water resources (work in progress). The generation of adequate baselines (e.g. water quality and hydrological balance, effluent discharges) remains a challenge that needs to be solved in order to ensure adequate monitoring and enforcement.

SECTION B

ANALYSIS

The organisation of this Section enables focus on all the relevant dimensions of each key issue, its baseline and trends, and the way the issue is currently monitored. It heeds work in progress (including change management) and known commitments for additional allocation of resources. It identifies and evaluates respective impacts using a ‘SWOT’ approach encompassing legal/regulatory, institutional and implementation components. The respective analysis includes consideration of the potential opportunities for mitigation and optimisation measures and their acceleration.

Some of the issues are closely related, so achievements in one of the issues will be convergent with objectives from others. This is particularly the case with technical issues 1-4, which all respond to an integrated crop management approach.

5 Technical issue 1: Soil and water conservation¹

5.1 Introduction

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 has been set as a priority at national level².

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. These aspects are dealt with under Technical Issues 2 and 4 respectively.

In **agroforestry systems** there are symbiotic ecological and economical interactions between the different components. Based on a definition provided by ICRAF³1993, this report considers that:

Agroforestry in Rwanda is the collective name for integrated land management, where trees, shrubs, deep-rooted perennial grasses and their combinations, are principally maintained in spatial arrangement along contours and associated bund and terrace structures at horizontal intervals commensurate with geology, soil conditions, slope and rainfall on the same land management unit as agricultural crops to provide:

- *environmental services that underpin agricultural sustainability; these include soil and water retention, foliar mulch and composts and (leguminous species) nitrogen fixation; and*
- *production of forage, wood, and other products for animal husbandry, subsistence and commercial purposes.*

5.2 Policy and regulatory framework

Main relevant policy documents are: Vision 2020; EDPRS; National Agriculture Policy; and SPTA2. The National Environmental Policy (and ENRSP) and the NSCLCD are also directly relevant.

The soil and water conservation approach is referred to in key policies and strategies. Policy initiatives (e.g. under SPTA2 and ENRSP) address agro-forestry as a way to enhance water conservation and contribute to erosion control⁴, although it also has other benefits (e.g. slope stabilisation, production of fodder and fuel wood). Nevertheless soil erosion control and agro-forestry remain largely detached in terms of implementation.

In the case of agro-forestry, the EDPRS puts forward a series of actions under the banner of forestry, and which include the “intensification of agro-forestry in order to improve agricultural productivity”. Agro-forestry is taken up in SPTA2. The Forestry Policy includes a Policy Statement (No 5) on Farm Forestry: “Tree-growing shall be promoted in all farming systems to boost land productivity, increase income and improve food security and a responsive forestry extension service developed”.

Under the framework environmental law⁵, soil and subsoil receive a high level of protection. In this context the State is responsible for establishing measures to control soil erosion and rehabilitate degraded soils. Decentralised entities are responsible for “ensuring activities related to better management of land, especially controlling soil erosion...”

In terms of management of water resources at a watershed level, key regulations are Organic Laws N° 04/2005 and 62/2008. Decentralised entities are given responsibility for “efficient management of rivers, lakes, sources of water and underground water”, as well as for the “efficient management and effective use of swamps”.

IWRM is a relatively new concept for water management in Rwanda and the framework law on water management⁶ is relatively recent (2008). Law N°62/2008 is not very clear on the IWRM focus for catchment management, which appears in a more explicit manner in the National Policy for Water Resources Management (2011)⁷. Nevertheless Law 62/2008 established some basic principles and responsibilities for water management relevant to the agriculture sector, including importantly the establishment of a Water Inter-ministerial Committee and the devolution of WRM functions to district level and user organisations. Not all of these aspects have been implemented to date.

The National Policy for Water Resources Management has recently been updated (April, 2011) in order to respond to the new context established by Law 62/2008 and other changes in the national planning context. The Water Resources Policy defines strategic actions, many of which are aimed at implementing Law 62/2008. Amongst these, we may highlight the establishment and operationalization of a water inter-ministerial coordination committee to co-ordinate WRM across all sectors of government; the formulation of principles for the allocation of water resources; institute measures to designate ecological water flows (‘reserve water’); and institute a system of permits and authorisations for uses of water⁸. To date the IWRM Master Plan is in process of development.

5.3 Institutional framework

The key institution for soil and water conservation in agriculture at a policy level is MINAGRI; at an implementation level it is RAB and District administrations, including MINALOC. MINECOFIN plays an important role in providing earmarked resources. MINIRENA retains deep interest in soil erosion control from a NR protection point of view and has acquired new responsibilities on climate change issues under the NSCCLCD.

In terms of water management, four ministries share responsibilities: MINIRENA, MINAGRI, MININFRA and MINALOC. The line ministry for water resources is MINIRENA; MININFRA deals with rural and urban water supply, urban sanitation and water sewerage service management. The Energy, Water and Sanitation Authority (EWSA) has charge of the implementation of the National Policy and Strategy for Water Supply and Sanitation Services; it is also in charge of implementing the infrastructure works for, e.g. water supply, urban sanitation and sewerage. Rural water services are responsibility of the district administrations and the actual management of services is contracted to private service providers and community-based water management authorities. MINAGRI deals with irrigation and marshland development.

5.4 Baseline

SPTA2 addresses ‘soil and water conservation’ (SP1.1 ‘sustainable management of natural resources and water and soil conservation). The priority lines of action (SPTA2 Table 11) narrows it down to construction of valley dams and reservoirs with conveyance structures, preparation of watershed management plans and soil erosion protection structures.

Soil loss and soil depth are among limiting factors for agricultural productivity, to which various factors contribute⁹. 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 not prone to erosion (MINAGRI, 2009). A high proportion of soils (especially in the Eastern half of the country) additionally have high acidity that inhibits nutrient buffering capacity.

As part of this SEA Districts have been classified according to the proportion of their land area with slopes larger than 16%, which gives an indication of priorities for soil erosion control.

Figure 1. Prioritisation of Districts based on % land of slope exceeding 16% (SAFEGE, Nov. 2011)

No	Slope category	National and Districts' Area Coverage (Ha) of Five Slope Categories					Total	>40%	>40%	>16%	>16%
		0-6%	6-16%	16-40%	40-60%	>60%					
	Colourcode						⇒	%land in the	⇒	%land in the	
	District						(Ha)	District	(Ha)	District	
1	Ngororero	2,110	9,056	45,019	11,296	417	67,899	11,713	17	56,732	84
2	Gakenke	3,047	10,441	39,786	15,535	1,597	70,406	17,131	24	56,918	81
3	Rulindo	4,006	8,925	29,320	13,364	1,084	56,698	14,448	25	43,768	77
4	Gicumbi	5507	13525	45016	17927	955	82,980	18,883	23	63,888	77
5	Karongi	3,294	15,369	50,574	9,476	507	79,220	9,983	13	60,557	76
6	Rutsiro	2,889	14,002	42,215	5,967	345	65,419	6,312	10	48,527	74
7	Muhanga	3,564	14,459	36,965	8,233	1,551	64,771	9,784	15	46,748	72
8	Nyabihu	5999	9208	27943	9908	732	53,130	10,039	19	37,983	71
9	Nyamagabe	5,886	25,677	67,869	9,158	436	109,086	9,594	9	77,463	71
10	Nyamasheke	6628	22739	54900	9874	889	94,530	10,262	11	65,162	69
11	Nyaruguru	6,153	26,070	63,826	4,774	95	100,918	4,869	5	68,665	68
12	Rusizi	9,086	22,233	48,416	8,955	1,680	90,411	10,676	12	59,092	65
13	Burera	17,019	12,114	23,957	10,131	1,125	64,346	11,256	17	35,213	55
14	Huye	5665	22580	27748	2102	68	58,153	2,169	4	29,918	51
15	Gasabo	5,277	15,680	19,190	2,634	128	42,919	2,762	6	21,952	51
16	Nyarugenge	2842	3794	5814	883	52	13,385	946	7	6,760	50
17	Gisagara	11,676	23,378	31,862	904	3	67,823	907	1	32,769	48
18	Kamonyi	8,886	25,749	28,706	2,057	154	65,553	2,211	3	30,917	47
19	Nyanza	9,344	31,436	24,888	1,523	60	67,201	1,583	2	26,421	39
20	Musanze	18473	15062	15669	3128	613	52,945	3,741	7	19,410	37
21	Ruhango	8,295	31,956	21,511	894	22	62,678	916	1	22,427	36
22	Rubavu	12,857	9,618	9,537	1,858	164	34,035	2,022	6	11,559	34
23	Kirehe	39,234	45,463	32,237	1,319	69	118,322	1,388	1	33,625	28
24	Rwamagana	15,102	34,635	17,911	539	9	68,196	548	1	18,459	27
25	Gatsibo	48688	66855	37776	4525	246	158,191	4,772	3	42,548	27
26	Ngoma	30,272	33,992	21,883	610	2	86,760	613	1	22,486	26
27	Kayanza	86578	64165	41275	1412	31	193,461	1,443	1	42,718	22
28	Kicukiro	5,623	8,266	2,760	22	-	16,671	22	0	2,782	17
29	Nyagatare	71,945	98,248	17,167	3,858	564	191,782	4,422	2	21,589	11
30	Bugesera	70290	54150	4555	4555	16	133,566	4,571	3	9,126	7
NATIONAL TOTALS		526,177	788,957	936,245	166,372	13,615	2,431,366	179,987	7	1,116,232	46
NATIONAL PERCENT'S		21.64	32.45	38.51	6.84	0.56	100.00		7		46
	Slope category	0-6%	6-16%	16-40%	40-60%	>60%		>40%	>40%	>16%	>16%
	Colourcode						⇒	%land	⇒	%land	

About 15 million t of soil is lost annually¹⁰. 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 (REMA/PEI, 2006 cited in REMA, 2009)¹¹.

More recent soil loss estimations were carried out by a UNEP team (UNEP, 2011) based on GIS modelling. These results suggest that 47% and 34% of the country is experiencing soil erosion rates of between 50 and 100 t/ha/yr respectively¹². These estimates were consistent with the very large amounts of sediment deposition found in four core samples from selected water bodies, as well as with measurements on degree of turbidity in surface waters¹³. Owing to their steeper terrain and higher annual rainfall, it is considered that the farmed Northern and Western uplands of Rwanda are the most vulnerable to erosion and should be prioritised in any new policy for reinforcing soil protection.

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 such as KWAMP, LWH and RSSP¹⁴.

According to the most recent JSR for the agriculture sector (09/2011)¹⁵, 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, as specified below, several shortcomings regarding the way this indicator is formulated and applied. It has been noted in the dialogue for the finalisation of this report that *“a policy action for a quantitative methodology to evaluate soil erosion infrastructures is being elaborated by MINAGRI in RAB; different development partners and stakeholders will play a greater role in validating and the implementation of the proposed new methodology.”*

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 (NISR, 2008) 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 to be achieved by the end of FY 2011/12. 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 un-maintained and thus ineffective structures are counted as ‘soil protection’¹⁶.

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 (Clay *et al*, 1998 cited in UNEP, 2011). This implies that MINAGRI 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, e.g. through demonstration plots and through FFS.

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 implementation¹⁷ (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. mulching¹⁸, 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.

5.5 Trends

It is not possible to make a projection on soil erosion due to the lack of monitoring data but it is noted that a new methodology is to be developed. To date no regular monitoring has been carried out of soil erosion rates, either directly or indirectly (e.g. TSS and TDS in river and streams) and the existing information is only indicative. However the GoR is embarking in enhancing the environmental monitoring system (in the framework of the Rwanda Environmental Information Network, which is an inter-sectoral effort coordinated by REMA), for which an indicator on rate of soil erosion (tonnes/ha/yr) has already been proposed (see REMA, 2011). Also work is in progress to establish a water quality monitoring system, including variables that will be able to give an indirect measure of soil erosion¹⁹.

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 (mainly through large projects), as well as efforts at soil erosion control promoted by NGOs. However trends 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.

In a similar note, it is not possible to establish trends for up-take of agro-forestry due to the lack of monitoring data. In this case pressure for improvement is not very high, as this variable is not being measured within the main M&E frameworks, although targets related to agroforestry are sometimes included within local level performance contracts.

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 provided by RAB through traditional means and Farmer Filed Schools, and in partnership with the contracted private service providers such as INGABO and Forrest Company.

In terms of water availability, it is recognised (and acknowledged in Vision 2020) 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 irrigation²⁰. 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 (National Policy for Water Resources Management 2011).

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)²¹. 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 multi-purpose 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 (promoted under SPTA2), agro-forestry and livestock development.

5.6 SWOT analysis

A SWOT analysis is presented below, synthesising strengths, weaknesses, opportunities and threats taken into account in the formulation of an approach to this issue.

Table 2 SWOT analysis for Technical Issue 1 on soil and water conservation

Strengths	Weaknesses
<ul style="list-style-type: none"> • GoR is highly committed to soil erosion control • High level of commitment to agro-forestry • Accumulated experience on soil erosion control through terracing • Significant donor support to soil erosion control • Sound regulatory framework for IWRM in place • High level acknowledgement of pressure on water resources • Water Users Associations begin to be constituted 	<ul style="list-style-type: none"> • Policy focus mainly on soil erosion control, separately on agro-forestry, and only at a low level on other soil and water protection measures, not integrated • Indicator on arable land under soil erosion control is ambiguously defined • Soil erosion control resource-intensive measures are prioritised • In some cases neglect of maintenance of terraces • Limited capacities at decentralized level to address soil erosion control, agro-forestry and other soil and water conservation measures • Agro-forestry is not reflected in the main M&E frameworks • Agro-forestry to a large extent is not being explicitly designed with a ‘purpose-based’ approach • Absence of a water balance for the country
Opportunities	Threats
<ul style="list-style-type: none"> • Soil management plan and strategy being developed by RAB. • Indicator on soil erosion is proposed • Surface water quality monitoring system will be developed (indirect measure of soil erosion) • Indicator on arable land under soil erosion protection is going to be reformulated • Farmers committed to soil erosion control • Recognition of soil erosion and water conservation as an area of key concern (incl. agro-forestry) • Land titling will provide incentives for farmers to invest in soil and water conservation measures • Agro-forestry convergent with the One Cow programme - potential to provide fodder 	<ul style="list-style-type: none"> • Population growth will increase pressure on land and forest resources • Climate change may exacerbate soil erosion through increased rainfalls and flooding • Important increase in water demand expected from various sectors (e.g. agriculture, industry, energy, sanitation)

<ul style="list-style-type: none">• Measures in agro-forestry convergent with climate change adaptation• Soil and water conservation measures will contribute to climate change adaptation• IWRM institutions to be shortly put in place	
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5.7 Synthesis, proposed specific objectives and required results

Addressing this key issue will require, fundamentally, a change at the policy level. Policy would have to shift to a focus on integrated soil and water conservation. This will imply giving more attention to the up-take of agro-forestry and other water conservation practices, and which will therefore deserve to be reflected in the list of performance indicators.

Being established at a policy level, the principles of soil and water conservation will have to permeate into all related activities in the sector, including its consideration and implications for the CIP. As well efficiency and effectiveness considerations call for the inclusion of other land protection measures besides resource-intensive radical terraces.

The associated indicators will require attention, including the re-definition for the indicator on proportion of arable land under soil erosion control, highlighting an indicator on agro-forestry and considering the integration of a measure of sustainability (e.g. in relation to maintenance of terraces and tree survival rate). There is also scope for the competent environmental institutions to aid monitoring of relevant variables associated to soil erosion, e.g. through the monitoring of variables that give an indirect measure of soil erosion (such as TSS, TDS, turbidity).

In the scenario of an increasingly water-scarce country, agriculture has to integrate the principle of water use efficiency in its irrigation schemes.

The proposed Specific Objective to address this key issue is: *a focus on integrated soil and water conservation guides the agriculture policy in addressing the problem of soil erosion and fomenting agro-forestry.*

The following Results are proposed to achieve the Specific Objective:

Result 1: Land is effectively protected against erosion

Result 2: On-farm water retention capacities are enhanced

Result 3: Water conservation at a watershed level is optimised

5.8 Activities proposed, responsible institutions and means

	Responsible Institution	Supporting institutions	Means	Proposed Objectively Verifiable Indicators and their timelines			
				12/2012	12/2013	12/2014	
All Results (General activities)							
G1	Explicitly adopt an integrated soil and water conservation approach, addressing aspects such as soil erosion control, agro-forestry and soil-and-water-conservation-oriented farming practices ³² .	MINAGRI	MINIRENA	Integration in broadened CIP design by MINAGRI-RAB-NUR-MINIRENA-RNRA Task Force	Soil and water conservation strategy devised and adopted	Strategy under implementation in N and W Provinces	Strategy under implementation in all Provinces
G2	Develop farmers' awareness of benefits of soil and water conservation measures.	RAB	Districts	Training of RAB Trainers (ToT); RAB Mobile Clinics; accelerated FFS programme	National awareness programme designed and funded	Programme reaches 25% farm population	Programme reaches 100% farm population
Result 1: Land is effectively protected against erosion							
1.1	Reformulate indicator on arable land under soil erosion protection (and methodology), so it reflects effective protection (e.g. addressing maintenance) and monitoring data can be comparable across the country.	MINAGRI-RAB	MINIRENA-RNRA NUR Districts	MINAGRI-RAB-NUR-MINIRENA-RNRA Task Force with indicator piloted before adoption. Training by RAB to local level staff responsible for monitoring.	Indicator formulated for trial	Piloting completed and results adopted	Adopted indicator under national implementation
1.2	Focus SPTA3 activities on development of less resource-intensive land protection approaches as complement to terracing	MINAGRI	RAB Districts	MINAGRI-RAB-NUR-MINIRENA-RNRA Task Force identification of required extension of results of previous and on-going ISAR-RAB-ICRAF research. ToT; Manuals; mass media; FFS	Review completed and drafts of manuals presented	Manuals, mass media and FFS disseminated to 25% of farm population	Manuals, mass media and FFS disseminated to 100% of farm population
1.3	Develop an indicator, and associated baseline, for the monitoring of soil erosion (tonnes/ha/yr), including the emplacement of necessary structures for monitoring. Train local level staff and farmers on associated monitoring and reporting.	MINIRENA-RNRA	RNRA MINAGRI RAB Districts	RNRA IWRMP design in consultation with MINAGRI; monitoring input to a wider indicator on soil erosion (that includes aspects such as mining	Indicator formulated for trial	Piloting completed and results adopted	Adopted indicator under national implementation

			and roads). Training by RNRA & RAB to local level staff responsible for monitoring.			on, including in Imihigo	
1.4	Complement soil erosion monitoring analyses with reference to changes in key water quality parameters (to be monitored by RNRA) (e.g. TDS, TSS, turbidity).	RNRA	MINAGRI RAB Districts	RNRA IWRMP design to provide more rigorous analysis for reporting on soil conservation effectiveness.	Indicators formulated for trial	Piloting completed and results adopted	Adopted indicators under national implementation
Result 2: On-farm water retention capacities are enhanced							
2.1	Promote purpose-based agroforestry as part of SPTA3	MINAGRI RAB Districts	MINIRENA CICA	This involved participatory methods for identification of agro-forestry purpose, crops and varieties	Dev. specific agro-forestry + progressive terracing recommendations for all land units by RAB	Publish recommendations (CICA): 1000 manuals for each land unit	Reprint according to need
2.2	Train extensionist workers and farmers on purpose-based agro-forestry		MINIRENA				
2.3	Indicators on agroforestry effectiveness incorporated into SPTA3: e.g. ha arable land under agroforestry; or linear km at defined density/interval for each land unit. Indicator to be coordinated with MINIRENA/RNRA	MINAGRI	MINIRENA	Including piloting and training on application. Coordinated w/ MINIRENA	Indicators piloted	Indicator for each land unit adopted	Indicator applied
Result 3: Water conservation at a watershed level is optimised							
3.1	Water-use efficiency in irrigation is incorporated as principle in SPTA3	MINAGRI	MINIRENA RAB	RAB with experiences from RSSP	Develop efficiency criteria (RAB)	Water use/abstraction monitored - all irrigation development	Idem
3.2	Indicator developed for water use efficiency in irrigation, incorporated into SPTA3 and Imihigo	MINAGRI	MINIRENA RNRA	E.g. Mm ³ /ha/yr or Mm ³ /t/yr	Indicator piloted	Indicator adopted	Indicator applied

3.3	Completion of water balance study	MINIRENA	RNRA			Study results published	
3.4	Allocation of water rights (based on water balance study) instituted in new agricultural developments then extended to all hydrological systems/units.	MINIRENA	RNRA	Taking into account also climate change			Allocations committed

6 Technical issue 2: Soil acidity and nutrient management

6.1 Introduction

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) (NISR, 2009). 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.

Through its nationwide cadre of contracted private service providers, and through RAB, MINAGRI's SPTA2 actively promotes and subsidises fertiliser use as to some 50% in CIP staple crops; the fertiliser 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 MINAGRI 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.

A number of producers and exporters to the EU and other markets in the coffee, tea and fresh horticultural produce sectors are bound to comply with numerous safe management practices under the GlobalGap standard and other standards and practices including HACCP (focusing on contamination prevention through hazard analysis and critical control points), imposed by importing nations which include a regime for keeping use of fertilisers, and so their residues, within safe limits. The regimes in place for these export sub-sectors are illustrative of the potential scope of the subject matter of this Chapter, which focuses on staple crops.

6.2 Policy and regulatory framework

Key national policies are the Rwanda Vision 2020 and the EDPRS in which the transformation of agriculture is a key pillar for development, with the current focus on increase of productivity. The respective M&E systems give evidence of a focus on intensification and increase in use of inorganic fertilisers and pesticides.

The most relevant sector policies to the subject matter of this issue are: the National Agriculture Policy; the National Fertiliser Strategy (NFS); National Environmental Policy; and the National Land Policy (2004). The Land Policy will be complemented by the National Land Use Plan (approved by Cabinet 2011, awaiting assent) and the associated intended District Land Use Plans (for integration in District Development Plans), which will be implemented with assistance from consultants in 2012. The NSCCLCD is also relevant, as fertilisers are the main source of GHG in Rwanda, and the strategy aims at optimising their use.

6.3 Institutional framework

The main institutions concerned with this issue are MINAGRI and its RAB¹ branches. Private service providers contracted by MINAGRI collaborate with RAB and District and Sector level Agronomists to support extension and implement fertiliser distribution².

6.4 Baseline

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 NFS 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:

- 40 % of farms to be using inorganic fertilisers by 2012 (EDPRS); 25% (from 12%) in SPTA2 SP 1.5.1, 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. Other targets set are 15 kg/ha/yr (by 2020) in Vision 2020.
- 25% of farms (from 7%) to be using organic fertilisers by 2012 (EDPRS); same in SPTA2 SP 1.5.2.
- SPTA2 SP 1.5.6 set a modest target of the No. of fertiliser demonstration plots increased to 12 by 2012 while SP 1.5.7 aimed for 15 on-going participatory analyses of soils and fertilization.
- Under SPTA2 SP 1.5.3 20% of farms were projected to be applying trace elements to the soil by 2012 however due to the reorganisation associated with creation of RAB this is not yet under implementation³.

Intensity of inorganic fertiliser use is the main ‘pressure’ measure of success (not only in SPTA2 but also at EDPRS and Vision 2020 levels); this undermines efficiency of resource use dimension, which is essential in terms of environmental sustainability and on minimising GHG emissions associated with fertilisers. Optimisation in use of fertilisers is also required for correct mainstreaming of the NSCCLCD.

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); there may be exceptions in (self-formulating) horticultural export and estate tea and coffee sectors.

Good regional and local experimentation in fertility management was done by the IFDC/CATALIST partnership with MINAGRI but the results and recommendations have not been thoroughly analysed and so have not been effectively communicated; the respective documentation has not been disseminated.

Soil nutrient research continues through the new 2011-14 RAB-AGRA (successor) pilot Fertiliser Recommendations Project, which includes un-mechanised trials on 24 AFSIS tracked plots for identification of limiting elements for each soil type/land unit. This is compliant with the requirements of Annex 17 of MINECOFIN’s Budget Call Circular (BCC).

Linkage of One-Cow programme to organic manuring and cultivation of nitrogen-fixing legumes has been recognised by MINAGRI and is a cornerstone of the organic manuring SP of SPTA2, although advice received suggests that manure may only yield 1.8kg of exchangeable N/t of material while in vegetable-only compost the exchangeable N content may be one quarter of this amount.

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; electronic auctions are organized every six months. A total of 14 private companies are involved in fertilizer distribution, 436 licensed fertilizers outlets are operational and 835 agro dealers have been trained in fertilizer management⁴.

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

Linkages with the National Fertiliser Strategy

In the case of **liming**, soil acidity amelioration strategies are applied systematically by assisted projects such as RSSP and LWH but this is not reflected in the normal scheme of implementation of NFS (2007)⁵ where there is focus on major nutrients without sufficient focus on lime, although both are given emphasis in the Strategy.

Travertine limestone is quarried in several locations in Rwanda and crushed stone can (based on analysis) be applied on acidic lands at the rate of some 5 to 7 t/ha⁶. This lime ‘dressing’ has the desired buffering effect on soil nutrient retention for up to 3 years or up to 6 crops. Even with composting of forest gleanings with farm manure and vegetative wastes, it may be unlikely that most farmers on low pH soils will ever achieve the organic matter balance that their soils require; liming may therefore become a permanently required practice that has an average material requirement of 1 t of stone/ha/crop and a material cost of about RWF35,000/ha/crop⁷. Effort of carrying limestone (its utilisation is some nine times the weight of N:P:K fertilisers) may be a limiting/inhibiting factor and is an important determinant of importance of penetration of rural feeder roads. *In the Eastern Sector of the country especially rural feeder road penetration may have very high linkage to the effectiveness of acidity correction.*

In the case of **inorganic** fertilisers, the 50% subsidised (assessed, voucher-based) 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.*”

In this regard the intent of NFS is explicit. Its activity 3.1 is to “revise fertiliser recommendations through a participatory approach”⁸. It would also appear that to accelerate effectiveness of fertility formulations under CIP, there remains plenty of scope to truly activate the spirit of SPTA2 SP2.3 for Research for transforming agriculture⁹.

6.5 Trends

The current mode of CIP implementation suggests that there will continue to be insufficient attention afforded to correcting soil acidity in the naturally acidic soils that cover over one half of Rwanda.

Use of inorganic fertilisers is expected to keep increasing, in conformity with CIP and set targets, posing an increased risk of environmental pollution if not accompanied by measures aimed at guaranteeing correct application.

In the context of contributing to climate change mitigation (i.e. reduction of GHG emissions), the NSCCLCD emphasises the rational use of fertilisers. When integrated into the agriculture sector strategy (SPTA3), these measures (which are fully in line with recommendations made in this SEA report) will help reduce the application of fertilisers, through the rationalisation of their use.

Promotion of organic composting and soil mulching will continue.

RAB fertility and yield research on trial plots will continue at its present small, dispersed scale and there may be some retrieval by RAB of relevant past fertility research results and their dissemination within RAB to its extension arm.

In order to respond to the relevant statements in its recent internal evaluation (as were reproduced in the first draft of this report), MINAGRI can be expected to consult with farming communities more closely in determining the optimum utilization of soil resources; there may be some reversion to traditional cropping patterns.

Formulation of IWRMP of RNRA can be expected to incorporate design of a comprehensive system of water quality monitoring in all major water bodies and enable checks on whether there is any fertiliser-caused chemical contamination; this system would also pick up contamination (unlikely) from farm livestock sources.

6.6 SWOT analysis

A SWOT analysis is presented below, synthesising the strengths, weaknesses, opportunities and threats that are taken into account for the formulation of an approach to this issue.

Table 3 SWOT analysis for Soil Acidity and Nutrient Management

<p style="text-align: center;">Strengths</p> <ul style="list-style-type: none"> • Fertiliser use supports national crop intensification • Application of NFS has achieved some spectacular yield improvements • Fertiliser recommendations may be fully effective in non-acidic soils • Organic manuring and associated composting are well promoted by the extension community • ‘One-cow’ programme contributes to nutrient recycling in the manuring scheme 	<p style="text-align: center;">Weaknesses</p> <ul style="list-style-type: none"> • Resources for soil fertility research remain limited • Lack of accurate nutrient deficit determination for respective land units and crops means soil may not be used optimally • Plant yield potential may be inhibited by mineralisation of (excess) fertiliser • In acidic soils NPK utilisation may be inhibited by lack of acidity correction
<p style="text-align: center;">Opportunities</p> <ul style="list-style-type: none"> • NSCCLCD emphasises fertiliser application based on nutrient needs assessment • Intensification of RAB research into plant nutrition and soil nutrient corrections, with associated input-output economic analysis. • Lime formulation to suit land systems • Fertiliser measures appropriate to soil types and crops • Extension of rural feeder roads to facilitate delivery of limestone and fertilisers 	<p style="text-align: center;">Threats</p> <ul style="list-style-type: none"> • Continuation of poor yield performance • Abandonment of unproductive arable terraces and reversion to pasture/bush • CIP discourages inter-cropping, which has potential to reduce N needs • State Extension system promotes conventional farming (instead of farming based on indigenous knowledge and indigenous risk management)

6.7 Synthesis, proposed specific objectives and required results

From field consultations and further analysis it has been concluded that production and use of organic compost, and associated recycling of livestock manure, is already generally well promoted by MINAGRI and its partners and the benefits of composting and soil mulching are well understood by a majority of farming communities. The focus of this issue is therefore on inorganic measures for correcting soil deficiencies in such a way that environmental risks are minimised and land use optimised.

The proposed Specific Objective to address this key issue is: *Measures for soil acidity correction and nutrient management for staple crops are economically optimised for all major land units*

The following Results are proposed to achieve the Specific Objective:

Result 1: Economic soil acidity correction measures determined for all major land units

Result 2: Economic inorganic fertiliser application rates and frequencies for staple crops determined for all major land units

Result 3: Kinyarwanda manuals for regional fertiliser recommendations (from Results 1 & 2) distributed to extension workers and farmers

Result 4: CIP and other extension by RAB and contracted private service providers comply fully with Results 1 and 2

Result 5: IWRMP of RNRA incorporates regular monitoring of groundwater and water bodies for fertiliser leachate/contamination

6.8 Activities proposed, responsible institutions and means

	Responsible Institution	Supporting institutions	Means	Proposed Objectively Verifiable Indicators and their timelines			
				12/2012	12/2013	12/2014	
Result 1: Economic soil acidity correction measures determined for all major land units							
1.1	Analyse previous research results for acidity correction	RAB	NUR	RAB soil/plant nutrient research team	Completed / published		
1.2	Trials for acidity correction undertaken in all major land units where research and formulation has not been completed	RAB	NUR; AGRA; contracted research body	RAB scientists + fieldpersons; contracted research organisation	Progress report	Progress report	Publish recommendations (major land units)
Result 2: Economic inorganic fertiliser application rates and frequencies for staple crops determined for all major land units							
2.1	Previous research results for soil nutrient management of staple crops analysed	RAB	NUR	RAB soil/plant nutrient research team	Completed / published		
2.2	Trials for nutrient management undertaken for staple crops in major land units where research and formulation has not been completed	RAB	NUR; AGRA; contracted research body	RAB scientists and fieldpersons; contracted research organisation	Progress report	Progress report	Publish recommendations (major land units)
2.3	Define indicator on fertiliser application based on nutrient needs assessment (e.g. in terms of quantity fertilisers applied based nutrient needs assessment)	MINAGRI	RAB	See recommendations for EDPRS2 in Section C. Indicator to be integrated into EDPRS2 and SPTA2.	Indicator defined	Indicator piloted	Indicator adopted
Result 3: English, French and Kinyarwanda manuals for regional fertiliser recommendations (from Results 1 & 2) distributed to extension workers and farmers							
3.1	Publish manual on economic soil acidity correction and nutrient management (all land units)	RAB	CICA	CICA with funding of printing and distribution costs (20,000 copies)	-	-	Publication and distribution
Result 4: CIP and other extension by RAB and contracted private service providers comply fully with Results 1 and 2							
4.1	Extension workers incl. ToT and FFS trainers inducted into and tested for knowledge provided	RAB	Recipient organisations	RAB	-	-	Y1:100 trained/certificated
4.2	Verification of effectiveness of soil nutrient management extension	NUR	-	NUR survey team	-	-	Y1: 1,000 farmers
Result 5: IWRMP of RNRA incorporates regular monitoring of groundwater and water bodies for fertiliser leachate/ contamination							
5.1	IWRMP of RNRA incorporates regular monitoring of groundwater and water bodies for fertiliser leachate/contamination (i.e. as for pesticides)	RNRA with possible support from NUR	Districts	RNRA with support of District Environmental Officers for sample collection	none	30% boreholes, main rivers, lakes, reservoirs, annually	All boreholes and main rivers, lakes, reservoirs, annually

7 Technical issue 3: Crop and variety selection

7.1 Introduction

A key element of the CIP is the determination of priority crops and varieties to be grown in each area, under mono-cropping. Crop and variety selection is of high importance, not only in terms of economic value of the crops, but also in terms of food security, adaptation to climate variability and climate change and protection of agro-biodiversity. For example, in terms of adaptation to climate variability and climate change, it is common to plant different varieties of the same crop, whilst access to the gene pool of agro-biodiversity can be of high importance for adaptation to climatic shocks.

This issue is aligned closely with SPTA2 SP1.2 for integrated development and intensification of crops and livestock. The strategies embrace increases in production and exports of coffee, tea, horticulture, pyrethrum, etc. and consolidation of single-crop cropping including staples rice, maize, climbing beans, wheat, soya, Irish potato, sweet potato and cassava; sorghum mostly is not targeted by CIP.

MINAGRI reports that cultivated lands include 870,000ha of annual crops. 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 embraced by GoR commitment to MDG No 1 to avert hunger.

Correct crop selection and associated husbandry, including soil conservation, nutrient management and pest risk analysis and mitigation measures, are necessary foundations for optimized production, which collectively extension workers define as Integrated Crop Management (ICM). They also require the integration of climate change adaptation considerations, as well as examination of trends of change in farming systems and the impact of commodity-oriented production.

7.2 Policy and regulatory framework

Key national policies are Vision 2020 and the EDPRS in which the transformation of agriculture is a key pillar for development, with the current focus on increase of productivity. The respective M&E systems give evidence of a focus on increasing the output of staple crops and the measurement of the quantities of subsidized inputs applied.

The most relevant sector policies to the subject matter of this issue are: the National Agriculture Policy; the National Fertiliser Strategy; the National Environmental Policy; and the National Land Policy. The Land Policy will be complemented by the National Land Use Plan (approved by Cabinet 2011, awaiting assent) and the associated intended District Land Use Plans (for integration in District Development Plans). In terms of climate change, the NSCCLCD is the key reference policy document¹; in terms of protection of agro-biodiversity the National Biodiversity Strategy and Action Plan is also relevant².

7.3 Institutional framework

With the focus of analysis falling mainly on the staple crops sector, key institutions concerned with this issue are MINAGRI, RAB and MINECOFIN, which supports planning processes and provides funding for supported inputs supply. Private service providers contracted by MINAGRI collaborate with RAB and District and Sector level agronomists to support extension and implement seed and fertiliser distribution³. From a climate change adaptation and protection of agro-biodiversity point of view, key institutions are REMA and MINIRENA.

7.4 Baseline

Performance indicators relevant to the environment-agriculture inter-linkages are set at different levels and in different sectoral strategies; SPTA2 SP1.2 for integrated development and intensification of crops and livestock is particularly relevant⁴.

Through its nationwide cadre of contracted private service providers, and through RAB, SPTA2 actively promotes and subsidises as to 100% the supply of staple crop seeds under CIP, matched (see Issue T4) by subsidy of required fertilisers as to 50%⁵. Two matching voucher systems support the respective

distribution programmes; preliminary enquiries by the consultant team could not detect a structured link between the voucher programme and meteorological insurance that is offered to farmers in some Districts under a Banque Populaire scheme linked to District-based Meteorological Monitoring Stations of the Rwanda Meteorological Service although this could be a natural future arrangement to underwrite the programme.

RAB continues to operate a limited number of its own on-farm trials for a number of crops and varieties to determine optimum returns from inputs, including fertilisers, in defined land systems. These trials are few and dispersed; it additionally has a trial programme on 24 plots with AGRA.

Crop and variety choice can be a limiting factor in yield optimization, and so in staple food supply, especially in zones where there may be frequent vulnerability to climate variability, notably drought. In the East maize regularly has to confront such a regular risk while traditional landraces of sorghum have been noted to be relatively resilient to such conditions⁶.

In some regions cultivation of traditional crops and their 'landrace' varieties, which often cope well with scarcity of soil nutrients, are not promoted by MINAGRI whose policy is to increase participation of farmers in the market economy with production that is suitable for intra-regional trade and for the national food security reserve. For the purposes of staple crop yield maximization, MINAGRI has also discouraged inter-cropping although the maize-and-climbing bean combination is a longstanding tradition. Discouragement of inter-cropping with legumes in many field situations can reduce options to minimise fertiliser use (nitrogen fixation) and may also exclude associated benefits that can keep pest levels below economic thresholds⁷.

Mono-cropping, often with a narrowly limited range of improved varieties, poses a risk to agro-biodiversity. Access to agro-biodiversity gene pool can prove very important for adaptation to climatic (and other) shocks, and its protection is also a remit of MINIRENA under the obligations of the CDM. Unfortunately there is no comprehensive data yet compiled and available on agro-biodiversity resources in the country, on which to form a basis for planning in this area; nevertheless incipient work is starting to develop through the establishment of a gene bank in South RAB Zone. The implementation of the agro-biodiversity protection components established in the National Biodiversity Strategy and Action Plan has not received due attention although it has received some Parliamentary discussion. The Plan includes the following strategies: 'improved performance of native varieties and species', the 'promotion of sustainable traditional production species', the 'prevention of introduction of intrusive species, control and eradication of non-native species likely to threaten ecosystems and native species' and the 'development of mechanisms for checking the importation and dissemination of genetic material capable of having harmful effects on biodiversity, particularly on agro-biodiversity'. Also relevant are the objectives aimed at managing the risks of biotechnology, as they can be directly related to improved seeds.

Some interviewed workers in the research and extension system consider genuine participatory concertation with farmers in crop planning and varietal selection, including mixed cropping options, could optimise returns to effort and investment. Moreover, in Eastern Province especially some farmers who have been disappointed by crop failure or poor returns under CIP (especially in the lowlands) are only showing lip service to CIP advice of extensionists of the contracted Private Service Providers and returning part of their farms to traditional cropping including sorghum and climbing bean-maize combinations as aired in fieldwork discussions in Kirehe in October 2011 and witnessed on 03/12/2011 during the consultant team's last day's field programme organised by RAB; also photographed by the consultant team.

The credibility of CIP in some localities, notably in Eastern Province, may thus be under serious scrutiny by farmers who have decades of experience in spreading the cropping options and their associated risks. As advocated at several junctures in the study programme, more science and associated economic analysis should be promoted to provide the foundation of crop and variety selection and nutrient and IPM management for defined land systems, and to demonstrate that the utilisation of scarce soil resources have been optimised, including resilience to climate change. It would also appear that to enhance crop and variety selection under CIP, there remains plenty of scope to truly activate the spirit of SPTA2 SP2.3

for research for transforming agriculture⁸. Lately, in its EDPRS self-assessment, MINAGRI has considered that its CIP “*targeting was perhaps too output-based in the PSTA II implementation. Additionally, social impact did not have as a large relevance as economic growth priorities.*”

7.5 Trends

Utilisation of farm soils in many localities for CIP purposes may remain suboptimal due to possible suboptimal compatibility of the chosen variety with its environment and lack of optimum acidity and nutrient management.

Sections of the farming community may find cause to question CIP and revert to traditional cropping if crop yields are not kept at acceptable levels. It would not be unreasonable to expect such an attitude to take root when farmers are generally required to plant indicated crops and varieties (being a condition of access to subsidized inputs), rather than the farmer being able to make an informed choice in consultation with his/her extensionist or Contracted Service Provider on his/her best strategy. Without application of all critical inputs, crop yield increases may not reach 50% above 2007 yields cited in SPTA 2; maybe much less without proper acidity amelioration and fertility guidance.

The crop/meteorological insurance programme may continue to expand, albeit slowly, increasing the degree of adaptation to climate resilience and climate change. However, the expected decrease in the agro-biodiversity gene pool will reduce opportunities for climate change adaptation, just as will the increased reliance on single crop and variety.

Vulnerability to pests and diseases associated with mono-varietal planting may increase. Also the discouragement of inter-cropping will inhibit development of sustainable options for minimisation of fertiliser use (nitrogen fixation), + pest and disease management.

Most of the opportunity to apply the spirit of SPTA2 Sub-programme 2.3 for ‘Research for transforming agriculture’ will have been foregone.

7.6 SWOT analysis

A SWOT analysis is presented below, synthesising the strengths, weaknesses, opportunities and threats that are taken into account for the formulation of an approach to this issue.

Table 4 SWOT analysis for Crop and variety selection

<p style="text-align: center;">Strengths</p> <ul style="list-style-type: none"> • CIP meets GoR output targets for scheduled staple crops • CIP reaps some economies of scale • National Biodiversity Strategy and Action Plan provides an agreed basis for the protection of agro-biodiversity 	<p style="text-align: center;">Weaknesses</p> <ul style="list-style-type: none"> • Crop choice under CIP may not be financially and economically optimised; thereby limiting output potential of the scarce soil resource. • CIP lacks genuine participatory concertation with farmers in crop planning and varietal selection • Protection of agro-biodiversity is weak, and there is limited baseline information • Unwillingness to fully apply the spirit of SPTA2 Sub-programme 2.3 for ‘Research for transforming agriculture’ (for budget reasons?)
<p style="text-align: center;">Opportunities</p> <ul style="list-style-type: none"> • Experience with FFS as potential to ‘empower’ farmers to make informed decisions on crop/variety selection and farming techniques, including consideration of adaptation to climate variability and climate change • Economically objective determination of soil yield potential for a range of staple crops based upon 	<p style="text-align: center;">Threats</p> <ul style="list-style-type: none"> • Utilisation of farm soils in many localities will remain suboptimal, due mainly to still limited coverage of soil acidity correction. • Farming community may come to question CIP if crop yields reach a low level without proper acidity amelioration and fertility guidance, especially in drought-prone areas where maize is being

<p>soil nutrient/fertility intelligence</p> <ul style="list-style-type: none"> • Selection of crops/varieties that are productive, less vulnerable to climatic hazards and resilient to pest and disease threats. • Fully activate SPTA2 Sub-programme 2.3 for ‘Research for transforming agriculture’ • Recently adopted NSCCLCD sets framework for better integration of climate change into CIP 	<p>promoted</p> <ul style="list-style-type: none"> • Crop/meteorological insurance programme will not cover vulnerable farmers; they may continue to incur heavy periodic losses • Vulnerability to pests and diseases may increase due to, <i>inter alia</i>, selection of single varieties and/or reduced inter-cropping. • Rigid application of CIP will inhibit development of sustainable options for the minimisation of fertiliser use (nitrogen fixation), + pest and disease management • Mono-cropping will continue to pose a risk to agro-biodiversity with possible vulnerability to climatic (and other) shocks
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7.7 Synthesis, proposed specific objectives and required results

The proposed Specific Objective to address this key issue is: *Crop selection by farmers is based on current intelligence for environmental compatibility, financial feasibility and risk.*

The following Results are proposed to achieve the Specific Objective:

Result 1: Cropping decisions of farmers are based on relevant and comprehensive information

Result 2: CIP is promoted in Districts where it is underwritten by crop/ meteorological insurance

7.8 Activities proposed, responsible institutions and means

	Responsible Institution	Supporting institutions	Means	Proposed Objectively Verifiable Indicators and their timelines			
				12/2012	12/2013	12/2014	
Result 1: Cropping decisions of farmers are based on relevant and comprehensive information							
1.1	Environmental compatibility of crops and their varieties for defined land units is determined on the basis of experience and guidelines written	RAB	-	RAB internal resources	-	National guidelines for 6 staple crops	National guidelines for all crops
1.2	Patterns of crop-weather interactions for defined land units and risk of meteorological variation and its crop effects are determined on the basis of experience and guidelines written	RAB	RMS; MINAGRI Meteorological Division	Internal resources of partners	-	National guidelines for 6 staple crops	National guidelines for all crops
1.3	Kinyarwanda manuals of crop/variety environmental compatibility and meteorological risk for all defined land units published and released	CICA	RAB	CICA	-	-	20,000 copies
1.4	Farmers are trained on crop/variety selection, including consideration of climate variability/change adaptation, so they may make informed choices	RAB Districts	AGRA	RAB internal resources			
Result 2: Crop/meteorological insurance is expanded to all Districts where CIP is promoted							
2.1	Expansion of meteorological recording stations network	RMS	MINAGRI Meteorological Division	On-going programme of RMS	8 Districts	20 Districts	All Districts
2.2	Adoption (within SPTA3) of NSCCLCD indicator on ‘% coverage of early warning system’	MINAGRI	RMS	MINAGRI-RMS-MINIRENA Task Force	Indicator adopted		
2.3	Meteorological insurance gets underwritten in CIP areas	MINAGRI Meteorological Division	Banque Populaire and other Banks	Meteorological insurance underwritten in CIP targeted areas	8 CIP serviced Districts covered by meteorological insurance-	20 CIP serviced districts covered by meteorological insurance	30 CIP serviced Districts covered by meteorological insurance
2.3	Meteorological insurance extended to all	MINAGRI	Banque	Expansion of Banque Populaire	Aggregate	Aggregate	Aggregate

farmers who can meet insurance terms and conditions	Meteorological Division	Populaire and other Banks	insurance insurance agency network	RWF value of insurance cover taken in adoption by CIP in insurance-serviced Districts	Value of insurance coverage is 300% of 2012 baseline	Value of insurance coverage is 1000% of 2012 baseline
2.4 Adoption of an indicator for the degree of uptake of weather insurance for CIP farmers (e.g. % farming HH under CIP with weather insurance)	MINAGRI			Indicator agreed	Indicator applied	100% of participating farmers

8 Technical issue 4: Pest and disease management

8.1 Introduction

This issue is aligned closely with SPTA2 SP1.5 for ‘supply and use of agricultural inputs’ and SP2.2 for ‘restructuring proximity services to producers through the medium of cooperatives, enhanced extension and Farmer Field Schools (FFS)’. Moreover the NSCCLCD brings additional considerations where recommendations for MINAGRI include the Action 4 for Mainstreaming of “Push-Pull” Strategies (IPM) which embody sustainable pest management techniques incorporating a multiple cropping and fodder system designed to control plant parasites and pathogens such as stemborers and striga weed¹.

Pest and disease (P&D) management encompasses all aspects of crop and livestock protection, and protection of their stored products from damage or loss due to P&D invasion. In its respective laws and regulations, the GoR has chosen to ascribe to the word ‘pesticide’ the meaning of a product used for any of the foregoing purposes². This report follows the same convention, but focuses principally on staple crop protection³.

The exploration of this issue coincides with current initiatives of MINAGRI and RAB that aim for determining the economic utilization of pesticides in staple crops, and the development of safe trading, storage, handling and application systems that optimize the safety of users and minimize harmful impacts on the general environment (e.g. associated to run-off of fertilisers into the water systems)⁴.

8.2 Policy and regulatory framework

The NCCLDCS Programme 1 (Sustainable Intensification of Agriculture) includes an action for prioritising the mainstreaming of IPM. This embodies sustainable pest management techniques incorporating a cropping system based on risk diversification by producing multiple crop and fodder yields and which necessarily, through crop and enterprise diversity and pest monitoring vigilance by the farmer, is also designed to keep incidence of plant parasites and pathogens below economic threshold levels without the need of pesticides.

Rwanda is a signatory of the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides. The National Implementation Plan of the Stockholm Convention on Persistent Organic Pollutants (POPs), 2006, provides the expression of Rwanda’s willingness to bring national corrective measures, and particularly elimination of storage and use of POPs, within the framework of Vision 2020. Pursuant to Organic Law n° 04/ 2005, Prime Minister’s Order N°26/03 (2008) determined the prohibited list of chemicals and other prohibited pollutants. Complementing this ban, the draft Organic Law of Agro-chemicals is now awaiting assent. It will encompass provisions for the manufacture, distribution, use, storage and disposal of agrochemicals including pesticides and fertilizers for the protection of public health and the environment, false practices in the supply of agrochemicals, injury avoidance during the application and use of agrochemicals, prevention of contamination of food with agrochemicals, protection of the agricultural community from deception and other related matters. It provides scope for designating use of personal protective equipment/clothing and establishment of Maximum Residue Limits (MRL) of chemicals in goods entering trade. It will need to be matched by an implementation and monitoring framework built around the scheduled responsibilities of the Registrar; such framework should preferably not be managed by MINAGRI (the implementation body) but by REMA..

8.3 Institutional framework

MINAGRI is responsible for mainstreaming IPM as already featured in SPTA2 SP2.2, but the responsibility and its urgency are now reinforced by the overarching demands of NSCCLCD. Within MINAGRI the Inspection and Certification Directorate in charge of plant health matters.

The Ministry responsible for monitoring impacts of chemical use is MINIRENA which delegates the tasks to REMA; RNRA is tasked to monitor chemical and turbidity water quality in water bodies.

Rwanda Bureau of Standards (RBS) also plays a role through providing chemical analytical services. At a pilot level NUR is also providing these services to World Bank funded projects.

Under Article 3 of the draft Agrochemicals Law, MINAGRI is charged with putting in place an Advisory Council to implement the Agrochemicals Law and also draft bylaws for agrochemicals registration and regulation. The draft Law provides for creation of the critical post of “Registrar of Agrochemicals who is the secretary of the Council”; this person will also be supported by a team of Inspectors fielded by MINAGRI. A (technical) committee will also be set up by the Council/Commission to advise the Registrar on any matter pertaining to pesticide registration and control. No agro-chemical may enter trade unless it has been registered and a certificate has been issued. Moreover the Law will provide for labelling and packaging in accordance with regulations made under the Law.

Under MINICOM, RBS is already an active player in supporting certification of food safety in manufacturing processes through its Environmental Analytical Chemistry Division and provides certification of chemical safety of crops and products exported by NAEB; it also has equivalent microbiological analytical capacity. By virtue of its chemical expertise it evidently has a role to play in the Advisory Council/Commission, possibly too in implementation until such time as a new laboratory has been set up by the Council to perform in this field. RBS has developed (2010-11) *Guidelines for quality and/or environmental management systems auditing* (suitable for use in the agrochemicals supply chain) and a *National Standard for General Requirements for the Competence of testing and calibration laboratories*, based on the ISO Standard ISO 17025.

The President’s Office through RDB plays a leading role in the ‘one-stop’ environmental screening and certification of planned agro-industrial activity. This includes post-harvest processes and storage (which can include fumigation), as coordinated with MINICOM and MINAGRI’s Post Harvest Handling and Storage Task Force. The Presidency is therefore an important institutional stakeholder in assuring post-harvest product safety/freedom from contamination.

8.4 Baseline

Biosecurity and Phytosanitary Capacity of Rwanda was assessed in 2007 (WTO-MSU) when GAP and HACCP approaches to management of Sanitary and Phytosanitary risks in the food chain were recommended; since that time Rwanda has not availed the EU-ACP Programme Initiatives Pesticides advisor facility that has been extensively used by Kenya Plant Health Inspectorate Service (KEPHIS). The Inspection and Certification Directorate of MINAGRI, which already has a collaborative relationship with KEPHIS, should follow up on this. Rwanda is a signatory member of the International Plant Protection Council (IPPC; focal point MINAGRI) (and OIE) and is accordingly committed to biosecurity and pest and disease risk analysis/monitoring. IPPC is an advocate of IPM.

National performance indicators relevant to agro-chemical usage are set at different levels and in different sectoral strategies. They are found in Vision 2020; EDPRS; the CPAF; and SPTA2. SPTA2 SP1.5.4 measures ‘% of farms using pesticides’ as a positive (but unquantified) input Indicator (which in EDPRS is quantified as 45% by 2012) without output or efficiency indicator; the same applies in SPTA 2 SP1.5.1 for fertilizer use. For the year ended June 2011 MINAGRI distributed 48,430 litres of pesticide (Pyral) applied in coffee plantations against a target of 40,000 litres (MINAGRI internal annual review). MINAGRI has recognised that such indicators are in conflict with both its NSCCLCD-designated Action 1 for Mainstreaming of Agroecology (which demands mainstreaming of agroecology in agricultural intensification) and Action 4 for IPM. As in the case of fertilisers such indicators need to be replaced by crop response/benefit indicators that justify their use and track the quantities that had to be used when IPM approaches failed.

Consultations in the field have revealed that the list of permitted and prohibited chemicals is not widely propagated.

Chemicals are labelled with instructions in French and/or English; many operators read only Kinyarwanda, although this issue is covered under the draft law on agrochemicals. There are numerous aspects of P&D chemical management that are not compliant with requirements of MINECOFIN BCC Annex 17. Among these are risks (to operators, physical environment and consumers) not well known,

including heavy metals; pesticides dressed on produce immediately before harvest; and harmful interactions with beekeeping.

RBS (it attends to Mycotoxin detection and analysis in export products) suggested that pesticides require the same level of awareness raising media attention as fertilisers. Pesticides are more demanding in management/safety thresholds and need regulatory rigour as for pharmaceuticals: licencing of traders and technical training of sales staff. There is a question of whether training on pesticide management could match the intensive levels of training offered by MINAGRI and its partners in 2010-11 on fertilisers which was reported as follows: *30 Agro dealers, 895 retailers, 252 service providers technicians trained in fertilizer business and voucher system.*

At the national level there is no established system of Maximum Residue Limits for crop protection chemical in food and animal feed. There are two (RBS; NUR) laboratories of ISO 17025 Standard capable of residue detection and analysis but only the RBS facility is normally used for such purposes. SPTA 2 SP4.1.2 identifies the (KEPHIS-style?) plan for the Autonomous Rwanda Agricultural Sanitary and Phytosanitary Service (protocols for P&D monitoring and management) but the plan needs to be championed by the newly established Directorate of Certification and Inspectorate Services in MINAGRI. When duly certified proficient by RBS, this service could play a leading role in providing laboratory analytical services related to P&D management.

At the field operational level RAB Plant Protection/Pest & Disease R&D-Extension capacity is strongest mainly in N and S Zones where respective expertise is based; RAB plant pathologists and entomologists were trained in 2010 in P&D recognition and threshold limits (for treatment) by CABI International (Kenya); RAB Northern laboratory is well equipped (PCR; Elisa; microscopy) but requires a new work programme; also reagents.

IFDC was active in training farmers of INGABO syndicate in safe handling of agrochemicals (programme ended). However RAB Extension includes new establishment of eight Mobile Plant Clinics (at major agricultural markets) to assist farmer P&D recognition and farmer feedback; safe handling of chemicals could become part of the mobile training system.

Protocols for P&D control measures to address common P&D are being developed by RAB. The menu of options remains limited and much of RAB focus is on problem solving. The Farmer Field School (FFS) training module developed for Integrated Pest and Disease (P&D) Management (IPM) by MINAGRI-BTC is ready for wide replication in accordance with the aims of SPTA 2 SP1.5.5, *which seeks 40% uptake by 2012*, and with its specific requirement enumerated in MINECOFIN BCC Annex 17. But P&D risk analysis/field scouting for threshold infections is not yet institutionalised to Districts and Sectors. Several RAB research scientists and extension coordinators have advocated that the FFS programme take a broader approach, by including IPM in Integrated Crop Management (ICM), which covers all aspects of management of the farm environment⁵.

8.5 Trends

On current information from MINAGRI the Law on Agro-chemicals will shortly be enacted but the Autonomous Rwanda Agricultural Sanitary and Phytosanitary Service may remain a lower priority project unless actively pursued by newly established Directorate of certification and inspectorate services in MINAGRI. This possible hiatus could seriously retard the design and implementation of a system of Maximum Residue Limits for staple crop protection chemicals in food and animal feed; although much inspiration in this regard can be drawn from the beverage and horticultural export sub-sectors.

There is no reason to doubt that the list of permitted and prohibited chemicals will be propagated, especially by RAB. Full functionality of the agro-chemicals Advisory Council and its subsidiary organs will be required to address the challenges of a lack of registration of traders, of chemicals remaining unlabelled in Kinyarwanda and to generally achieve progress towards compliance with MINECOFIN BCC Annex 17. It should also be borne in mind that the Climate Change and International Obligations Unit (CCIOU) of REMA has responsibility to verify and ensure that Rwanda continues to comply with its international obligations on prohibited chemicals.

Rwanda remains vulnerable to cross-border transmission of plant and animal pests and diseases from neighbouring States but stakeholders did not consider this a major threat.

Indigenous pest and disease outbreaks will continue to occur and may accelerate and intensify under extensive mono-cropping, mono-varietal systems.

The FFS training module for IPM/ICM is unlikely to accelerate its operations to meet the SPTA2 target of 40% uptake by 2012 and may not become widely replicated unless additional resources are given. Moreover the associated practice of P&D risk analysis/field scouting for threshold infections may not be institutionalised to Districts and Sectors without additional resources being provided.

RAB Northern laboratory resources are likely to remain not fully utilized until such time as a definitive work programme and rehabilitation budget are adopted for them (not seen by the consultant team); expanded RAB Extension with Mobile Plant Clinics (at major agricultural markets) is taking place. Protocols for P&D control measures to address common P&D are being slowly developed by RAB but RAB P&D effort mostly remains focused on problem solving.

8.6 SWOT analysis

A SWOT analysis is presented below, synthesising the strengths, weaknesses, opportunities and threats associated to this technical issue.

Table 5 SWOT analysis for Pest and Disease Management

<p style="text-align: center;">Strengths</p> <ul style="list-style-type: none"> • IPM methods and associated FFS training approaches have been developed by MINAGRI and are ready for accelerated roll-out • Integrated Pest and Disease (P&D) Management (IPM) ready to be promoted within a broader ICM package embracing aspects including plant nutrition and optimisation of the farming system • The potential for an effective overarching regulatory and implementation framework for pesticides exists and will be enacted shortly • Very high awareness across all interest sectors (MINAGRI; MINIRENA and subsidiary agencies) and at RBS to risks of current unmonitored chemical distribution and handling systems • Recognition by observation that use of pesticides in horticulture – sometimes at high frequency - can transform returns to effort of farmers, especially farmers of upland potatoes 	<p style="text-align: center;">Weaknesses</p> <ul style="list-style-type: none"> • The current regulatory framework lacks operator licensing • Underutilisation of past national and regional project research results (e.g. CATALIST) • The environmental, consumer and user impacts of pesticides use at high frequency by some horticultural farmers have not been quantified • There is underutilisation of RAB research and laboratory resources • Environmental + economic options/thresholds for various pesticide use not yet determined • RAB research plots remain mostly localised and their results may only have local relevance
<p style="text-align: center;">Opportunities</p> <ul style="list-style-type: none"> • RAB focus transformed to risk assessment with support of Inspection and Certification Directorate • FFS training in IPM expanded within a broader ICM programme and adopted countrywide • P&D risk analysis/field scouting for threshold infections, and application of ‘roguing’/burning of infected plants, institutionalised in all Districts and Sectors • Training of all actors in safe handling and use • RAB Northern laboratory fully utilised 	<p style="text-align: center;">Threats</p> <ul style="list-style-type: none"> • Indicator on intensity of pesticide use not conducive to rational utilisation • Lack of detection of environmental contamination • Lack of quantification of contamination • Medium- and long-term effects upon human health: operators, water users, product consumers derived from pesticide use • Other development objectives taking priority • Lack of decision and/or resources for creation/designation of a suitable analytical

<ul style="list-style-type: none"> • RAB Extension Mobile Plant Clinics effectively assist farmer P&D recognition + farmer feedback • Protocols for economic P&D control measures to address common P&D developed by RAB • Appointment of informed technocrats to the panel of the Agrochemicals Advisory Council and establishment of an effective permanent Registration and Inspection capacity • The Inspection and Certification Directorate in charge of SPS will be in a position to play a central role • By its own admission (EDPRS self-assessment review/draft) “MINAGRI has learnt from weak linkages to specific ministries.... e.g. Ministry of Health, so that environmental concerns could be better coordinated and mainstreamed.”(uptake of pesticide residues by humans) • Activate planning for establishment of the Autonomous Rwanda Agricultural Sanitary and Phytosanitary Service 	<p>chemistry laboratory</p>
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8.7 Synthesis, proposed specific objectives and required results

The synthesis for this issue is built largely around the:

NSCCLCD requirement for Mainstreaming of IPM; belief that the nascent FFS Programme of RAB will be more widely applied; promise of the new Organic Law of Agro-chemicals taking effect; assumption that MINAGRI and RAB will be actively supported in their implementation by RBS and MOH (monitoring); and, anticipation of full water quality monitoring aspects of IWRMP of RNRA being effective.

The proposed Specific Objectives to address this key issue are:

SO1: Integrated crop management (ICM) extension methods are mainstreamed for farming systems optimisation

SO2: Necessary use of permitted agro-chemicals in integrated staple crop management is optimised for safety and efficiency in compliance with multi-lateral environmental agreements

The following Results are proposed to achieve the Specific Objectives:

SO1: Integrated crop management (ICM) extension methods are mainstreamed for farming systems optimisation

Result 1: IPM and Pest Risk Analysis (PRA) protocols and associated roguing practices developed for all major crops

Result 2: Kinyarwanda manuals for IPM and Pest Risk Analysis (PRA)/roguing of all major crops distributed to extension workers and farmers

Result 3: Farmer Field Schools (FFS) for ICM conducted

SO2: Necessary use of permitted agro-chemicals in integrated staple crop management is optimised for safety and efficiency in compliance with multi-lateral environmental agreements

Result 1: Regular publication of approved and banned agro-chemicals completed, based on international norms

Result 2: Authorised distributors periodically licenced and certified

Result 3: All agro-chemical products are plastic-tagged with Kinyarwanda instructions

Result 4: Efficacy and efficiency results of P&D trials in CIP staple and other crops documented

Result 5: Crop-specific protocols for farmer adoption of specific pesticides are released in Kinyarwanda

Result 6: P&D certification of public and private extension staff completed

Result 7: Verification that the production systems (i.e. distributors; on-farm practices) are chemically safe

Result 8: Pesticide leachate content of groundwater and water bodies reported

8.8 Activities proposed, responsible institutions and means

	Responsible Institution	Supporting institutions	Means	Proposed Objectively Verifiable Indicators and their timelines			
				12/2012	12/2013	12/2014	
SO1: Integrated crop management (ICM) extension methods are mainstreamed for farming systems optimisation							
Result 1: IPM and Pest Risk Analysis (PRA) protocols and associated roguing practices developed for all major crops							
1.1	Development of IPM/Pest Risk Analysis (PRA) protocols, field scouting frequencies and roguing practices completed for all major crops	RAB	BTC; External provider: KEP HIS Kenya &/or CABI	RAB exchange visits to Kenya; external consultant support in Rwanda	10 crops	All crops	-
Result 2: English, French and Kinyarwanda manuals for IPM and Pest Risk Analysis (PRA)/roguing of all major crops distributed to extension workers and farmers							
2.1	Manuals developed for IPM/PRA and associated practices of all major crops	RAB	-	RAB P&D research and extension teams	10 manuals	20 manuals	All manuals
2.2	Manuals published: 20,000 copies	RAB	CICA	CICA with funding of printing and distribution costs	-	-	Publication + distribution
Result 3: Farmer Field Schools (FFS) for ICM conducted							
3.1	FFS training programmes incorporate modules and Kinyarwanda extension materials for: IPM/PRA and associated practices of all major crops; Soil and Water Conservation (see TI1); Acidity and Nutrient Management (see TI2); Crop and Variety Selection (see TI3); crop-specific protocols for use of specific pesticides (see SO2)	RAB	Private service providers; District Agronomists	RAB extension teams supported by Private service providers and District Agronomists	100/year (pilots)	500/year (pre-testing)	3,000/year
SO2: Necessary use of permitted agro-chemicals in integrated staple crop management is optimised for safety and efficiency in compliance with multi-lateral environmental agreements							
Result 1: Regular publication of approved and banned agro-chemicals completed, based on international norms							
1.1	Review conducted and lists published in the Official Gazette	MINAGRI	RBS	Registrar of agro-chemicals and team	Annual lists published	Annual lists published	Annual lists published
Result 2: Authorised distributors periodically licenced and certified							
2.1	Environmental screening of distributors, personnel, premises and handling systems conducted and approved list published in the Official Gazette	MINAGRI	RBS	Registrar and MINAGRI Inspectors with powers of inspection and enforcement	none	Biennial list published	None

Result 3: All agro-chemical products are plastic-tagged with Kinyarwanda instructions							
3.1	Review of manufacturers' instructions suitability for local conditions and translation	MINAGRI	RBS	Registrar of agro-chemicals and team, according to manufacturers' published recommendations (as adapted to local conditions from Result 4).	Progress report only	All products	All products
3.2	Setting of specifications of plastic tags	RBS	-	RBS materials division	Completed	-	-
3.3	Purchase and printing and use of plastic tags by national dealers	Dealers to RBS specs.	-	Inspection: RBS materials division	10 products	30 products	All products
Result 4: Efficacy and efficiency results of P&D trials in CIP staple and other crops documented							
4.1	Results of previous work (CATALIST, etc) documented – including associated residue analysis in food and feed products, soil and water	RAB	-	RAB P&D research team	20 recommendations documented	All recommendations documented	-
4.2	Results of new research on trial P&D measures in CIP staple and other crops documented – including associated residue analysis in food and feed products, soil and water	RAB	-	RAB P&D research team	none	5 trial results documented	15 trial results documented
4.3	Methods of residue analysis in products, soil and water appraised for rigour	RBS	RNRA	RBS and RNRA analytical chemists	none	As above	As above
Result 5: Crop-specific protocols/manuals for farmer adoption of specific pesticides are released in Kinyarwanda							
5.1	Manuals developed for safe dosages, frequency, handling systems, disposal; economic application measures, equipping/protective clothing; pre-harvest intervals; risks.	RAB	-	RAB P&D research and extension teams	10 manuals	20 manuals	All manuals
5.2	Manuals published and released	CICA	RAB	CICA		10 manuals X 10,000 copies	20 manuals X 10,000 copies
Result 6: P&D certification of public and private extension staff completed							
6.1	Training (ToT) of public and private (service provider) extension staff (Sector and District) completed	RAB	-	RAB extension teams	30/year	200/year	200/year (refresher)
6.2	Respective (pesticide use) certification of public and private (service provider) completed	RAB	RBS	RBS individual test verification of knowledge acquired RAB HQ		200/year	200/year

Result 7: Verification that the production systems are chemically safe							
7.1	Spot checking, detection and quantification of residues throughout the food chain	RAB	RBS	RAB extension teams supported by RBS laboratory analysis	50/year	100/year	150/year
7.2	Spot checking, detection and quantification of residues in user blood samples	MOH	-	Sub-District Health Centres and MOH Central Analytical Laboratory &/or RBS	150/year	150/year	150/year
Result 8: Pesticide leachate/content of groundwater and water bodies reported							
8.1	IWRMP of RNRA incorporates regular monitoring of groundwater and water bodies for pesticide leachate/ contamination	RNRA	RBS with possible support from NUR Districts	RNRA with support of District Environmental Officers for sample collection; RBS	none	30% boreholes + major rivers, lakes and reservoirs, annually	All boreholes and major rivers, lakes and reservoirs, annually

9 Technical issue 5: Rural feeder roads

9.1 Introduction

Initially the principal determinant of this Issue being presented was compliance with the ToR related to assessing and providing results-oriented recommendations on:

- the likely significant effects on the environment to be taken into account in the formulation of the Rural Feeder Roads (RFR) SPSP to be supported by the EU;
- the degree to which the planned SPSP would address the major environmental sustainability challenges;
- how potential negative environmental effects could be minimized and positive effects might be optimized;
- the regulatory framework, and
- the adequacy of institutional structures and capacities.

This paper accordingly examines the draft proposals of the RFR SPSP Formulation Team which is due to submit its final recommendations in January 2012. It is based on the documentation offered by the Formulation Team¹ and on the SEA team's further investigations of information and analysis related to the subject matter. In this way steps have been taken towards satisfying the basic requirement set forth in the EU Identification Fiche for RFR SPSP, i.e. *Environmental risks will be covered by the Strategic Environmental Assessment to be undertaken, which shall identify specific risks and ensure appropriate mitigation measures...* Importantly too, *when it comes to options for harmonisation with other donor interventions, the EU intends to initiate and coordinate a joint monitoring, to be carried out with GoR and the other Development Partners active in the domain of rural roads (currently Netherlands, USAID and WB) of the implementation of this SPSP and other programmes in place; with the aim of a performance assessment under an integrated approach (possibly implying a Memorandum of Understanding specific for this domain)*. There is therefore the possibility that other RFR Development Partners will wish to consider adoption of the same environmental monitoring framework as applied by the EU.

At the overall sector level the SEA has revealed that this Issue influences the effectiveness of several environmentally beneficial activities suggested to address other technical (T) issues. RFR are vital conduits for efficient delivery of farm inputs including limestone and inorganic fertilisers (T2) and seeds (T3), and enhance farming community consolidation of production and provide access to markets². They can facilitate the efficiency of time use by extension services (S4; T4) by monitoring/inspection bodies (S1; S3; S4 & T2; T3; T4) and by community work parties engaged in regular environmental improvement activities such as in *Umuganda* initiatives for land and water conservation (T1).

It has been concluded therefore that in relation to implementation of other issues identified, this report would be incomplete without drawing attention to the important role that the RFR sub-sector can play in optimising resource use and contributing to acceleration of the desired improvements and positive outcomes projected in the Strategic Logframes for the other issues.

9.2 Policy and regulatory framework

Key national policies are Vision 2020, SPTA2 and the EDPRS in which the transformation of agriculture is a key pillar for development, with the current focus on increase of productivity. The National Decentralisation Policy delegates to Districts a number of responsibilities in this sector; these include procurement for District roads. Other relevant policies and strategies include the National Post Harvest Staple Crop Strategy (PHSCS), which advocates improvement of the RFR network. The National Transport Policy (2008) integrated RFR into the overall Policy and advocated a global budget of RWF2 bn (some 2.5M€) for RFR annually from 2009 up to 2012-13. The draft National Road Law (version September 2011) Article 28 heeds the need to manage natural water run-off with great care and Article 30 draws attention to the need for 45% maximum slope to (rocky) embankments but generally does not address RFR.

Other policies which support the implementation processes are: the Community Development Policy; National Gender Policy; Environmental Impact Assessment Guidelines; and National Labour-Intensive Public Works (HIMO) Strategy. Policies and regulations are more fully reflected in the RFR Formulation documentation.

The NSCCLCD observes that the terrain and climate of Rwanda are characterised by hills and intense bursts of precipitation. Under its Programme 9, Action 3 ‘Investment in Infrastructure’ it draws attention to the quality of transport infrastructure not only affecting the efficiency of the transport system, but also its resilience to climatic impacts, i.e. improved infrastructure, such as road surface, both increases **efficiency** and improves **resilience** to climatic events.

9.3 Institutional framework

Among the main institutions concerned with this issue is MINAGRI as the owner of the PHSCS Policy. Progress of the planning of this programme is regularly monitored in the AJSR; MINAGRI also participates in the Transport Sector Working Group. RTDA shall support the organisation of the Programme Steering Committee (PSC) and plans to send representation through its (currently small: 4 officers) District Support Unit (DSU) to support Programme Monitoring and guide the District agricultural officers in identification and implementation of feeder roads. The full institutional matrix is examined and analysed in detail in the RFR SPSP formulation documentation. This needs to include REMA for all environmental regulatory and monitoring issues and which should also sit in the RFR SPSP Steering Committee³.

Effectiveness of REMA is addressed under Issue S3. For the purposes of RFR it can be demonstrated that, when fully applied by REMA and its cell within RDB, EIA and associated mitigation measures in the RFR feasibility and design stage, and implementation of the developer’s associated EMP for monitoring and maintenance, can be effective to assure minimum negative environmental impacts.

At local government level the Ngororero District has established the precedent of devoting recurrent budget resources to the creation of the new post (2011) of Infrastructure and Land Officer in all Sectors, due to the identification of the inability of Sector Agronomists to effectively cope with their Agro-environment responsibilities alongside the multiple tasks inherent to settlement of land adjudication/ titling questions and to civil works of both buildings and rural roads; the conflict of technical loyalties of Agronomists in other Sectors is discussed under Issue S4.

9.4 Baseline

The RFR network extends to some 29,000km (as per USAID note). A World Bank 2010 Rwanda Infrastructure Assessment Report stated that all RFR were in poor condition and in need of repair and/or upgrading. In the context of SPTA2 and the PHSCS, improved road quality can directly lead to reduced vehicle wear and tear and lower transport costs. The target under PHSCS 5-year Action Plan (March, 2011) is of no less than some 80km of feeder roads improved per year. Under SPTA2 (SP3.5.7 for Market-oriented rural infrastructure) there is a target of 1,000km of rural access roads to priority production areas created by 2012.

The main example of rural feeder road design and implementation is the longstanding partnership between HelpAge and The Netherlands. This is discussed in the RFR SPSP Formulation documentation.

The RFR formulation documents explain how for the first phase of SPSP, EU assistance will target seven Districts⁴, whilst Netherlands (5; on-going), USAID (8 to 12; started), IFAD (1; on-going) and World Bank (2; new) will support RFR in the other (20) rural Districts. With a strong in-house engineering team in Kigali, the EU explicitly expressed the wish to coordinate the donors’ system of monitoring of implementation; this would necessarily include environmental monitoring.

Poor RFR design and implementation can have harmful environmental impacts, especially in hilly terrain of the type encountered in EU target Districts, Ngororero (all), Northern Rulindo and Western Muhanga where typically high rainfall (>1,200 mm/yr) on steeply sloping land pre-disposes the natural environment to high run-off, floods, risk of significant soil erosion and sedimentation downstream, undermining productivity of lowland farming lands and disturbing the ecology of wetlands. In Ngoma and Bugesera in the East (two other EU target districts) the potential for negative environmental impacts attributable to rainfall (<1,100 mm/yr) and speed of run-off is much lower.

The RFR SPSP preliminary Formulation proposals have been reviewed by the SEA team and provisional recommendations have been offered. Existence of environmentally compliant standards and specifications could

be pre-requisites to one or several SPSP disbursements in the corresponding Financing Agreement.

As previously asserted, prevailing weather patterns affect integrity of the feeder roads network through intense rainfall events and flooding, which may be exacerbated by climate change. Rwanda has not yet adopted standards for the construction of feeder roads. MININFRA and RTDA are expected to establish climate-proofed specifications for RFR as a by-product of the implementation of the USAID project (linked especially to PHSCS opportunities) in the sector.

The consideration of environmental maintenance along the length of paved roads by the National Roads Strategy includes routine maintenance on a continuous basis, including tasks of grass cutting and vegetation control. This is not accompanied by a statement for vegetation maintenance or improvement, although there is physical evidence along numerous public highways that embankment vegetation is promoted and planted. But, this unregulated situation does not provide a satisfactory basis for roadside environmental management and monitoring on feeder roads.

Currently the principal instrument for ensuring that environmental safeguards are integrated into road construction and maintenance is the EIA system, but it has been largely ineffective (in terms of EMP implementation and enforcement). This can be rectified by measures described under issue S3.

9.5 Trends

It is likely that the RFR standards and specifications adopted by MININFRA, and RTDA in particular, will be based on the experience gained in initial implementation of the USAID-supported programme in 8 to 12 Districts.

The arrival of not only the EU but also other development partners to support RFR suggests that - with the requisite increase of Sector absorption capacity (infrastructure planning and coordination) - SPTA2 target for 1,000km of rural access roads to priority production areas may be surpassed over the next four years even if the 2012 target may not be met on time.

The means of deciding on prioritization of RFR rehabilitation have yet to be worked out; for the time being it will depend heavily on existing District Development Plans – but the current plans will lapse in 2012 when new DDPs will be written and offer utilization of a new matrix of criteria as the foundation for decisions on RFR development⁵.

Under issue T2, this report identifies the importance of rural roads for the supply and delivery of vital fertility management inputs, especially limestone which is a much bulkier material than inorganic fertilisers yet of similar density. In acidic soil zones, roughly one tonne of limestone is needed to match 0.1t of fertilizer therefore, in terms of handling complexity and physical effort, proximal delivery of this material to farms is more critical than fertiliser delivery.

The implementation strategy advocated by the SPSP Formulation encompasses the following general considerations: (i) priority would be given to full rehabilitation and spot improvement of existing feeder roads, without extension of carriageway width beyond 4m, instead of new construction; (ii) favouring labour-based methods (LBM) including opportunities for female participation and female management; additionally combining use of labour and light machinery - wherever technically and economically feasible; (iii) rehabilitated and improved feeder roads to reach the standard of all-weather road; (iv) attention given to capacity building of specialised contractors using LBM - both through refresher technical training for existing ones and training of new contractors (v) rehabilitation works subject to agreements reached with District councils and concerned ward/communities with regards to the selection, organization and oversight; (vi) provision made to finance regular mechanized maintenance works (spot improvement) 2-3 years after rehabilitation works are completed.

The strategy is to be accompanied by proposals for technical assistance over a period of 3.5 years to assist implementation. This will include deployment of project officers in all supported Districts to fulfil the new post of District Feeder Roads Engineer who may, upon appraisal before the project closes, be adopted into the regular District establishment.

9.6 SWOT analysis

This analysis takes two forms. It identifies further provisions that require to be incorporated in RFR SPSP documentation to satisfy environmental requirements and then presents a table of the general context of SPTA2 implementation and relevance to other Key Issues.⁶

The general SWOT analysis in the broader context of SPTA2 implementation and relevance to other identified Key Issues is presented below, synthesising the strengths, weaknesses, opportunities and threats that should be taken into account especially by MINAGRI for RFR development and maintenance.

Table 6 SWOT Analysis of Rural Feeder Roads (RFR)

<p style="text-align: center;">Strengths</p> <ul style="list-style-type: none"> • The Sector level Agronomist and IDP at cell level offer some planning and implementation support to RFR development in their areas of work • Umuganda offers an effective system of RFR regular maintenance in some Districts and/or Sectors • TIG has contributed significantly to road rehabilitation and maintenance 	<p style="text-align: center;">Weaknesses</p> <ul style="list-style-type: none"> • No adopted standards for RFR construction (including environmental standards for vegetative protection of verges, water courses, embankments and cuttings) inhibit planning and budgeting for RFR development • Large ranges of topography, soil structure and rainfall patterns across Rwanda lead to complexities in determining suitable standards and specifications for specific locations; one size will not fit all • Low capacity at sector and cell levels (for RFR implementation, maintenance and monitoring); an additional staff member in charge of land and infrastructure is required (and release the agronomist for the breadth of duties related to ICM - see T4) • Lack of prioritisation of District funding for RFR maintenance, moreover diminishing TIG resources require to be succeeded by sustainable budgeted maintenance systems • Lack of analysis to reveal the true economic costs of inefficiencies attributable to RFR deterioration and neglect
<p style="text-align: center;">Opportunities</p> <ul style="list-style-type: none"> • New DDPs to be prepared in 2012 and offer a new matrix of criteria as the foundation for decisions on RFR development • Development of CIP increases commercial utilisation of RFR and strengthens the economic case for their rehabilitation • Supervising engineers and contractors to incorporate environmental standards into their codes of practice and management systems • Road design standards can be reinforced to cope with increased rainfall/surface water surges • Staffing establishment at Sector level to be expanded to cope with the surge of donor support to the RFR sector – possibly through budget earmarking; this staff can harness learning by doing in partnership with the Technical Assistance offered • Robust all-weather roads enable maximised 	<p style="text-align: center;">Threats</p> <ul style="list-style-type: none"> • Climate change expected to affect integrity of rural roads network • EMPs are not adequately implemented • Delays in RFR rehabilitation have knock-on effects on sub-optimal use of farm and extension resources: input supply and fertility management; mobility and time efficiency of extension workers; ability of RAB/extension to access trouble spots of pests and diseases

<p>economies of transport of farm outputs and inputs and minimised time lost to travel by extension services</p> <ul style="list-style-type: none">• Experience of HelpAge and other RFR developers can inform optimisation of road design and budgeting (as explained in the RFR SPSP formulation documents)• Experience in nearby countries can shed light on best approaches to RFR design and mitigation of harmful environmental impacts	
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9.7 Synthesis, proposed specific objectives and required results

The synthesis for this Issue assumes that all recommendations offered for environmental integration into RFR SPSP Formulation for EU support (see Endnote 6) will be: (a) incorporated into the respective SPSP planning and conditionality matrix; (b) matched by necessary commitments and implementation of the full EIA/EMP system advocated under the Strategic Logframe for Issue S3; and (c) not be materially undermined by deviant approaches to RFR rehabilitation and maintenance support by other Development Partners active in the sector.

The synthesis otherwise concentrates on the aspects of the issue identified in the Baseline, Trends and especially the SWOT analysis that still require to be addressed.

The proposed Specific Objective to address this key issue is: *Durable rural feeder road development and maintenance sustain integrated practices that optimise land utilisation*

The following Results are proposed to achieve the Specific Objective:

Result 1: Region-specific climate-proofed feeder road standards and specifications adopted in conformity with good environmental and engineering practice

Result 2: Human resources (HR) at Sector level strengthened to avert dilution of agro-environmental HR and improve dedicated absorption capacity for donor support to RFR

Result 3: The basis of feeder road development prioritisation includes integrated land husbandry criteria as well as market-related criteria

9.8 Activities proposed, responsible institutions and means

	Responsible Institution	Supporting institutions	Means	Proposed Objectively Verifiable Indicators and their timelines			
				12/2012	12/2013	12/2014	
Result 1: Region-specific climate-proofed feeder road standards and specifications adopted in conformity with good environmental and engineering practice							
1.1	Lessons/experience from RFR design and climate-proofing/durability within the different geo-climatic environments of Rwanda and from elsewhere (Ethiopia, etc.) are analysed and documented, incl. measures for vegetative protection	RTDA	Consultants/Technical Assistance (TA)	RTDA internal resources	Complete report submitted	-	-
1.2	Manual of RFR good environmental and engineering practice developed and published	RTDA	MININFRA	RTDA internal resources with budget earmarking	-	Manual published (incl online)	
1.3	District Engineers and Environment Officers, Contractors and Supervising Engineers trained in RFR good environmental practices	RTDA	Consultants/TA; RNRA	RTDA internal resources with budget earmarking and support from RNRA		5 Districts (pilot)	All Districts
Result 2: Human resources (HR) at Sector level strengthened to avert dilution of agro-environmental HR and improve dedicated absorption capacity for donor support to RFR							
2.1	Job description written for new post of Infrastructure and Land Officer based on experience in Ngororero	RTDA	RNRA (land) Ngororero District	RTDA internal resources	Completed		
2.2	416 Sector Infrastructure and Land Officers recruited and trained in RFR good environmental practices	Districts	RNRA (land) Consultants/TA; RNRA (environment)	Districts and RTDA internal resources with budget earmarking and support from RNRA	-	100 recruited and trained	Balance (316) recruited and trained
Result 3: The basis of feeder road development prioritisation includes integrated land husbandry criteria as well as market-related criteria							
3.1	Guidelines to District Development Committees (or relevant equivalent committee as established under the new Local Government Law) for criteria and their scoring are developed with an ICM orientation to support feeder roads prioritisation	MINAGRI	RTDA	MINECOFIN - MINAGRI – RTDA – REMA – RNRA - MINIRENA Task Force	Completed	Adopted by all DDCs; 25% applied	100% applied

10 Systemic issue 1: Monitoring and evaluation

10.1 Introduction

M&E systems are established to track the extent to which desired objectives and their results are achieved, and to report the timing and effectiveness of implementing associated activities, and the amounts and effectiveness of implementation. Based on results the need for corrective actions can be identified. For this reason it is important that indicators provide an objective indication of progress for key variables of concern. MINAGRI is working on the development of its internal M&E system in conformity with CAADP.

However for M&E to be effective it is also necessary that reporting mechanisms ensure effective communication of results across all interested levels and institutions and that the different M&E systems addressing environmental aspects of agriculture are harmonised. This is where the M&E system for the agriculture system requires strengthening. Aspects related to specific indicators are addressed under the relevant technical issues; this section focuses on the set-up and management of the M&E system itself.

10.2 Policy and regulatory framework

The main M&E frameworks with agro-environmental content are derived from policy and strategy documents. At national level these are Vision 2020 and EDPRS, whereas at the sector level these are SPTA2 and ENRSSP. More recently indicators from the NSCCLCD have been defined and are also relevant due to their implications for the agriculture sector.

10.3 Institutional framework

The main institutions for responsibilities in the agriculture M&E system are: MINAGRI as Chair of the ASWG and monitoring of overall progress in the agriculture sector; local Governments, responsible for monitoring at the local level and reporting to MINALOC. MINIRENA is Chair of the ENR SWG and thus responsible for monitoring and reporting on progress in the ENR sector, which includes some agriculture-related indicators.

10.4 Baseline

Performance indicators relevant to the environment-agriculture inter-linkages are set at different levels and in different sectoral strategies. We can find these in: Vision 2020; EDPRS; the CPAF; SPTA2; the ENRSSP; the MTEF and Imihigo/Performance Contracts.

Environmental authorities (e.g. MINIRENA) have established environmental indicators relevant to the agriculture sector and, through existing mechanisms for inter-institutional coordination (such as the SWGs and the IDP), they try to ensure that these objectives and indicators are up-taken at the sectoral level (MINAGRI). Also MINIRENA has contributed environmental mainstreaming objectives for the agriculture sector, and which now form part of the BCC guidelines for the preparation of budgets. Local authorities also include environment-agriculture indicators as part of their PCs. A synthesis of the main environmental-agriculture indicators is provided in Annex A2b.

The most elaborate environment-agriculture indicators are found in the SPTA2 log-frame (some of which are reflected in the EDPRS and CPAF). The ASWG produces two reports per year, which are considered to be the key monitoring of performance in the sector. In a similar fashion, the ENR SWG produces two reports per year reporting on progress in the ENR sector, with special emphasis on EDPRS and CPAF indicators.

Although stated indicators under the various policy and strategy documents address most key variables of interest¹, many of these indicators are not being applied and key focus is on CPAF and AJSR indicators and which are mainly concerned with soil erosion control, use of fertilisers, area of marshland developed and intensity of extensionist services. Also, in spite of various M&E frameworks addressing similar issues, the corresponding indicators are not always consistent, with smaller or larger variations in their

formulation. This situation leads to potential confusion, especially as mechanisms for data collection and treatment are usually not specified (except for some CPAF indicators).

Local governments play a key part in M&E, as they are in charge of implementation of agriculture activities and their monitoring. The M&E reporting flows are as follows:

- Districts, Sectors and Cells have established Performance Contracts (under Imihigo); performance at District level being directly reported to the President’s Office.
- Districts report monitoring results to MINALOC, in the form of District Imihigo/Performance Reports.
- MINAGRI prepares Annual Sector Performance Reports for MINECOFIN and the sector’s stakeholders giving special emphasis on the progress achieved towards EDPRS/CPAF indicators.
- MINIRENA, through the ENR SWG reports to MINECOFIN, especially on CPAF indicators.

As far as Performance Contracts are concerned, Districts are to choose indicators from those offered by line ministries; however in practice many select indicators which are not in the list, and thus not closely linked to earmarked spending allocations². This adds to the harmonisation gap.

There is no integrated system that collates the performance on SPTA2, and there are significant gaps in monitoring SPTA2 implementation³. SPTA2 includes a large list of indicators, but with no reference as to how these will be monitored and reported. There is interest in establishing a Management Information System (MIS) in MINAGRI, but this is yet to be implemented⁴.

The reporting mechanisms and platforms do not favour effectiveness; without a common platform for the different institutions, these cannot have easy access to what others are reporting. For example, monitoring information generated at local level for MINALOC and MINECOFIN use is not easily accessible to MINAGRI; there is no formal read-access link of technical and financial reporting from local level to MINAGRI, nor access of MINAGRI to databases of other Ministries. Also at the local level, reporting is often done based on hand-written reports due to lack of access to computers and/or Internet connections.

10.5 Trends

The M&E system is expected to improve with respect to some individual indicators, which are already receiving attention, and which are referred to in the corresponding sections on technical issues. Otherwise no short-term changes are expected in monitoring system for SPTA2 nor for reporting mechanisms and platforms.

10.6 SWOT analysis

A SWOT analysis is presented below, synthesising the strengths, weaknesses, opportunities and threats associated to this systemic issue.

Table 7 SWOT analysis for the M&E system

Strengths	Weaknesses
<ul style="list-style-type: none"> • Good coordination in the framework of the ASWG and the⁵ ENR SWG • Overall good consistency between key M&E frameworks for key variables (Vision 2020 – EDPRS – SPTA2 – ENRSP – Imihigo) • Regular production of AJSR and ENR JSR reports • Annual National Dialogue chaired by His Excellency the President 	<ul style="list-style-type: none"> • Absence of a definition of mechanisms for monitoring and reporting of SPTA2 indicators • Limited access by MINAGRI to technical and financial monitoring data at the local level gathered by other Ministries • Need for MINAGRI to perform physical ground-truthing/spot checks for ‘ear-marked’ implementation at District level • Limited capacities for monitoring at the local level (dedicated personnel)

	<ul style="list-style-type: none"> • Lack of common ICT platform • District and sector level limited access to paperless communication, computers and Internet
<p style="text-align: center;">Opportunities</p> <ul style="list-style-type: none"> • Awareness of weaknesses and limitations of M&E system by MINAGRI and on-going commitment (CAADP framework) to enhance the system • Increased donor funds to the agriculture sector can allow improvement of M&E system (e.g. the development of a functional MIS) • Rwanda Environmental Information Network (REIN) (REMA-coordinated) can help inter-institutional coordination (central level) • Up-coming preparation of SPTA3 will allow to improve sector M&E system • Integration of MINAGRI budget earmarking expenditure tracking into MINECOFIN-Districts ICT platform • SBS 'value for money' reporting requirements of donors can be addressed in EDPRS2 and SPTA3 • Village-Cell-Sector-District performance contracts offer a structure for improved monitoring (technical and financial) 	<p style="text-align: center;">Threats</p> <ul style="list-style-type: none"> • Harmonisation of indicators difficult to take up to the Vision 2020 level, as no revision of the document foreseen • Variations in the definition of indicators in different M&E systems (lack of harmonisation)

10.7 Synthesis, proposed specific objectives and required results

The shortcomings of the M&E system are basically centred around: access to monitoring data by all concerned institutions; reporting mechanisms to ensure broad access to results; capacities for monitoring at the local level especially; absence of a proper M&E system for SPTA2, including monitoring and reporting mechanisms; and incomplete harmonisation of indicators across the main M&E systems.

Addressing these aspects will require solutions of a technological nature (e.g. purchase of sampling/analytical equipment); of a strategic planning nature (e.g. defining a proper M&E system for SPTA3); of capacity-building; and, very importantly, a very good inter-institutional coordination as relevant indicators are under responsibility of different authorities and levels of government (e.g. monitoring of water quality is under responsibility of RNRA, but is necessary in order to understand impacts from fertiliser and pesticide use, as well as to corroborate effectiveness of soil erosion control measures).

NB: aspects on specific indicators are addressed under the corresponding Technical Issues.

The proposed Specific Objective to address this key issue is: *the different M&E (including regular and periodical reporting and communication of data) frameworks relevant to the environmental aspects of agriculture are harmonised and accessible across relevant sectors and levels of government such that their combined effectiveness as a control and planning tool is maximised.*

The following Results are proposed to achieve the Specific Objective:

Result 1: the M&E system is effectively integrated across sectors and levels of the administration.

Result 2: performance of agriculture sector strategies are regularly and effectively monitored.

10.8 Activities proposed, responsible institutions and means

	Responsible Institution	Supporting institutions	Means	Proposed Objectively Verifiable Indicators and their timelines			
				12/2012	12/2013	12/2014	
Result 1: M&E system is effectively integrated across sectors and levels of the administration							
1.1	All environmental indicators relevant to the agriculture sector are harmonised across the different M&E systems	MINAGRI (leading)	MINIRENA, MININFRA, NISR	Revision of all relevant indicators in EDPRS, SPTA2, ENRSSP, NSCLCD to ensure corresponding indicators are formulated in exactly the same manner. Alignment to existing NISR indicators to be considered.	Detailed review of indicators completed	Agreement on harmonised list of indicators	Official adoption of agreed indicators in respective M&E frameworks
1.2	All environmental indicators relevant to the agriculture sector have an associated methodology for their application (Metadata)	MINAGRI (leading)	MINIRENA, MININFRA, NISR	Careful consideration of methodologies to make best use of accessible and cost-effective data, but which provide objective and relevant indication of performance.	Review of methodologies associated to relevant indicators	Completed metadata doc, incl. dev. of methodologies	GOR adoption of Metadata document (official NISR document)
1.3	Indicators used for reporting of advance in achievement of Performance Contracts are aligned to the harmonised indicators	MINALOC	MINAGRI		Review of PC indicators being used and degree of alignment	Agreement on use of harmonised indicators in PCs (by District authorities)	Effective integration of aligned indicators in PCs
1.4	A harmonised reporting framework for all M&E systems is established, where data are readily accessible to all relevant institutions	MINECOFIN	MINAGRI, MINIRENA, MININFRA	Requires setting up MIS. To guarantee accessibility to local government's, provide computers, Internet, training.	Analysis of options for setting up MIS	Acquire MIS platform; set-up system	MIS in use by all key actors†
Result 2: Performance of agriculture sector strategies are regularly and effectively monitored							

† These include: MINAGRI, MINALOC, MINECOFIN, MINIRENA, RAB, RNRA, District Authorities and Sector Authorities.

2.1	SPTA3 integrates a detailed M&E framework for follow-up of its logical framework indicators, including measurement methodologies, periodicity of monitoring and reporting	MINAGRI	RAB Districts	Framework should address recommendations made in Chapman (2011). It will most certainly require gathering of data from local governments.	Integrate M&E framework as part of SPTA3	Adopt M&E framework as integral part of SPTA3	Implementation of M&E framework
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11 Systemic issue 2: Climate variability and climate change

11.1 Introduction

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 adaptation.

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.

11.2 Policy and regulatory framework

Rwanda has ratified the UNFCCC as well as its Kyoto Protocol. In the context of the UNFCCC it has prepared its National Adaptation Programme of Action (NAPA) and two National Communications. The NAPA defines priority areas for adaptation.

Recently (October, 2011) it has approved its National Strategy for Climate Change and Low Carbon Development (NSCCLCD), which defines 14 Programmes of Action, two for which the agriculture sectors is to take the leading role for implementation (Programmes of Action 1 on 'sustainable intensification of agriculture' and 2 on 'agricultural diversity for local and export markets'), and 9 for which the agriculture sector takes a secondary role¹.

11.3 Institutional framework

Responsibilities for climate change related issues are shared amongst different institutions. REMA has created the Climate Change and International Obligations Unit (CCIOU), which also acts as Designated National Authority (DNA) for carbon market activities. The Rwanda Meteorological Service (RMS), recently been designated as an autonomous agency, is responsible for collection of meteorological data and weather forecasting. In terms of disaster management, there is a Disaster Management Unit (DMU) under the Ministry of Disaster Preparedness and Refugee Affairs, which carries out disaster risk assessment studies in the sensitive parts of the country.

11.4 Baseline

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 (UNEP, 2011). 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 (UNEP, 2011). 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) (Byamukama *et al*, 2011).

The impacts and economic costs of current climate variability and events are already significant, and likely to increase with climate change (SEI, 2009).

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 (Byamukama *et al*, 2011).

Climatological observations indicate, however, that climate change is very likely happening in Rwanda² (UNEP, 2011). Expected outcomes of climate change in Rwanda include increased rainfall³ (up to 20% by the 2050s and 30% by the 2080s), increases in mean annual temperature (up to 3.25°C for the region by 2100) (Byamukama *et al*, 2011) prolonged periods without rain and an extension of the dry season (UNEP, 2011).

The effects of climate variability and climate change are especially felt in the agriculture sector, which is highly vulnerable. Changes in rainfall intensity and patterns, 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.

11.5 Trends

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 NSCCLCD. 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 forecasting⁴, as well as the further development of an Early Warning System (EWS) (being developed with UNEP/UNDP). 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.

Strategies in the agriculture and ENR sectors promote activities that are convergent with climate change adaptation efforts, contributing to reducing the adaptation gap. To give but a handful of examples, SPTA2 promotes expansion of irrigated agriculture, rainwater harvesting, increased land productivity, soil erosion control; ENRSP promotes afforestation; etc. Nevertheless the degree of integration of climate change into sectoral policies remains weak, as evidenced by a recent review undertaken commissioned by DFID (Dyszynski *et al*, 2011).

There are concerns that the CIP, as currently being promoted, conveys a risk of reducing opportunities for adaptation, linked to flexibility in crop and variety selection as well as to impacts on agro-biodiversity (see Technical Issue 3).

11.6 SWOT analysis

A SWOT analysis is presented below, synthesising the strengths, weaknesses, opportunities and threats associated to this systemic issue.

Table 8 SWOT analysis for climate variability and climate change

Strengths	Weaknesses
<ul style="list-style-type: none"> • Institutional structures are in place for climate change management and inter-institutional 	<ul style="list-style-type: none"> • As to date very limited network of meteorological stations (necessary for climate variability and

<p>coordination</p> <ul style="list-style-type: none"> • The NSCCLCD is a solid strategy that is the basis for triggering some adaptation efforts • The NAPA has defined priority actions for climate change adaptation • SPTA2 strategies are largely convergent with climate change adaptation 	<p>climate change forecasting)</p> <ul style="list-style-type: none"> • Lack of adequate down-scaled model for climate change predictions for Rwanda, linked largely to unavailability of basic data • Lack of modelling of crop yields and water availability under different climate change scenarios • High vulnerability to extreme climatic events, especially floods and droughts • High dependence on rain-fed agriculture • Many rural feeder roads highly vulnerable to intense rainfall and floods • Limited coverage of insurance against weather-related crop failure
<p style="text-align: center;">Opportunities</p> <ul style="list-style-type: none"> • High level of awareness at high levels of decision-making on importance of climate change adaptation, including willingness to mainstream climate change into SPTA3 and EDPRS2 • Work in progress to improve the infrastructure capacity for RMS • Work in progress to establish an EWS; FEWS⁵ already operative at a regional/national level • Donor interest to address climate change adaptation in Rwanda (e.g. DFID, UN) • FONERWA (National Climate and Environment Fund of Rwanda) being established with broader mandate which also covers climate change • Commitment to mainstream the NSCCLCD into Vision 2020, EDPRS 2, sector policies and strategies, as well as into sub-national arrangements • Various international climate change funds available for the agriculture sector in Rwanda • Various opportunities to attract private investment 	<p style="text-align: center;">Threats</p> <ul style="list-style-type: none"> • International climate funding will not be sufficient to finance the NSCCLCD, which will need to draw from domestic sources of revenue and leverage capital for low carbon and adaptation activities • Crop selection strategy under CIP may undermine the flexibility needed for crop selection by farmers, and the development of farmers' capacities to make informed decisions • Promotion of inorganic fertilisers are the main source of GHG in Rwanda and a key element of CIP. • Discouragement of inter-cropping reduces options for minimisation of fertiliser use (nitrogen fixation) • Mono-cropping, often with improved seeds, poses risk to agro-biodiversity, which can be important for adaptation to climatic (and other) shocks • Population growth exacerbates pressure on resources vulnerable to climate change (e.g. land)

11.7 Synthesis, proposed specific objectives and required results

The challenges of climate variability and climate change are already on the policy agenda and they start to be addressed. These are especially relevant to the agriculture sector, due to its high vulnerability. Some of the challenges on the right track to be addressed include the critical re-construction of the network of meteorological stations. Other aspects are integral elements of some of the Technical Issues covered in this SEA, and are thus addressed in the corresponding sections; such is the case of aspects having to do with optimal use of fertilisers, climate proofing of roads, and integration of climate change considerations into CIP crop and variety selection.

Recommendations are focused on aspects of research, mainstreaming into SPTA3, water use efficiency, EWS, agro-biodiversity and awareness raising.

The proposed Specific Objective to address this key issue is: *the agriculture sector strengthens its climate resilience capacities.*

The following Results are proposed to achieve the Specific Objective:

Result 1: climate change is mainstreamed into SPTA3.

Result 2: vulnerability to climate variability and climate change in the agriculture sector is reduced.

11.8 Activities proposed, responsible institutions and means

	Responsible Institution	Supporting institutions	Means	Proposed Objectively Verifiable Indicators and their timelines			
				12/2012	12/2013	12/2014	
Result 1: Climate change is mainstreamed into SPTA3							
1.1	SPTA3 process explicitly addresses integration of NSCCLCD Programme 1 on ‘sustainable intensification of agriculture’, especially with regards to implications to the CIP, and Programme 2 on ‘agricultural diversity in local and export markets’	MINAGRI	MINIRENA	MINAGRI-MINIRENA-REMA Task Force	Result 1: Climate change is mainstreamed into SPTA3 Relevant	Approved SPTA3 provides strategies + means to achieve NSCCLCD	-
1.2	SPTA3 component on RFR addresses NSCCLCD Programme 9 on “efficient resilient transport systems” with regards to climate-proofing on roads	MINAGRI	MININFRA		NSCCLCD objectives+ indicators reflected in SPTA3		
Result 2: Vulnerability to climate variability and climate change in the agriculture sector is reduced							
2.1	Early Warning System is upgraded	RMS	MINAGRI MINIRENA	Support from FEWS experience	Road map for EWS upgrading	Upgraded EWS piloted	EWS fully functional
2.2	Agriculture sector climate change vulnerability assessment is carried out, to inform aspects of crop and variety selection	MINAGRI RAB	MININFRA MINIRENA	Including modelling of crop yields and pest onsets under different temperature and rainfall scenarios Will require strengthening of capacities	ToR for vulnerability assessment completed	Strengthen technical capacities Vulnerability assessment.in preparation	Vulnerability assessment completed
2.4	Awareness raising on climate change is strengthened amongst farmers	Districts	RAB REMA Private service providers	District + private extension force	Climate change awareness raising strategy prepared	Extensionists trained on climate change awareness	Farmers trained on climate change awareness
2.5	Protection of agro-biodiversity is promoted and monitored, in line with National Biodiversity Strategy	MINAGRI MINIRENA			Protection of agro-biodiversity strategy integrated in	Agro-biodiversity protection strategy implemented	Agro-biodiversity protection strategy implemented

				SPTA3, including definition of indicator	in CIP areas	in 75% of farming areas
2.6	Farmers' insurance against weather-related crop failure is further promoted	MINAGRI	RMS	See T3	See T3	See T3
2.7	SPTA3 introduces an indicator on ' % of farming households covered by weather-related crop failure insurance policy'	MINAGRI		Indicator defined	Indicator functional	

12 Systemic issue 3: Environmental Impact Assessment system

12.1 Introduction

Environmental Impact Assessment is a fundamental tool to identify potential environmental impacts of development projects, and thus define a project alternative which is environmentally sustainable and which minimises environmental impacts and risks. EIA is also a decision-informing tool for the competent environmental authorities to be able to authorise or not – on environmental sustainability grounds - a proposed development project, and define the necessary conditions of approval.

Environmental integration into project design, construction and operation is fundamentally sustained in the EIA system. Environmentally sensitive projects must prepare an EIA that identified and assesses its potential impacts on the environment, and devise measures to eliminate, or mitigate and manage such impacts. These measures are synthesised in an Environmental Management Plan (EMP), which is essentially a document containing the details as to how mitigation measures will be implemented and monitoring carried out.

Project authorisation is conditioned to the issuing of an EIA Certificate, which specifies conditions for EMP implementation. However there is concern that EMPs are not being adequately implemented by developers due to REMA's limited enforcement capacities. REMA will in the first quarter of 2012 deploy an environmental officer in each District, whose main duties will be monitoring EMPs of implemented projects¹. This welcome District-focussed human resources initiative needs to be matched by action at the REMA centre to assure that the EIA/EMP system fulfils its purpose and puts into the effect the obligation of 'the operator' to submit (compliance focussed) EMP implementation monitoring reports, in consistency with the provisions in the EIA Guidelines.

12.2 Policy and regulatory framework

Organic Law N°04/2005 determining the modalities of protection, conservation and promotion of environment in Rwanda makes provisions for EIA (Chapter IV), whereas 'every project' is subject to EIA before obtaining authorisation for implementation. Art. 68 establishes the minimum contents of an EIA, and which include a definition of mitigation measures as well as an indication as to how the state of the environment will be monitored and evaluated "before, during the activities of the project, in using the installation but particularly after completion of the project". The EIA procedure proper is specified in general terms in a Ministerial Order (2008) 'relating to the requirements and procedures for environmental impact assessment'.

The EIA has to be in conformity to REMA "Guidelines and procedures for Environmental Impact Assessment" (2006). The Guidelines categorise projects (based on a screening procedure) so as to determine the degree of detail required by the EIA²; they also define details for approval of the EIA report and for monitoring.

12.3 Institutional framework

REMA is the end institution legally responsible for the EIA system³. However many of the responsibilities for managing the EIA system on a day-to-day basis in the agriculture sector, including the issuing of EIA Certificates, has been delegated to RDB which nevertheless has to feed back to REMA all advice and recommendations received.

12.4 Baseline

The EIA process is clearly described in the REMA EIA Guidelines. The aspects analysed below are related to the effectiveness in the implementation of EMPs, and the corresponding monitoring. There are some fundamental moments in the EIA process (as specified in the Guidelines) that must be recalled:

1. The EMP is an integral part of the Environmental Impact Report. In words of the EIA Guidelines: *"in this section, tasks to ensure the implementation of mitigation measures and monitoring of impacts should be presented. This is a plan for*

monitoring and management of impacts during the implementation and operation of the project, where the responsibilities between the state and investor are differentiated”.

2. REMA issues an Implementation and Operations Order (IOO), specifying compliance terms and conditions to be met during project implementation and operation; they indicate requirements for implementation, impact mitigation and environmental monitoring.
3. Once the IOO is agreed, the EIA Certificate of Approval – a binding document - is issued.
4. Self-monitoring, self-record keeping and self-reporting are foreseen. However it is also specified that the information gathered through monitoring shall be recorded and forwarded to REMA annually.

In spite of a robust regulatory framework for the EIA/EMP system, there are some concerns about the effectiveness of the EIA system that REMA is aware of:

- EMPs are not implemented by all project developers⁴;
- EMP (success focussed?) monitoring reports are mostly not being submitted to REMA, which essentially relies on its (problem focussed) inspection functions that necessarily stretch REMA human resources capacity;
- As discussed in the SEA Workshop, in the case of agriculture projects there are uncertainties as to who assumes responsibility for monitoring during a project’s operational phase, as the developer that submits the EIA Report and obtains the EIA Certificate would normally transfer the project to the farmers for the operational phase.

12.5 Trends

Projects in the agriculture sector (especially related to creation of rice fields) will continue to be developed, most associated to potential environmental impacts which the EIA/EMP system is meant to contain:

- increase in wetland reclamation will increase risk of soil contamination, soil salinization and freshwater depletion;
- an important increase in water use from different sectors (including for irrigated agriculture) will increase pressure on available water resources, compromising the ecological water flow and leading to inter-sector competition for the resource;
- an important increase in the use of fertilisers and pesticides have a large potential of increasing water contamination and further contributing to eutrophication; and
- an increase in agro-industrial activity is expected, for which track records have shown a large degree of non-compliance with environmental regulations (e.g. in terms of waste water treatment).

In a framework of an ineffective EIA system due to insufficient implementation of EMPs and absence of monitoring, environmental risks associated to agricultural development will be multiplied. The EIA/EMP system calls for an urgent revision to guarantee its effectiveness.

12.6 SWOT analysis

A SWOT analysis is presented below, synthesising the strengths, weaknesses, opportunities and threats for this systemic issue.

Table 9 SWOT analysis for effectiveness of the EIA system

Strengths	Weaknesses
<ul style="list-style-type: none"> • EIA system is in place and covers all major development projects • Robust EIA procedures are in place, largely consistent with international good practices • REMA is a well-respected environmental regulatory body • EMPs are established as an integral part of EIA reports • System of licensing based on EIA considerations (EIA Certificates) in place • Well designed guidelines for the preparation of EIAs 	<ul style="list-style-type: none"> • EMPs are not satisfactorily being implemented, including monitoring • Annual monitoring reports (specified in the EIA Guidelines) are not being submitted by all developers to REMA • REMA has limited capacities to carry out inspection (to verify EMP compliance) • No clarity as to who is considered the ‘developer’ during the long-term operation of agricultural developments (e.g. wetland reclamation; irrigation systems), basically for purposes of obligations for monitoring and reporting • EIAs generally do not take into account the expected effects of climate change in their analyses (especially relevant for water management and infrastructure sensitive to intense rainfall and flooding)
Opportunities	Threats
<ul style="list-style-type: none"> • Recognition of deficiencies in the EIA/EMP system amongst key actors, including REMA (especially with regards to degree of implementation of EMPs) • REMA planned (2012) deployment of a monitoring officer in each district • Relatively easy to improve effectiveness of the EIA system once an adequate effectiveness assessment has been completed • REMA can greatly enhance its enforcement capacities by ensuring full implementation of provisions in the EIA Guidelines with regards to submission of annual monitoring reports • REMA can specify responsibility for EMP implementation for long-term operation of agricultural developments in EIA Certificates 	<ul style="list-style-type: none"> • Increased activities in agro-industry, wetland reclamation and use of fertilisers may lead to increased environmental impact in the context of an ineffective EIA/EMP system • Climate change is likely to increase vulnerability to environmental disasters • Pressure to develop industrial sector may be an obstacle for effective enforcement of EIA system • Potential conflict of interest by RDB managing the EIA system and promoting investments at the same time

12.7 Synthesis, proposed specific objectives and required results

The proposed Specific Objective to address this key issue is: *the EIA system contributes effectively to environmental sustainability of development projects.*

The following Results are proposed to achieve the Specific Objective:

Result 1: EMPs are fully implemented and reporting to REMA done also according to the EIA Guidelines.

Result 2: Climate change considerations are integrated into the EIA system.

12.8 Activities proposed, responsible institutions and means

	Responsible Institution	Supporting institutions	Means	Proposed Objectively Verifiable Indicators and their timelines			
				12/2012	12/2013	12/2014	
Result 1: EIAs are fully implemented and reporting to REMA also done in accordance with the EIA Guidelines							
1.1	REMA undertakes a comprehensive EIA/EMP effectiveness assessment to determine a strategy for enhancement	REMA	RDB	EIA effectiveness assessment with potential donor support	ToR for EIA effectiveness assessment	Effectiveness Assessment completed	
1.2	REMA implements EIA/EMP effectiveness enhancement measures based on assessment study (Result 1.1)	REMA	RDB	EIA effectiveness enhancement with potential donor support	ToR for EIA effectiveness support	Effectiveness enhancement support initiated	Effectiveness enhancement support completed
1.3	RDB routinely reflects the EIA Guidelines requirement that annual monitoring results are submitted to REMA	RDB		RDB own internal procedures	Mandatory annual monitoring reports specified as part of EIA Certificate	REMA receives annual monitoring reports	
1.4	EMP monitoring reports are filed by REMA and accessible for consultation	REMA	RDB	REMA internal procedures		Annual monitoring reports filed and accessible	
1.5	Clarification made in the EIA Guidelines on who is considered to be the ‘developer’ during the long-term operation of agricultural projects, for effects of routine environmental monitoring	REMA RDB	MINIRENA Districts/ Sectors (projects may be handed over to local authorities)	Inter-institutional coordination and legal advice	Revision of EIA Guidelines	Clarification incorporated in relevant documents	
Result 2: Climate change considerations are integrated into the EIA system							
2.1	The EIA Guidelines are revised to integrate consideration of climate change adaptation and mitigation as part of the EIA	REMA	RDB	REMA-led with potential donor (TA) support		EIA Guidelines revised	EIA reports incorporate climate change aspects

13 Systemic issue 4: Local capacities

13.1 Introduction

Decentralisation is one of the cornerstones of Rwanda's public sector reform, which responds to a large extent to the subsidiarity principle (planning and decision-making is done at the lowest administrative level feasible). In practice this means that the local government assumes a very large degree of responsibility for the implementation of sector policies¹.

Rwanda has made impressive improvements in its local capacities in the post-1994 period, but important challenges remain. These challenges have not passed unnoticed but rather, have been focus of attention for some years now. Various analyses of local capacities have taken place, including a recent Capacity Needs Assessment and the development of a new Strategic Capacity Building Initiative (World Bank, 2011)².

Local capacities is broader than just 'know-how' of staff; it includes aspects such as, *inter alia*, access to operational resources and facilities in order to perform a job efficiently, motivation, and on-going training. Division of responsibilities is also addressed here as necessary for good performance while absolute numbers of staff and/or their work burden may also be a constraint.

The definition of capacity building is broad. It is a holistic enterprise, encompassing a multitude of activities. It means building abilities, relationships and values that will enable organizations, groups and individuals to improve and sustain their performance and achieve their development objectives. It includes strengthening the processes, systems and rules that influence collective and individual behaviour and performance in all development endeavours. And it means enhancing people's technical ability, willingness and initiative to play new developmental roles and adapt to new demands and situations. Among institutions, and within their networks, it includes examination of opportunities to achieve required outcomes with greater efficiency of resource use through simplification, harmonisation and convergence of practices, with selective adoption of modern information and communications technology (ICT).

13.2 Policy and regulatory framework

The key policy of relevance to local capacities is the National Decentralisation Policy (2000). Decentralisation has taken place in tandem with a far-reaching Public Sector Reform, which redefined the structure of the local administration. The EDPRS is also a fundamental policy document, as public sector capacity building is an integral part of it.

In terms of environmental management at the local level, Prime Ministerial Order N°126/03 determines the responsibilities, organisation and functioning of the District and Sector Environment Committees.

13.3 Institutional framework

Coordination of local authorities is provided under MINALOC. In terms of public service capacities, MIFOTRA also has an important personnel training coordination and quality assurance role to play. At the sector level MINAGRI and MINIRENA are faced with the challenge of ensuring a good coordination with the Districts, so their respective sector policies find their way to local level implementation. Through MINECOFIN high levels of financial autonomy – covering both the recurrent budget and procurement under development budgets – are delegated to District administrations. MINECOFIN also administers the sectoral distribution of earmarked funds to the Districts, such as the funds (some from EU SBS) channelled on behalf of MINAGRI to specific components of SPTA2 implementation and on behalf of MINIRENA to environmental investments.

At the local level the administrative structures are Districts, Sectors, Cells and Villages. The administrative structure at the district level consists of the supreme body – the Council, an Executive Committee with an elected mayor and two elected vice-mayors (who serve five years in office and a maximum of two terms), all of whom have executive authority and are salaried, assisted by the Executive Secretary (who is also the

Chief Budget Manager). There are six departments;³ for the agriculture sector there is provision for an agronomist, positioned under the Director for Economic Affairs. In terms of environmental governance, Environment Officers are recruited at the District level (all districts have at least one environment officer), and placed under the Department for Lands, Town Planning, Housing and Infrastructure (at the sector level, the agronomist is responsible for ENR matters).

Every District also has an Infrastructure Officer, Lands Officer and Forestry Officer (Annex B13.1). All officers have an annual performance contract; the District performance contract is signed and presented by the Mayor before the President of the Republic – an administrative arrangement unique to Rwanda.

At the Sector level there is an equivalent smaller executive structure (with individual performance contracts) headed by an Executive Secretary whose deputy is the Legal Officer. Sector financial management is not autonomous but based largely on a system of Requisition to the District; this includes the management of earmarked funds over which Sectors have little control. Communications between Sectors and Districts are mostly by telephone and hard paper copies of documentation⁴. As a notable exception to the general pattern, in 2011 Nyagatare District supplemented its already advanced ICT system (integrating Sector offices) with supply of internet-linked mobile phones to all officers at District and Sector level.

As illustrated at Annex B13.1, there is provision for one agronomist who has to deal with aspects of rural infrastructure, lands adjudication/title registration, forestry and environmental management (responding to the respective four designated officers at District level) in addition to the ‘primary’ focus on agriculture, livestock and horticulture.

There are also special arrangements where two technical ministries deploy full-time staff at Sector level. MINAGRI, through RAB (from its own payroll), deploys a Livestock Veterinary Assistant in each Sector to give technical and animal nutrition advice mainly for the One-Cow programme and provide associated Artificial Insemination and vaccination services, while MINIRENA, through RNRA, deploys a Forestry Officer in the ratio of one for every two Sectors. The Sector Forestry Officers spend most of their time on supporting forest management, including regulating harvesting and replacement, but they also have responsibility for lending support to agro-forestry.

At Cell level there are two salaried posts. The Executive Secretary performs largely statistical and administrative functions while the Social Development Officer (better known as the Integrated Development Programme Officer or ‘IDP’) performs a number of functions that reflect the role of the Sector Agronomist; often the IDP is an agronomy diplomate. With regard to ENR, the IDP is typically the custodian of the Cell agro-forestry nursery that is supplied by tree seeds from RAB (formerly ISAR).

Prime Ministerial Order N°126/03 defines responsibilities of the Environmental Committees⁵ at district, sector and cell levels, which include, inter alia, aspects related to: monitoring of forests management; ensure monitoring of management of marshlands; M&E of environmental policies and programmes; ensure strategies against soil erosion are executed (sector and cell levels); ensure tree planting (cell level). The officer at the end of the chain of command responsible for implementation is the IDP.

MINAGRI and MINIRENA play key roles with their permanent placement of personnel at Sector level; additionally there is seasonal deployment of a RAB CIP Officer at District level in concert with one or more contracted CIP service providers who organised seed and fertiliser distribution and provide related extension advice.

13.4 Baseline

The EDPRS defines, as one of the performance indicators, the ‘No. of households per extensionist’ and sets a target of a 1:1,500 ratio (the 2005/06 baseline being 1:3,000). Tests of this target in the field suggest this numerical target is yet far from being met although the new developments since 2008 are as follows: 1 agronomist and 1 veterinary assistant are at sector level and a staff at cell level in charge of integrated development programme (IDP).

The administrative structure for local governments is described in the section above, which also shows that central government provides some additional support. It should also be pointed out that service providers sometimes also provide extension services, as well as the large projects (e.g. KWAMP, LWH).

The role of the agronomist, at the district and sector level, is not altogether clear. It would seem that its role mainly relates to management and coordination, not implementation (World Bank, 2011). In practice agronomists are indeed expected to engage in implementation, however challenging these tasks are in light of their work portfolio. MINAGRI (2008) have pointed out that *“it is not clear what is expected from the agronomist”*; for example, *“some agronomist seem only marginally aware of the budget for the earmarked grant, but do not feel they have any responsibility in planning and budgeting for or managing that budget”*, whereas in the understanding of the authors of that report district agronomist should have primary responsibility for achieving the objectives of the agriculture sector, and hence for the activities under the sector earmarked grant. The job description of the agronomists begs for a clarification.

As mentioned in the previous section, agronomists at the sector level also have to deal with aspects of rural infrastructure, land and NR management. Moreover, they are usually also engaged in administrative matters, sometimes beyond their area of work. The very limited number of staff available to deal with agriculture aspects at the local level is, without a doubt, insufficient. These heavy work-loads not only result in insufficient degree of attention given to their primary areas of responsibility, but also result in lowering the morale and motivation.⁶

In addition to the above, the professional capacities of agronomists are also an issue. The 2009 National Skills Audit revealed that the agriculture sector alone accounts for 35% of the total skills shortage in the country, and that there was a skills gap of some 60% for agricultural technicians (UKAID, 2011). Other aspects add to the challenges for local capacities: limited professional experience of technical staff; high level of staff turnover of skilled personnel, and thus no building of institutional memory; and inadequate or insufficient work tools, including, e.g. ICT and transport.

There are various root causes for the above, including low paid jobs and inequalities in pay amongst different organisations (which motivate skilled personnel to seek employment elsewhere, e.g. in agencies, projects or the private sector).

Finally the placement of the ‘agronomist’ in the district and sector organograms may be contributing to limiting best use of their potential. At the district level the agronomist is positioned under Economic Affairs, which acts more as the Planning Department, and the planner heading the section may not necessarily have affinity with agricultural activities to adequately supervise the agronomist (MINAGRI, 2008).

13.5 Trends

The drivers that result in low capacities for implementation of the agriculture strategy at the local level are unlikely to change in the short-term, although the issues have been identified and highlighted. With the expected increase in donor contributions to the agriculture sector there is, however, a potential to canalise some of these resources to strengthen local level capacities. Broader actions at the central level will nevertheless be necessary, such as increasing the skills level of graduates from national universities, securing job motivation and decreasing the salary gap between the public service and the private sector. Progress in these variables will probably start showing in the medium-term.

13.6 SWOT analysis

A SWOT analysis is presented below, synthesising the strengths, weaknesses, opportunities and threats with regards to local capacities.

Table 10 SWOT analysis for local capacities

Strengths	Weaknesses
<ul style="list-style-type: none"> • Local authority commitment in capacity building • Existence of institutions involved in capacity building of local authorities (e.g. Rwanda Governance Board and RALGA) • High level of awareness of challenges with regards to local capacities • Donor support (EC) indirectly targeted at decentralisation of the agriculture sector • Environment Committees have high potential for coordination at the local level on environmental matters • Precedent established for adoption of ICT and mobile e-communications between District and its Sectors (Nyagatare) • Precedent established for permanent deployment of Sector Infrastructure and Lands Officers (Ngororero) 	<ul style="list-style-type: none"> • Complex structure of sectors and cells vis-à-vis limited decentralised resources • Limited financial autonomy for sectors • Budgetary constraints • Limited number of skilled technicians available in the country • High work load of Sector agronomists, dealing with multiple sectors; an additional staff in charge of infrastructure and land is required to cope with the tasks and to release the agronomist for the breadth of duties related to ICM as defined under Issue T4 • Limited ICT facilities (only seen in Nyamagabe District) • Limited mobility for agronomists
Opportunities	Threats
<ul style="list-style-type: none"> • Donors interested in local level capacity building • Sectors and cells can become well organised • Earmarking of funds to support adoption of ICT and mobile e-communications between District and its Sectors • Earmarking of funds to support permanent deployment of Sector Infrastructure and Land Officers 	<ul style="list-style-type: none"> • Salary gap between the public and private sectors, as well as between public institutions • Graduate quality and output of higher education establishments may not keep pace with demand

13.7 Synthesis, proposed specific objectives and required results

Due to the degree of decentralisation in Rwanda, adequate capacities for planning, coordination and implementation at the local level are critical to guarantee good performance in the agriculture and ENR sectors. Many are the challenges that districts and sectors face in terms of capacities, ranging from the mere numbers of staffing and levels of experience and academic training, to issues of ambiguous definition of responsibilities, motivational factors, ICT facilities, mobility, etc.

Some aspects are to be approached at a high strategic level and in the medium and long-term, e.g. those related to development of university curricula. This report will focus on the more immediate concerns, and which could be solved in the short- and medium-term.

The following Results are proposed to achieve the Specific Objective: *Enhance local level capacities for planning, coordination and implementation of agriculture and ENR strategies and their M&E*

Result 1: Increased capacities of agronomists and environment officers

Result 2: Redefined key functions of local level staff for agriculture so as to optimise input

13.8 Activities proposed, responsible institutions and means

	Responsible Institution	Supporting institutions	Means	Proposed Objectively Verifiable Indicators and their timelines			
				12/2012	12/2013	12/2014	
Result 1: increase capacities of agronomist and environment officers							
1.1	Provide training, as necessary, to enhance capacities of agronomists and environment officers	RAB RNRA	Districts MINALOC	Needs assessment; ad hoc training design In coordination with R2.3	Needs assessment promoted	Trainings in 50% of districts	Trainings in 100% districts
1.2	Develop a retention strategy (e.g. staff benefits) to reduce staff rotation	MINALOC	MIFOTRA MINAGRI MINIRENA Districts		Strategy defined	Policy dialogue seeking opportunities implement'n opportunities	
Result 2: redefine key functions of local level staff for agriculture so as to optimise input							
2.1	Clarify functions of agronomists at district and sector level	MINALOC	MINAGRI Districts	Policy dialogue	Functions clarified		
2.2	Produce a job description for agronomists at district and sector level	MINALOC	Districts			Job description produced	
2.3	Train agronomists to ensure common understanding of their roles and responsibilities	MINALOC	Districts	Training designed; link to on-going training	Training designed	50% of agronomists trained	100% agronomists trained
2.4	Secure hiring of land and infrastructure specialist at sector level, so as to free up responsibilities of agronomist	MINALOC Districts	MINAGRI MINIRENA MIFOTRA MINECOFIN	Dialogue to secure agreement and seek sources of financing	Agreement reached	Sources of financing secured	New position implemented in 25% sectors

SECTION C

RECOMMENDATIONS

Based on the foregoing analysis and the team's knowledge of on-going developments and the pipeline of stakeholder commitments, this Section presents a synthesis of the recommended actions, distinguishing those addressed to MINAGRI for the enhancement of SPTA3's environmental performance; those addressed to the European Commission for better reflecting key environmental concerns in their support to the SBS to the agriculture sector; and those addressed to other institutions, whose role will be important in contributing to the environmental sustainability of the agriculture sector.

14 Recommendations to the GoR to enhance environmental performance of the agriculture sector

14.1 Recommendations to be addressed in SPTA3

Most of the opportunities to enhance the environmental performance of the agriculture sector should find a place within the scope of SPTA3. The recommendations synthesised here refer only to those aspects that should be reflected in the SPTA3 document; to a large extent they provide a response to changes in policy thinking that have been taking place amongst stakeholders in the sector, but had not yet found an opportunity to be expressed in the relevant strategic and policy documents. In other cases they emphasise policy aspects and activities that were already present in SPTA2, but which have not been given the degree of attention we now believe they deserve due to their potential to contribute significantly to enhance the sector's environmental performance.

All recommendations are found in the sections dealing with the technical and systemic issues above (Sections 5 to 13). This section singles out those aspects that can be reflected directly in the SPTA3, and are presented as a summary. Recommendations that are best handled outside SPTA3 are summarised in Section 14.2 below¹, whereas recommendations to be reflected in EDPRS2 are addressed in Section 14.3 below.

An indication is given in parentheses to categorise recommendations according to: (a) interventions that should be continued; (b) reinforced/increased; (c) modified; or (d) introduced for the first time. As well, an indication is given of their priority (top-, high- or medium priority).

Systemic issues 3 (EIA system) and 4 (local capacities) are not referred to in this section, as recommendations are primarily addressed to actors outside the agriculture sector.

General principles

- Efficiency (best use possible of limited resources) and effectiveness (best strategy to achieve results) must always guide the selection of activities.
- Objectives are often best achieved by the selection of strategies whose components have amplifying effects, rather than individual measures. In this context the concept of Integrated Crop Management (ICM) can be seen as a guiding principle, under which soil and water conservation, acidity correction and nutrient management, and pest and disease management all call for a coordinated approach.
- Empowering farmers through participatory engagement (farmer field schools and other training means) to make informed decisions should be a constant element to secure effectiveness and develop capacities.
- The development of skills and the availability of the resources required to make use of increased knowledge and capacities should always be promoted where necessary.
- Progress should be measurable. SMART performance indicators must be developed for the most critical expected results.

Soil and water conservation (Technical Issue 1)

- SPTA3 should promote soil and water conservation as an integrating policy focus, and it should be *effectively implemented as an integrated approach*. This means that SPTA3 should not only focus on specific components leaving aside other dimensions, as was the case under SPTA2 (e.g. terracing, hillside dams and irrigation and less attention to agro-forestry and soil cover). District-wide packages of measures should thus be promoted, where land protection and agro-forestry should be incorporated. [modified – top priority]
- As advised by REMA, Rwanda is below UN recommended per capita renewable water resources of 1,000 m³/person/yr. This triggers a potential concern, especially with the pressure for converting

wetlands into agricultural use. However, the MINAGRI irrigation master plan is advanced in implementation of 101 dams across the country together with other water harvesting infrastructure and promoting water use efficiency. It is concluded that water scarcity is not yet a major concern for the agriculture sector; however, it is becoming a concern at an inter-sector level, and water use efficiency should be incorporated into the irrigation subsector. [introduced for first time – medium priority]

- Focus should be on activities that are the most cost-effective (e.g. in relation to less resource-intensive soil erosion control), and serving a purpose (e.g. species and varieties for agro-forestry must be selected based on the choice purpose – for example fodder, fuel wood, non-timber forest products, construction materials). [reinforced/increased – top priority]
- It is critical that monitoring of soil erosion control gives an objective account of progress, with comparable reporting across the country. [continued – top priority]

Acidity correction and nutrient management (Technical Issue 2)

- Soil conditions for improved yields cannot rely solely on increasing the application of inorganic fertilisers, however necessary these may be. From the perspectives of optimal use of scarce resources (soil), minimisation of environmental risks and impacts, and building resilience for climate variability and climate change adaptation, the focus should change to one of increasing yields with optimisation in use of inputs. This calls for an integrated approach which widens the support menu to encompass all critical factors of production, which must be seen in conjunction also with issue T1 (soil and water conservation), T3 (crop and variety selection) and T4 (pest and disease management). [modified – top priority]
- Two main dimensions to consider in SPTA3 are: managing acidity (an important limiting factor for crop yields) and optimising use of fertilisers. [reinforced/increased – top priority]
- In response to the above, SPTA3 will need to dedicate more efforts to secure acidity correction.
- As well, and very importantly, the focus on increasing use of inorganic fertilisers needs to be changed to one of application of fertilisers based on nutrient needs. Such change will require fundamental changes in monitoring: it is not consistent (nor desirable) to measure intensity of use of inorganic fertilisers; rational use based on nutrient needs **MUST** be incorporated into the equation. This new focus has important implications for EDPRS2 as well. [reinforced/increased – top priority]
- The focus on efficient use of fertilisers requires the necessary training and capacity building, always keeping in mind the principle of empowering farmers to make informed decisions. [reinforced/increased – high priority]

Crop and variety selection (Technical Issue 3)

- Choice of crops and varieties is central to CIP, and of key importance to secure livelihoods and food security. The CIP is the cornerstone strategy relevant to this issue. However, and in spite of the dramatic increases in crop yields associated, some aspects of the focus currently given to the CIP are being questioned (e.g. on aspects of resilience to climatic shocks, social acceptance, economic feasibility).
- SPTA3 offers a key opportunity to re-share the CIP in order to better secure its objectives in an environmentally sustainable manner. It is noted that several policy objectives (land registration/tenure regularization, land consolidation, Umudugudu settlement model, CIP, SME promotion) are geared to export oriented commercial level modernized and "sustainable" agriculture, with science offering the means to retain agro-ecology in CIP for climate resilience. Nevertheless specifically the following aspects should be given due consideration and effectively incorporated:

- do not set aside the possibility of inter-cropping, which can be highly beneficial in terms of pest and disease management and nutrient management (reducing inorganic fertiliser requirements); [introduced for first time – high priority]
- build flexibility for decision-making of crops and varieties by farmers, developing farmers' know-how and skills to make informed choices – flexibility is important for adaptation to climate variability and climate change; [introduced for first time – high priority]
- build adaptation capacities to climate variability and climate change by requiring all CIP schemes to be accompanied by weather insurance – important in a farming system that increases farmers' vulnerability to climatic shocks. [reinforced/increased – high priority]

Pest and disease management (Technical Issue 4)

- The approach to pest and disease management so far has been centred on the increase in use of pesticides, to the extent that the amounts of pesticides used is taken as an indication of performance in the sector. Considering the environmental and health risks associated to the use of pesticides, this focus is inconsistent with the principles of environmental sustainability and optimal use of scarce resources.
- SPTA3 should change the focus to one where environmental and health risks are minimised. This means using pesticides only when necessary and only in the amounts necessary, as well as fomenting cost effective measures that reduce the need of pesticides. More particularly, IPM requires more serious attention, to the extent that – *based on on-farm pilot results obtained by RAB with non-chemical pest and disease control measures (and their respective indicators)* - success should ideally be measured in relation to avoidance of pests/disease with the least use of pesticides. [modified – high priority]
- Various aspects related to safe management of pesticides are to be addressed by other institutions (e.g. RBS), but MINAGRI should be concerned with the review of manufacturers' instructions so they are suitable for local conditions and labelled in Kinyarwanda. Manuals for correct application should be prepared as part of SPTA3 results, contributing to minimising environmental and health risks. [modified – high priority]

Rural feeder roads (Technical Issue 5)

- Most of the recommendations related to this issue are best addressed by other institutional actors (namely RTDA and District authorities). However MINAGRI can contribute to enhance effectiveness in this sub-sector by providing guidelines to District Development Committees on criteria for prioritising feeder roads, such that ICM orientation is taken into account. [reinforced/increased – high priority]

Monitoring and evaluation (Systemic Issue 1)

- Apart from specific environment-agriculture indicators, which are recommended under some of the technical issues, there are some overarching aspects related to MINAGRI's own M&E system that require attention by MINAGRI in order to ensure M&E can contribute effectively to planning and decision-making.
- Inter-sectoral coordination is fundamental, as different sectors and subsectors (mainly agriculture, ENR, RFR and climate change) have objectives and indicators that relate to the agriculture sector. It should be MINAGRI's role to coordinate these different actors and agree on a harmonised set of indicators (and their associated methodologies). [reinforced/increased – high priority]
- An important shortcoming is that monitoring data and information is not readily available for all authorities concerned; such a harmonised reporting framework should be promoted by

MINECOFIN, but MINAGRI is to make an important contribution. [reinforced/increased – high priority]

- Progress of SPTA2 has not been measured in a systematic basis. This should not be repeated under SPTA3, where proper monitoring and reporting mechanisms should be defined as part of the strategy and all key indicators should be SMART, supported by Metadata and have a defined methodology to measure them. [modified – high priority]

Climate variability and climate change (Systemic Issue 2)

- Many of the strategies and activities promoted in the agriculture sector have benefits in terms of climate change adaptation. However there are some approaches that may be reducing adaptation capacities (e.g. in relation to CIP crop and variety selection, see above), and there are also further opportunities to enhance climate change adaptation and the contributions to climate change mitigation (e.g. in relation to rationalisation in use of fertilisers, increased weather crop insurance).
- The NSCCLCD sets the way forward to Rwanda’s green growth. Importantly, two of the strategy’s Programmes (on ‘sustainable intensification of agriculture’ and on ‘agricultural diversity in local and export markets’) are to be led by MINAGRI, and thus mainstreamed into SPTA3. These programmes are fully compatible with the findings and recommendations made in this SEA, especially with regards to the optimisation in the use of fertilisers, the expansion of IPM up-take and the promotion of integrated soil and water conservation practices, including agro-forestry.
- MINAGRI should make climate change one of its key concerns; for this it will need to generate knowledge and capacities to better understand how the agriculture sector in Rwanda relates to climate change (which may imply post-graduate and/or on-the-job training, participation in regional/international climate change forums, etc.) Activities should include modelling of crop yields under different climate change scenarios, contributions to upgrade and use the EWS, favour climate resilient crops and farming methods (including the protection of agro-biodiversity) and further promote farmers’ weather insurance. [reinforced/increased – high priority]

Table 11 below, drawn from Annex 14.1, is divided into two broad sections to enable reference to existing frameworks. On the left are the key elements of the SPTA 2 logical framework activities. Column 2 identifies if the activity (or an associated element) is also included in the Vision 2020, EDPRS and CPAF Frameworks. On the right are included proposed indicators, proposed activities and observations. As requested, this table is presented to identify relevance of this study’s proposals to these frameworks but ***it should be noted, as the frameworks do not encompass all the Issues and subjects covered in this study, most of the study’s proposed activities and their indicators are not included below.***

Table 11 Suggested activities and indicators in relationship to SPTA2 logical framework sections

Activity	Covered by VISION 2020; EDPRS; CPAF	Proposed Indicator: UPPER CASE IF EDPRS; <u>UNDERLINED IF</u> ALSO CPAF	Proposed Activities	Observations
Programme 1. Intensification and development of sustainable production systems				
Sub-programme 1.1 Soil and water conservation				
Reductions in the rate of soil erosion and restore fertility	VISION 2020; EDPRS; CPAF	<u>USE EXACT WORDING OF THE INDICATOR THAT WILL SHORTLY BE</u>	Complement with promotion of less resource-intensive erosion control methods	

		<u>REVISED ON ‘% OF ARABLE LAND UNDER SOIL EROSION PROTECTION’.</u>	Emphasis on awareness raising of farmers on benefits of soil erosion control and training of methods available	Lack of awareness of benefits is an obstacle to implementation
			Redefinition of indicator to measure proportion of arable land under soil erosion protection	To address also sustainability of structures (i.e. proper maintenance)
			Definition of methodology to measure new indicator, and piloting thereof	
Irrigation on hillside farms	EDPRS	WATER USE EFFICIENCY OF IRRIGATION SCHEMES (Mm ³ /ha/yr OR Mm ³ /t/yr)	Agreement of indicator on water use efficiency for irrigation schemes ToR for all new irrigation schemes to seek water use efficiency as one of their objectives	Water use efficiency needs to be promoted in context of climate change adaptation and foreseen increased competition for water resources (different sectors). Indicator to be monitored by WUAs for each individual irrigation scheme.
Training of farm households in land husbandry on hillsides and hillside irrigation		WATER USE EFFICIENCY OF IRRIGATION SCHEMES (Mm ³ /ha/yr OR Mm ³ /t/yr)	Training to focus on ‘soil and water conservation’ approach	This would include aspects of conservation agriculture and irrigation water use efficiency
Sub-programme 1.2 Integrated development and intensification of crops and livestock: crop diversification and intensification				
Increases in agroforestry and agro-silvopastoral activities	VISION 2020; EDPRS	HA OF FARMLAND UNDER AGRO-FORESTRY TREE SURVIVAL RATE (CONSISTENCY WITH NSCCLCD)	Institute purpose-based agro-forestry , which implies identifying needs in a participatory manner and selection of appropriate species, and awareness raising of benefits of agro-forestry Train extensionist workers and farmers on purpose-based agro-forestry	Indicator on ‘ha of farmland under agro-forestry’ to be harmonised with ENR SSP indicator, but a measure of degree of up-take of agro-forestry is needed Indicator on ‘tree survival rate’ is taken from the NSCCLCD
Review of fodder requirements for the One Cow Programme with recommendations for types of livestock to promote by farm size (fodder generating capacity)				Integrate, where appropriate, fodder production from agro-forestry
% of livestock maintained in intensive systems	EDPRS			This objective remains very relevant to reduce pressure on land from

				livestock
Professionalised and increased honey production				Use of pesticides in nearby fields may affect beekeeping activities.
Strengthen fisheries commodity chains				Although not identified as a priority area, fish farming has to be promoted in compliance with environmental good practices, through EMPs
Sub-programme 1.3 Marshland development				
Marshlands developed with irrigation and drainage systems and farmer training, after EIAs	EDPRS	MARSHLAND AGRICULTURAL DEVELOPMENTS THAT FULLY IMPLEMENT EMPs	Regular assessments of EMP compliance by MINAGRI	REMA will also have a major role in enforcing EMP compliance
Sub-programme 1.4 Irrigation development				
Establish the legal basis for water use rights and tenure rights for irrigation systems	EDPRS	WATER USE EFFICIENCY OF IRRIGATION SCHEMES (Mm ³ /ha/yr OR Mm ³ /t/yr)		Not included in priority issues, but should promote water use efficiency
Develop hillside irrigation systems	EDPRS	WATER USE EFFICIENCY OF IRRIGATION SCHEMES (Mm ³ /ha/yr OR Mm ³ /t/yr)	Agreement of indicator on water use efficiency for irrigation schemes ToR for all new irrigation schemes to seek water use efficiency as one of their objectives	Water use efficiency needs to be promoted in context of climate change adaptation and foreseen increased competition for water resources (different sectors). Indicator to be monitored by WUAs for each individual irrigation scheme.
Implement pilots for pressurised irrigation on hillsides and fertigation systems	EDPRS	IDEM	Water use efficiency dimension is integrated and measured.	See above
Organise and train hillside farmers for water management, system maintenance and management of finances for irrigation systems			Farmers' awareness raising on water use efficiency	
Sub-programme 1.5 Supply and use of agricultural inputs: fertiliser and agrochemical supply and use				
% farms using inorganic fertilisers	VISION 2020; EDPRS;	CHANGE TO: NO. OF FARMERS USING FERTILISERS BASED AFTER	Modify the indicator to measure use of fertilisers; develop methodology to measure it; and pilot its	The indicator should be fully consistent to the one defined for the EDPRS, and should

		ACIDITY CORRECTION AND BASED ON SOIL NUTRIENT NEEDS ASSESSMENT FOR THEIR PARTICULAR LAND UNIT* (OR SIMILAR)	application	reflect the efficiency dimension
		SUGGEST TO DROP THIS INDICATOR, AS NOT CONSISTENT WITH PRINCIPLES OF ENVIRONMENTAL SUSTAINABILITY AND RATIONALISATION OF FERTILISER USE	Training to include optimisation of use based on soil nutrient needs assessment	
% farms using pesticides	EDPRS	SUGGEST TO DROP THIS INDICATOR, AS INCOMPATIBLE WITH PRINCIPLES OF ENVIRONMENTAL SUSTAINABILITY AND OF RATIONAL USE OF PESTICIDES POSSIBLE INDICATORS: ‘NO. OF FARMERS RECEIVING TRAINING ON P&D MANAGEMENT’ ‘% PESTICIDES MARKETED WITH LABELLING IN KINYARWANDA’		Indicators associated to safe use of pesticides must be integrated It must be ensured that, if use of pesticides is measured, the indicator should always be presented side-by-side the indicator on up-take of IPM
% farms practicing IPM			Develop IPM/Pest Risk Analysis (PRA) protocols, field scouting frequencies and roguing practices completed for all major crops Manuals developed for IPM/PRA and associated practices for all major crops	

# fertiliser demonstration plots			FFS training programmes incorporate modules and Kinyarwanda extension materials for: IPM/PRA and associated practices of all major crops; soil & water conservation; acidity and nutrient management; crop & variety selection; crop-specific protocols for use of pesticides	
# on-going participatory analyses of soils and fertilisation			<p>Undertake trials for acidity correction in all major land units</p> <p>Trials for nutrient management undertaken for staple crops in all major land units</p> <p>Prepare manual of economic soil acidity correction measures and nutrient management for all land units</p> <p>Incorporate elements of acidity correction and nutrient management in training for extensionists and farmers (through FFSs)</p>	<p>Acidity correction is important component for agricultural productivity, and has been largely neglected</p> <p>Based on nutrient needs assessment</p>
			<p>Environmental compatibility of crops and varieties for defined land units determined on basis of experience and guidelines written</p> <p>Patterns of crop-weather interactions for defined land units and risk of meteorological variation and its crop effects determined on basis of experience and guidelines written</p> <p>Preparation of Kinyarwanda manuals for crop/variety environmental compatibility and meteorological risk for all defined land units</p> <p>Farmers trained on crop/variety selection, including consideration of climate variability/change, so as to make informed choices</p>	<p>CIP needs to integrate principles of ICM (including nutrient management) and flexibility for climate change adaptation</p> <p>Farmers are to be trained so they may make best of CIP and make informed choices on farming</p>
			Environmental screening of distributors, personnel, premises and handling in	

			relation to agrochemicals	
			Review of agrochemical products manufacturers' instructions suitability for local conditions, and translation (Kinyarwanda)	
			Document results of previous work on efficacy and efficiency of P&D trials in CIP stable and other crops	Including associated residue analysis in products, soil and water
			Develop manuals for agrochemicals' safe dosages frequency, handling systems, disposal, economic application measures, equipping/protective clothing, pre-harvest intervals, risk	
			P&D certification of public and private extension staff	Including ToT of public and private extension staff; respective (pesticide use) certification
			Spot checking, detection and quantification of residues throughout the food chain	
Sub-programme 1.5 Supply and use of agricultural inputs: certified seeds and other inputs				
Increased use of improved seeds	EDPRS			In the SEA report MINIRENA is asked to emphasise protection of agro-biodiversity, which may be further endangered by increase in use of improved seeds
Increased use of farm mechanisation			Farm mechanisation strategy to incorporate elements of conservation agriculture	This activity is not highlighted in the core text of the report, but poses an opportunity which already appears in the draft report for the mechanisation strategy
Increased use of animal traction				
Sub-programme 1.6 Food security and vulnerability Management				
Early warning capability for food shortages		% coverage of EWS (NSCCLCD indicator – to be integrated)	Fully develop EWS	Activity to be undertaken in coordination with Meteo Rwanda
		No. farmers under CIP with weather insurance coverage	Weather insurance to be promoted in all land under CIP Promoted beyond CIP as well	
Programme 3. Promotion of commodity chains and agribusiness development				

Sub-programme 3.2 Development of traditional exports: coffee				
Improved performance of coffee washing stations	CPAF: water quality			Not identified as priority area, but MINAGRI should ensure washing stations treat wastewaters to standard
Sub-programme 3.5 Market-oriented rural infrastructure				
All-weather roads to priority production areas	VISION 2020; EDPRS;	POSSIBILITY: KM OF RFR BUILT UP IN COMPLIANCE WITH ENVIRONMENTAL STANDARDS AND CLIMATE PROOFING BUILT INTO DESIGN	Ensure adequate environmental standards are adopted, including climate-proofing	See details of recommendations in Issue T5 of main report. Coordination with RTDA required
Programme 4. Institutional development				
Sub-programme 4.4 M&E systems and coordination of the agricultural sector				
Results indicators reviewed and refined as necessary and baseline developed where needed			Harmonise environment-agriculture indicators between all relevant government institutions	Close coordination with MINIRENA and RNRA
			Develop adequate methodologies for all harmonised indicators (environment-agriculture)	
Self-reporting monitoring system developed			Develop M&E framework and provisions (including methodologies) for SPTA3	

14.2 Recommendations for non-agriculture sector institutions

Important opportunities were identified to enhance the environmental performance of the agriculture sector that are best addressed by institutional actors outside the agriculture sector. These relate mainly to environmental policy and management, in the hands of the competent environmental authorities, but also to issues that should be addressed by actors such as the RMS, RBS, MINECOFIN, MINALOC and Districts.

This section presents a summary of the recommendations that are addressed to non-agricultural institutional actors.

MINIRENA and RNRA

- Being the government institution in charge of environmental policy aspects, and also responsible for implementing and monitoring the ENRSP, MINIRENA should play a key role in coordinating with MINAGRI in all matters related to the environmental dimensions of SPTA3. Existing fora can be used for these ends, such as the ENR and the agriculture SWGs. [reinforced/increased – high priority]
- MINIRENA, together with the RNRA, should take primary responsibility for the development of an indicator measuring soil erosion, which will be key to monitor the effectiveness and, (especially) impact of soil erosion control measures. MINAGRI would have to contribute with the component

dealing with soil erosion from arable land, but MINIRENA/RNRA would deal with the overall measure. [reinforced/increased – medium priority]

- RNRA is already developing the system for monitoring of water quality. They should ensure that variables that give an indirect measure of soil erosion are included (i.e. TSS, TDS, turbidity). [reinforced/increased – medium priority]
- In terms of water use efficiency, the water balance study in charge of MINIRENA will be fundamental to determine availability of resources. Setting up the mechanism of water use allocations will be important to ensure good management of resources in the context of increasing water demand and climate change. [reinforced/increased – high priority]
- RNRA, with the possible support of NUR, should take in charge the regular monitoring of surface and groundwater quality to check for fertiliser and pesticide residues. [reinforced/increased – medium priority]
- MINIRENA should revisit the National Biodiversity Strategy, and devise appropriate measures (in coordination with MINAGRI) for the protection of agro-biodiversity, which is potentially imperilled by the CIP, and which is important also in terms of climate change adaptation. An associated indicator would be useful in this context, to be considered for the revised ENRSSP. [reinforced/increased – medium priority]

REMA and RDB (as implementation agent of REMA)

- The enhancement of the EIA system is fundamental to guarantee the environmental sustainability of agriculture sector development projects, especially with regards to the adequate implementation of EMPs and the strengthening of REMA's enforcement capacities. This exercise should include the integration of climate change considerations where and as appropriate.
- Although REMA has wished to assert that the deployment of environmental inspectors/monitors in each of the 30 districts has been arranged, also that capacity strengthening will ensure success in their effectiveness, it is recommended that REMA carry out measures at the headquarters level to strengthen the EIA system itself, based on the effectiveness assessment done by REMA and more particularly based on the gaps in enforcement (on operators) identified in this report. [reinforced/increased – high priority]
- The EIA regulatory framework, including the EIA Guidelines, are well developed and powerful instruments; REMA and RDB should make better use of them. In particular the indication – in the EIA Certificates – that developers should submit annual monitoring reports to REMA will strengthen REMA's enforcement capacities, and also put more pressure for compliance on developers. [reinforced/increased – high priority]
- REMA, in coordination with MINIRENA, should clarify who is considered to be the 'developer' (for purposes of monitoring, reporting and for all other legal ends) in the case of long-term operation of agricultural projects (e.g. rice field development/irrigation system handed over by donor-funded project to a farmers cooperative). [reinforced/increased – high priority]

MINALOC and Districts

- Districts will play a very important role in the implementation of most recommendations, normally in coordination with MINAGRI/RAB. Especially important, they should take a leading role in training of farmers, with a view to empower farmers to be able to make informed decisions on best farming practices. [reinforced/increased – high priority]
- MINALOC, in coordination with Districts should take a leading role in measures aimed at enhancing local capacities, including the clarification of job descriptions for agronomists and

infrastructure officials and providing the necessary training. In some organograms will have to change to incorporate new structures and hire new personnel (e.g. Sector Infrastructure and Land Officers). Freeing up agronomists from non-agricultural and ENR functions will be key to enhance local capacities for environment-agriculture. [introduced for the first time – top priority]

- MINALOC is recommended to consider ways to enhance local capacities, including with regards to reducing the high levels of staff turnover. [reinforced/increased – top priority]
- MINALOC should be able to contribute significantly, in coordination with MINECOFIN (and other sector line ministries) to define a harmonised reporting framework for the M&E system, whereas the data/information MINALOC collects from the local level can be easily accessible to MINAGRI and MINIRENA. [reinforced/increased – high priority]

Rwanda Bureau of Standards (RBS)

- RBS is to play an important role in setting up an adequate framework for the safe management of pesticides, including aspects of product standards, labelling, residues analyses. As earlier stressed, REMA's CCIU needs to take an active part in monitoring and verifying that framework implementation is not only sound but also meets international obligations. [reinforced/increased – high priority]

Ministry of Health (MOH)

- The MOH should take an interest in the spot-checking, detection and quantification of pesticide residues in user blood samples. This is important to verify adequacy of the framework established for safe management of agrochemical products. [reinforced/increased – medium priority]

Rwanda Transport Development Authority (RTDA)

- Most recommendations to the RFR sub-sector are addressed to the RTDA. These concern especially the adoption of the necessary environmental standards, training of key actors in good environmental management practices, and contribution (in coordination with Districts) to create the job description for the new post of Infrastructure and Land Officer at the local level.

14.3 Recommendations for enhancement of EDPRS2

The EDPRS is a critical policy document, as all sector and local government strategies have to contribute to it. In this sense the focus, indicators and targets defined in the EDPRS are of fundamental importance, as they permeate all levels of strategic planning and implementation.

Being of utter importance for national development, and the main economic sector, agriculture figures prominently in the EDPRS. The increase of agricultural productivity is a key goal under its Flagship Programme 1 on “sustainable growth for jobs and exports”.

Through a simple discourse analysis of the document, it is discerned that, when it comes to the agriculture sector, the implicit policy statement runs along the following lines: *‘agricultural productivity has to be enhanced through a significant use of fertilisers (especially inorganic)’*. This is reflected particularly in the selection of EDPRS indicators. Amongst the ‘intermediate indicators’ (which are meant to be useful to link to SBS) the following indicators are defined: “% of farm households using: inorganic mineral fertilisers; organic fertilisers; improved seeds; insecticides”, with associated targets. This is further highlighted by the fact that the Rwanda Vision 2020 includes an indicator on *‘use of fertilisers (kg/ha/yr)’*.

As discussed under Technical Issue T2 above, although it is certainly true that increased use of inorganic fertilisers are necessary in Rwanda to increase agricultural productivity, from an environmental sustainability and climate change point of view, it is important to ensure fertilisers are optimally applied, based on the soil's specific nutrient needs for the particular crop(s) in question.

A key recommendation for the preparation of EDPRS is to shift the policy focus from increasing the amount of inorganic fertilisers applied, to one of increasing the amount of inorganic fertilisers applied AND that such application responds to soil nutrient needs. This will also help in the integration of the Programme 1 of the National Strategy for Climate Change and Low Carbon Development (2011), which aims for rational use of fertilisers.

Secondly from the time the EDPRS was written, the institutional level of awareness on climate change, and the corresponding policy focus, have matured; climate change adaptation is now rightly recognised as an important aspect to address, especially due to the high level of vulnerability to climate change of the agriculture sector.

This SEA has shed light on important opportunities available to improve the environmental dimension of the agricultural sector. Although all recommended actions are considered important, some specific actions deserve special attention due to their particular potential to contribute significantly to increase the environmental performance of the agriculture sector in Rwanda. These deserve to be highlighted in the EDPRS2 'policy actions matrix', especially as these actions are meant to serve as triggers for the release of budget support funds.

Three key recommendations for enhancement of the environmental dimension of the EDPRS with regards to the agriculture sector are synthesised below.

Table 12 Key recommendations for EDPRS2

<ol style="list-style-type: none">1 Modify the indicator on intensity of use of fertilisers (in the intermediate indicators matrix), to one that clearly reflects the optimisation in its use. An appropriate measuring methodology should be developed. Some possible formulations to consider are:<ul style="list-style-type: none">• ‘number of farmers using acidity correction and fertiliser application based on nutrient needs assessment for their specific land unit’;• ‘tonnes of inorganic fertilisers/ha/yr applied based on estimation of soil nutrient needs’; and/or• ‘% of total inorganic fertilisers applied whose application is based on estimation of soil nutrient needs’.2 Make explicit reference in the SPTA3 document to the vulnerability of the agriculture sector to climate change, and the importance of adaptation.3 Integrate, as part of the ‘policy actions matrix’, the following:<ul style="list-style-type: none">• Develop and implement a purpose-based agro-forestry strategy;• Develop SPTA3 in line with recommendations made in the Strategic Environmental Assessment (SEA) of the agriculture sector in Rwanda.

14.4 Recommendations for the CPAF

The Common Performance Assessment Framework (CPAF) contains a subset of sector strategy and EDPRS indicators, which are agreed by all key stakeholders to represent the key variables that measure performance of a sector, and which are followed through the respective SWGs. The number of indicators contained in the CPAF is therefore only a fraction of those used in the EDPRS and SPTA frameworks.

Currently the CPAF contains only the following three indicators relevant to the environment-agriculture interactions²: (1) *‘land portion protected against soil erosion (%)’*; (2) *‘% of farming households using improved farm methods’*; and (3) *‘% of water resources complying with water quality standard’*.

The shortcomings of the first of these indicators have been acknowledged, and are discussed under issue T1 above. The third indicator is to be monitored by RNRA under the IWRMP. Both these indicators are welcome and necessary at the CPAF level.

As for the second indicator on up-take of improved farm methods, on examination of the methodology to measure the indicator, it is identified that ‘improved farming methods’ is related exclusively to the use of fertilisers (chemical and organic)³.

As will be evident by the discussions provided under issue T2 above, the concept of ‘improved farm methods’ should be much wider than merely applying fertilisers; it should include the up-take of an Integrated Crop Management (ICM) approach, including aspects of up-take of agro-forestry and Integrated Pest Management (IPM). In any case, the use of fertilisers should be matched to the soil nutrient needs after any necessary correction of acidity.

A re-defined methodology for *‘% of farming households using improved farm methods’* will not be provided here, as it will require further discussions amongst the agriculture SWAp community. However it is important that the aspects highlighted in the above paragraph are taken into account, especially the rational use of fertilisers. One possible compound formulation is: ‘farming households that make use of soil acidity correction measures and fertilisers based on the assessment of soil nutrient needs, and which engage in IPM’.

In addition, or as a complement, to the above indicators, it is recommended that the following indicators be integrated into the CPAF⁴ (for a brief description of the rationale behind each indicator, see Section 15.1 below)⁵:

- No. of farmers using acidity correction and fertiliser application based on nutrient needs assessment for their specific land unit;
- ha of arable land under agro-forestry;
- No. of farmers exposed to Farmer Field Schools, with an ICM focus;
- No. of Districts where Infrastructure and Land Officers are functional (relieving agronomists of those functions);
- % of cultivated land under CIP with weather insurance.

The Table below synthesises the main indicators suggested for EDPRS2, CPAF and SPTA3. The indicators referred to for SPTA3 are only indicative, based on the activities suggested in this SEA report (NB: they may not be explicitly suggested as indicators in Sections 5-13 although, if actions are integrated into SPTA3, associated indicators would probably assume a wording similar to what is suggested in this table). The SPTA3 document will certainly include a broader range of indicators.

Table 12 Synthesis of suggested indicators for EDPRS2, CPAF and SPTA3

Proposed Indicators	EDPRS2	CPAF	SPTA3
<ul style="list-style-type: none"> • No. of farmers using acidity correction and fertiliser application based on nutrient needs assessment for their specific land unit; AND/OR • Tonnes of inorganic fertilisers/ha/yr applied based on estimation of soil nutrient needs; AND/OR • % of total inorganic fertilisers applied whose application is based on estimation of soil nutrient needs. 	✓	✓	✓
Policy action:	✓		✓
<ul style="list-style-type: none"> • Develop and implement a purpose-based agro-forestry strategy 			
Policy action:	✓		
<ul style="list-style-type: none"> • Develop SPTA3 in line with recommendations made in the SEA of the agriculture sector in Rwanda 			
<ul style="list-style-type: none"> • ha of arable land under agro-forestry 		✓	✓
<ul style="list-style-type: none"> • No. of farmers exposed to FFSs, with an ICM focus 		✓	✓
<ul style="list-style-type: none"> • No. of districts where Infrastructure and Land Officers are functional (relieving agronomists of those functions) 		✓	✓
<ul style="list-style-type: none"> • % of cultivated land under CIP with weather insurance 		✓	✓
Policy action:			✓
<ul style="list-style-type: none"> • Devise and adopt Soil and Water Conservation Strategy 			
Policy action:			✓
<ul style="list-style-type: none"> • Devise and adopt National awareness programme (farmers' awareness of benefits of soil and water conservation measures) 			
<ul style="list-style-type: none"> • No. of extensionists trained on purpose-based agro-forestry 			✓
<ul style="list-style-type: none"> • Water use efficiency for irrigation (Mm³/ha/yr or Mm³/t/yr) 			✓
<ul style="list-style-type: none"> • No. of acidity correction trials completed for major land units 			✓
<ul style="list-style-type: none"> • No. of nutrient management trials completed for staple crops in major land units 			✓
<ul style="list-style-type: none"> • No. of extension workers including ToR and FFS trainers inducted into and tested for knowledge on acidity control and nutrient management 			✓
<ul style="list-style-type: none"> • % coverage of early warning system 			✓

• No. of crops for which IPM/Pest Risk Analysis protocols, field scouting frequencies and roguing practices are completed			✓
• No. of crops for which manuals on OPM/PRA have been developed			✓
• No. of farmers trained on climate change awareness			✓
• Indicators (as yet undefined) measuring protection of agro-biodiversity			✓
• % farming households covered by weather-related crop failure insurance policy			✓
Indicators proposed to be WITHDRAWN/MODIFIED	EDPRS2	CPAF	SPTA3
• % of farm households using inorganic mineral fertilisers	✓		✓
• % of farm households using organic fertilisers	✓		✓
• % of farm households using insecticides	✓		✓
• % of farming households using improved farm methods (definition of 'improved farm methods' to be modified)		✓	
• land portion protected against soil erosion (%) (measurement methodology to be modified so it reflects 'effective protection' and monitoring data can be comparable across the country)		✓	✓

15 Recommendations to the European Commission

15.1 Recommendations in the context of the SBS to the agriculture sector

The EC has committed a 20M€ top-up to its SBS for Decentralised Agriculture through an Action Fiche of October 2011, reaching a total commitment of 40M€, and adding an additional 3 years to the programme. Recommendations are provided above on how GoR institutions can enhance the environmental performance of the agriculture sector in the design of SPTA3 and EDPRS2 in particular. The EC has mainly two instruments to enhance the environmental performance of the agriculture sector through its SBS:

- (1) making sure that critical environmental indicators are integrated in the SBS performance indicators, as variable tranche indicators and targets;
- (2) addressing environmental concerns through the on-going policy dialogue.

General conditions for disbursement of tranches

The general conditions for disbursement of all tranches are linked to a set of general eligibility conditions. From the point of view of adequacy of the sector policy (in this case the SPTA), it is necessary that it is environmentally sustainable. When re-assessing for future disbursement the appropriateness of the sector policy, budget, monitoring systems, sector coordination and institutional capacities, the implementation of the recommendations drawn by the present Strategic Environmental Assessment (SEA) should be taken into account.

Performance Indicators for the disbursement of variable tranches

The most pressing environmental concerns in the agriculture sector should be reflected either in the performance indicators for the disbursement of variable tranches or at least be present amongst the issues to be raised in the on-going policy dialogue. It is recommended that the EC, within the context of the SBS Programme, gives special emphasis towards the following six indicators. The rationale is given in the right column.

Table 13 Priority agro-environmental performance indicators for SBS to the agriculture sector in Rwanda

Performance Indicator	Associated Key Issue	Rationale
1 No. of farmers using acidity correction and fertiliser application based on nutrient needs assessment for their specific land unit	T2	Intensity of inorganic fertiliser application is used as a key 'pressure' indicator for sector performance (e.g. in EDPRS), but is not consistent with principles of environmental sustainability. Fertiliser use has to be optimised, for which it must respond to determined nutrient needs, after acidity correction where necessary. This approach is also necessary for correct implementation of the NSCCLCD.
2 ha of arable land under agro-forestry	T1	Agro-forestry can play a critical role in soil erosion prevention and water conservation – necessary for optimised agricultural productivity and climate change adaptation. As well it can provide fertility enhancement (from leguminous species), fuel wood, horticultural poles, construction materials, fodder, fruits, seeds, etc., contribute to increase of the permanent forested area and to mitigation of climate change. Agroforestry has been promoted, but not integrated in extension (CIP, etc.) to the extent desirable.
3 No. of farmers exposed to Farmer Field Schools, with an ICM focus (Issue T4, SO1, Result 3)	T1; T2; T3; T4 (SO1); S4	Empowerment of farmers to make informed decisions on aspects of ICM (including soil and water conservation measures, acidity control and nutrient management, pest & disease management, selection of crops and varieties, and adaptation to climate variability and climate change) must be accelerated and promoted nationwide. Farmers are the end-of-the-line implementers, and thus the development of their capacities for optimum resource use and optimum output is critical; this also has important national economic consequences
4 Law of Agrochemicals enacted and Registrar of agro-chemicals and inspection team functional	T4 (SO2)	So that necessary use of permitted agro-chemicals is optimised for safety and efficiency, the EU needs to support this important and carefully framed MINAGRI initiative in which MINAGRI has taken full ownership
5 No. of Sectors where Infrastructure and Land Officers are functional (relieving Sector Agronomists of those functions)	S4	In context of decentralisation Sector Agronomists are critical to ensure proper implementation of agricultural and environmental strategies and policies. They are overburdened with multiple responsibilities, which do not allow them to focus properly on agriculture and environment functions. This indicator is highly important to ensure enhancement of sustainable decentralised agriculture.
6 % of cultivated land under CIP with weather insurance	S3	CIP has produced important results in improving yields; in some Districts it is matched by the weather insurance scheme. In its present form CIP limits the opportunities for adaptation to climate variability and climate change. Weather insurance is an important adaptation measure, which should be extended to all farmers engaged in the CIP. Existing CIP farm inputs supply administration can facilitate insurance set-up.

Policy dialogue

There are some recommendations which are necessary to enhance the environmental performance of the agriculture sector, but which are beyond the sole responsibilities of the agricultural institutions. For this reason they have not been included in the aforementioned list of top priority agro-environmental performance indicators, but they should indeed be pursued in the wider policy dialogue of the EC and other Development Partners in Rwanda. Those issues should include, *inter alia*:

1. Harmonisation of environmental indicators relevant to the agriculture sector.
 - a. Different strategies define environmental indicators relevant to the agriculture sector (e.g. SPTA, ENRSSP, NSCCLCD, National Biodiversity Strategy). For a well-functioning M&E system, these indicators must be harmonised, including their associated methodologies. MINAGRI should take a leading role.
2. No. of annual monitoring reports submitted to REMA in context of EMP implementation
 - a. Reporting of self-monitoring associated to EMPs is provided for in the EIA Guidelines, and a powerful tool to enhance REMA's enforcement capacities and put pressure on developers for compliance with EMPs and environmental regulations in general. REMA and RDB should be leading actors for this issue.
3. Development of a common ICT platform for M&E enabling effective computer access by all relevant Government institutions to M&E data and information under common formats.
 - a. Possibly to be coordinated by MINECOFIN, with close involvement of all line ministries and Districts.

The EC is nevertheless encouraged to familiarise with the corpus of recommendations made for all technical and systemic issues, so they may be addressed through the policy dialogue whenever adequate opportunities arise to do so. These include aspects related to, *inter alia*, the Early Warning System (EWS), water quality monitoring, Integrated Pest Management (IPM), etc.

The draft AF for the SBS top-up included two expected results related to soil erosion protection, and which are necessary:

R3: The protection of cultivable land against soil erosion has been supported country-wide; and

R4: The methodological approach for soil erosion and soil protection assessments has been revised.

Results R3 is addressed by Indicator 2 above related to issue T1; R4 is addressed in the detail of the actions proposed under T1 and should remain in the AF matrix.

Due to the importance being given to the amounts of fertilisers used as a key measure of input performance in the agriculture sector¹, and that such an approach (alone) is incompatible with principles of environmental sustainability and incongruent with the principles advocated in the NSCCLCD, it is necessary that the GoR modifies its approach to one of rational use of fertilisers. A similar approach is taken by this study for pesticides².

The recommendations for any EU participation/policy dialogue in formulation of EDPRS include changing the approach which should be reflect the following principle:

The indicators to measure use of fertilisers and pesticides reflect their rational use .

15.2 Recommendations in the context of the SPSP to rural feeder roads

Dialogue was established by with the formulation team for RFR SPSP, with the Ministry of Infrastructure (MININFRA) and the Rwanda Transport Development Agency (RTDA). Preliminary recommendations for integration of environment into the draft documentation offered for RFR SPSP formulation were provided to the RFR SPSP formulation team as follows based on the agreed condition of no significant change to the RFR carriageway width recommended as standard (+/- 4 metres):

1. *The Code of Practice and actual management systems of A) Supervising Engineers and B) Road Rehabilitation and Maintenance Contractors would need to incorporate Environmental Capability including capability related to the issues set out at II and III below – should be a requirement;*
2. *The adopted Road Standard(s) would have to incorporate rigorous guidance and specifications for Vegetative Protection of Water Courses, Verges, Embankments and Cuttings and other earthen structures associated with RFR rehabilitation and maintenance, according to soil type and other geological and hydrological considerations – should be a requirement;*
3. *Minimum road specifications applied to the respective implementation should require climate-proofing road design, so that roads and associated structures would be capable of sustaining greater intensity of rainfall as indicated by officially recorded trends.*

The European Commission is encouraged to take on board these recommendations in the formulation of the RFR SPSP.

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¹ According to NISR (2008).

² “Improved farming methods refer to the use of chemical as well as organic fertilisers” (NISR, 2008).

Notes to Chapter 1: Introduction

¹ SPTA2 document (2009).

Notes to Chapter 2: Approach and methodology

¹ REMA-deployed person for environmental mainstreaming in MINAGRI, Ms Madeleine Usabyembabazi, was part of all field missions.

² Ms Annette Sylvie was nominated as the focal point within MINAGRI for this SEA.

Notes to Chapter 4: Policy, institutional and regulatory framework

¹ A more detailed account of the policy, institutional and regulatory framework is provided in Annex A4.

² Support to environmental mainstreaming is provided under the UN Poverty-Environment Initiative (PEI):

³ Mayors are also members of the District Council, as well as head of the District Executive Committee (composed of a Mayor and two Vice-Mayors in each District and the City of Kigali).

⁴ The higher-level environmental objectives for the agriculture sector are: (1) ensure a sustainable use of marshland; (2) promote improved soil and water conservation practices; and (3) restore and improve soil fertility and prudent use of agricultural inputs.

Notes to Chapter 5: Technical issue 1 (soil and water conservation)

¹ Additional details on soil erosion are found in Annex B5.1.

² Soil erosion leads to other impacts besides reduced agricultural productivity. These include, *inter alia*, increase of sedimentation downhill-cultivated lands from eroded plots; risk of crop destruction and silting-up in marshes and plains; risk of local landslides and mudslides; and risk of irreversible leaching of soils (Twagiramungu, 2006). Most of the soil loss ends up in river and stream networks and marshlands (Musahara, 2006). Research cited in the SPTA2 document provides some quantitative data: the Nyabarongo river system carried 51 kg/sec of soil at Nyabarongo-Kigali, 44 kg/sec at Nyabarongo-Kanzenze and 26 kg/sec at Akagera-Rusomo. Unfortunately systematic monitoring of sediment load in the river and stream systems is not yet available.

³ ‘Agroforestry is a collective name for land-use systems and technologies, where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land management unit as agricultural crops and/or animals, either in some form of spatial arrangement or temporal sequence. In agroforestry systems there are both ecological and economical interactions between the different components’. (ICRAF, 1993)

⁴ Short-term trials have indicated that agroforestry can reduce soil erosion by up to 90% (Byers, 1990 quoted in UNEP, 2011).

⁵ Organic Law N° 04/2005.

⁶ Law N° 62/2008 of 10/09/2008 putting in place the use, conservation, protection and management of water resources regulations.

⁷ Nevertheless Law 62/2008 established some basic principles and responsibilities for water management relevant to the agriculture sector, including: (a) calls for establishment, in the PM’s office of a Water Inter-ministerial Committee; (b) devolves water resources management functions to the district level and user organisations. In this regards it: calls for the establishment of a Basin District Committee. A basin committee at the sector level is also to be established, with structure and functions similar to the equivalent committee at the district level, on the basis of a local master plan. It allows for the constitution of water users associations, to deal with issues of management,

enhancement of production and protection of water resources and fight against flooding; (c) calls for the establishment (at Ministerial level) of a national water inventory, as well as a national water master plan; (d) provides for charges to be levied on water use; (e) establishes that installations and activities relative to water use that may impact water quantity or quality, or affect wetlands, are subject to authorisations at the Ministerial level; (f) calls for the Minister to maintain and update an inventory of wetlands, indicating their location and features, especially those with a protection status.

⁸ Other provisions include: to monitor and assess water resources to identify its spatial and temporal occurrence and distribution in the country with a special focus on areas vulnerable to water related disasters, including droughts and floods; to develop a water resources information system; and to formulate water quality standards and legal limits for discharges of effluent into natural water courses.

⁹ We have a densely populated country where land is limited and thus intensively farmed, with very limited fallowing. Adding to this a large portion of the territory is hilly terrain (46% greater than 16% slope; 7% greater than 40% slope) which is being farmed (farming can be found in gradients of up to and above 55%); soils are especially fragile in the Northern and Western uplands that experience high rainfall (>1400mm); the rainy seasons often see periods of intense rainfall. All these factors have contributed to Rwanda being one of the countries in Africa experiencing heavy soil losses (REMA, 2009).

According to the 2010 Forestry Policy, natural forest areas have declined by 65% in the 1960-2007 period and the distribution of the remaining forest resources is uneven over the country (concentrating along the Congo-Nile Ridge). However at the moment a comprehensive forest inventory has not been produced, so it is not possible to provide more accurate estimates of forest cover.

Deforestation has a direct incidence on soil erosion. The main cause of deforestation is the collection of wood for energy (either fuel wood or for production of charcoal), as wood is the main source of energy for most (96%) of the population in Rwanda. Deforestation poses a major challenge for the forestry sector, which must be tackled from multiple fronts (e.g. energy policy, agriculture policy): the Forestry Policy document estimates that “in order to fill the gap between demand and supply of wood, it will require planting additional 400,000 ha and increasing the forest productivity up to an average of 15 m³/ha/yr”; however such land is not available in Rwanda and the current productivity is very low.

The war and genocide resulted in the displacement of thousands of Rwandans and in the abandoning and destruction of erosion control structures; also, the massive return of refugees led to the systematic destruction of wooded areas and a take-over of protected zones (mainly the Akagera National Park and the Gishwati natural reserve) (Ministry of Lands, Environment, Forests, Water and Mines, 2004). The impact of the conflict and post-conflict situation over forest cover (and thus, on soil erosion) is deemed to be enormous, even if the extent of encroachment has largely been controlled.

¹⁰ Environmental Profile of Rwanda (2006). REMA/PEI (2006) refer to a loss of 14 million tonnes of soil per year. The SPTA2 document erroneously makes a reference to 1.4 million tonnes per year.

¹¹ This loss also corresponds to about 945,200 tonnes organic matter, 42,210 tonnes nitrogen, 280 tonnes phosphorous and 3,055 tonnes potassium.

¹² According to the OECD agri-environmental indicators, severe erosion is considered when >33 tonnes/ha/year. Annexes B5.1 and B5.2 provides more details on soil erosion per District.

¹³ Data on turbidity from a 2002 study undertaken by the NUR¹³. Whereas the WHO standard is 5 FTU, only 1 out of 18 sample sites complied with the standard; of the rest, one exceeds the standard in 40%, 5 in between 500-1,000%, 8 in between 1,000-5,000% and 2 in more than 5,000%.

¹⁴ The Agriculture JSR report synthesizes advances made under SPTA sub-programme on ‘sustainable management of natural resources and water and soil preservation’, which reflect advances based on the large projects managed by MINAGRI: for FY 2010/2011, 9336.52 ha of radical terraces and 22,128 ha of progressive terraces were constructed. Other soil protection control measures are also due mainly to efforts of NGOs such as Food for Work, World Vision, CRS and Care International (REMA, 2009).

¹⁵ MINAGRI (2011) *Sector Evaluation Report for the Joint Sector Review FY 2010/2011*.

¹⁶ The inattention given to the sustainability dimension is widely recognised by stakeholders, and also indicated in Chapman (2011).

¹⁷ The ENRSSP includes an indicator on % of arable land under agro-forestry, but it is not being monitored.

¹⁸ There are indications that mulching is being reduced, as fuel wood becomes increasingly scarce, and farmers begin using crop residues as fuel.

¹⁹ It is foreseen that three automatic surface water quality stations will be installed on the Nyabugogo river near Kigali and Nyabarongo downstream of Kigali, for which it has been recommended that the sampling points for suspended sediments be located at the hydrometric stations (van't Klooster *et al*, 2011).

²⁰ van t'Klooster *et al* (2011).

²¹ Other large schemes under development include Rusumo Falls (90MW) and Rusizi 3 (147MW), whilst at a later stage (Rusizi 4) another 300MW could be added (van't Klooster, 2011).

²² National Policy for Water Resources Management (2011), p. 17.

³² SPTA2 included a sub-programme (1.1) on “sustainable management of natural resources and water and soil conservation”; but is focused exclusively on resource-intensive erosion control structures (radical and progressive terraces), hillside irrigation and preparation of watershed management plans.

Notes to Chapter 6: Technical issue 2 (soil acidity and nutrient management)

¹ Regarding decentralisation, MINAGRI's recent EDPRS self-assessment concluded “*RAB Zones should be given responsibility to back-stop district authorities in both the development of District Development Plans (DDPs) and implementation of PSTA III.*”

² The providers include ALUPA, IMBARAGA, Forrest Company and others.

³ Pilot work of Gicumbi farm assistance programme reveals importance of discovery of trace element status in soil nutrient analysis, i.e. to support this SPTA 2 Sub-programme. Gicumbi relies on soil analysis abroad.

⁴ According to an IFDC report (2010), out of the US \$22.8 million CIP budget for 2009/2010, 79.67% and 16.38% were spent on the bulk purchase of, respectively, fertilizer and improved seeds, leaving 3.37% for (private) extension service providers and 0.31% for administrative costs.

⁵ The NFS asserted the following. Priority Action 3: Stimulate the demand for fertilizer; Activity 3.3. Promote investments in lime as a key amendment, through organising and strengthening capacity of producers organisations in lime production, and establishing a mechanism to promote lime use.

⁶ An illustrative delivered cost of limestone is RWF35,000/t or some RWF200,000/ha based on competitive tender. Application requires some 25 - 30 person-days/ha or about 5 persons/t, i.e. far more labour/ha than typically needed for ordinary inorganic fertiliser application.

⁷ This may be compared with (depending upon crop) an average CIP fertiliser recommendation of 75-150kg of ‘straight’ nitrogen and/or compound (N:P:K) fertiliser/ha/crop costing (+/-RWF500/kg) some RWF115,000/ha/crop; on this measure lime accounts for 23% of the total material cost of ‘optimum’ fertility management.

⁸ This is to be achieved through, a review existing recommendations; strengthening of ISAR (now RAB) technical and financial capacity; conducting participatory identification of bottlenecks, formulation of solutions, testing/adaptation and introduction of updated recommendations; and introducing and disseminate adapted recommendations.

⁹ This Sub-programme includes the following elements: Participatory research activities established and supported; Farmers become more involved in establishing research agendas; Competitive research funding mechanism established; Strengthen ISAR's (RAB) capacity; and Increased adaptive research on varieties from the region. The respective Indicators/Quantities up to 2012 include: Six participatory research programmes established with farmer groups; Seven research stations are converted so that farmers have the main voice in establishing research agendas; Participation of ISAR (RAB) scientists in specialised training of extension agents in the new facility; and Participation of ISAR (RAB) scientists in fertiliser trials and participatory soil analysis activities.

Notes to Chapter 7: Technical issue 3 (crop and variety selection)

¹ In which relevant Sub-programmes of Action include: (1) mainstreaming of agro-ecology (indicator: % of farms up-taking agro-ecology technologies); (2) expansion of crop varieties (indicator: % of farms adopting crops); and (3) disaster management and disease prevention integrated early-warning system (indicator: % coverage of early warning system). Related climate variability/climate change aims under SPTA 2 and Agriculture SWG include: Early warning capability for food shortages; Weather insurance programme functioning; Plan for rehabilitating meteorological stations and strengthening networks; and, Quarterly update of meteorological / climatic data for ENR planning.

² The National Biodiversity Strategy and Action Plan (2003) includes, amongst the objective on ‘Sustainable use of the biodiversity of natural ecosystems and agro-ecosystems’ an objective on ‘sustainable use of agro-biodiversity’. The following strategies are defined: (1) improved performance of native varieties and species; (2) promotion of sustainable traditional production systems; (3) prevention of introduction of intrusive species, control and eradication on non native species likely to threaten ecosystems and native species; and (4) development of mechanisms for checking the importation and dissemination of genetic material capable of having harmful effects on biodiversity, particularly on agro-biodiversity.

³ The providers include ALUPA, IMBARAGA, Forrest Company and others. This is a sizeable operation: out of the US \$22.8 million CIP budget for 2009/2010 16.38%, i.e. US\$3.7 million was spent on the bulk purchase of improved seeds.

⁴ This includes indicators on: number of farms growing export crops; and increases in crop production. Associated targets for 2012 are: 50% increase (by 2012) in number of farms growing export crops and 6% average annual increases in crop production.

⁵ Some of the seeds, such as hybrid maize varieties, are imported from Kenya and other nations while others – typically open-pollinated varieties – are cultivated within Rwanda under contract to RAB; one of the largest producers is the Army.

⁶ The Agriculture Sector Performance Report 2010-2011 explained that maize and beans planted late in Season A (to early November) were hit by drought and their yields subsequently decreased.

⁷ As discussed in the Workshop of 08/12/11, the crop selection policy under CIP may increase vulnerability to pests and diseases. There is some evidence to support this notion as offered in the Baseline for Issue T4.

⁸ This Sub-programme includes the following elements: participatory research activities established and supported; farmers become more involved in establishing research agendas; competitive research funding mechanism established; strengthen ISAR's (RAB) capacity; and increased adaptive research on varieties from the region. The respective Indicators/Quantities up to 2012 include: six participatory research programmes established with farmer groups; seven research stations are converted so that farmers have the main voice in establishing research agendas; ISAR (RAB) linked to new integrated cassava programme; participation of ISAR (RAB) scientists in specialised training of extension agents in the new facility; and adaptive research programmes for at least 3 crops and 20 varieties from the region.

Notes to Chapter 8: Technical issue 4 (pest and disease management)

¹ The document states “Rwanda will implement a push-pull system using Napier grass and Desmodium legume to manage pests in fields of maize, sorghum, millets and rain-fed rice. “Push-pull” strategies increase maize yield, fix nitrogen into farm soils and provide a continuous supply of cattle fodder from the harvest of Napier grass and Desmodium, which improves milk yields of cattle while also reducing methane emission due to improved fodder regimes.”

² Pest: as defined under the Draft Law of Agro-chemicals: any insect, rodent, weed, virus, nematode, fungus, bacteria or other organism causing plant disease or interfering with, damaging or destroying crops, food, human beings, animals and other things.

Pesticide: as defined under the Draft Law of Agro-chemicals: any substance or mixture intended for preventing, destroying or controlling any pest (as above), unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage, transport, or marketing of food, agricultural commodities, wood and wood products, or animal feedstuffs. The term includes substances intended for use as a plant growth regulator, defoliant, desiccant, or agent for thinning fruit or preventing the premature fall of fruit, and substances

applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport *but excludes substances which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies.*

³ The laws and regulations grant slightly different treatment and control to substances used to protect livestock from parasites.

⁴ A number of producers and exporters to the EU and other markets in the coffee, tea and fresh horticultural produce sectors are, irrespective of local legislation, bound to comply with numerous safe management practices under the *GlobalGap* standard and other standards and practices including HACCP (focusing on contamination prevention through hazard analysis and critical control points), imposed by importing nations which include a regime for keeping use of chemicals, and so their residues, within safe limits. The regimes in place for these export sub-sectors are illustrative of the potential scope of the subject matter of this Section, which focuses on staple crops.

⁵ Some of the examples of practical challenges facing the agriculture sector are described below:

Highland growers of ISAR-bred maize variety Tamira (Pool 9A) have experienced (2011) epidemic-scale outbreaks of 'Nkongwa' stem borer at the two-month stage; this variety is more sensitive to borer than imported hybrids from Kenya (short supply). Unchecked it can cause crop failure. It is not a new pest; traditionally it has invaded plants after grain-fill and not been economically significant. In Musanze District three Sectors are planted with Kenya hybrid and 14 are planted entirely with Tamira under the CIP centrally planned programme. The respective 14 sectors have no other maize variety under the terms offered by CIP.

CIP provides insecticide for serious borer invasion at no charge. RAB is developing borer control/eradication options; there is just one current remedy: Chloropyriphos (3.5 to 5 ml/ 10l), a systemic insecticide. Outbreaks of leaf miner occur in Irish potatoes: Chloropyriphos is being tried under RAB supervision and contact insecticides Lambda-Cyhalothrin and Dimethoate are under trial. Late potato blight is treated with Mancozeb – at weekly intervals where deemed necessary in high rainfall locations.

Notes to Chapter 9: Technical issue 5 (rural feeder roads)

¹ Cited documentation of RFR SPSP Formulation Team (as at 19/12/2011):

- ToR_RWANDA 10th EDF MTR - SPSP RuralFeederRoads FORMUL STUDY ToRs _ 120911corrig.pdf
- Environmental Aspects of Feeder Roads in RwandaKBTND041211.docx
- 20111207 SUMMARY of Final Report (KBT) revJCF.docx
- Interim Report Draft 2011-273049 091211 Ver Pre-Final ATKINS + JCF.docx
- Logical Framework(1).docx version 11/12/2011
- PowerPoint presentations of 12 & 13/12/2011:
 - Session 1Key Assessment Areas.pptx
 - draft - Session 2 Technical Issues.pptx
 - Session 3 Programme Objectives.pptx
 - Session 4 Programme Management.pptx
- Districts selectionRFRtoDonors301111.docx

² They also improve consumer access to safe and affordable food and so strengthen food security, reduce the time taken to access essential services including health and education and facilitate access of emergency services.

³ Memorandum from the SEA Team to the Formulation Team and EU 18/12/2011 – see Annex B9.8

⁴ Districts selected (tentative) for EU Programme (*updated on request as at 29/01/2012*):

District	Total production area of maize and beans (ha)	Province	Topography	SAFEGE ranking out of 30 for steepness of slopes (%land >16% slope)
Ngororero	15,238	Western	Mountainous	1, 84%
Rulindo	16,213	Northern	Mountainous	3 ; 77%
Muhanga	10,252	Southern	Mountainous and Rolling Hills	7 ; 72%
Huye	11,350	Southern	Rolling Hills	14; 51%
Rubavu	21,908	Western	Rolling Hills	22; 34%
Ngoma	30,696	Eastern	Low lying and Marsh lands	26; 26%
Bugesera	23,491	Eastern	Low lying and Marsh lands	30; 7%

⁵ The SPSP Formulation documentation considers criteria of a non-commercial nature as well as criteria related to crop evacuation, marketing and post-harvest development.

⁶ To facilitate finalization of their draft Report the Formulation team was briefed on 18/12/2011 about the following observations from the SEA team regarding the indicated strategy for SPSP implementation:

- I. It was noted that the document summarizing the draft Final Report stated: “Environmental issues will be promoted by incorporating the environmental impact assessment and mitigation measures in the feasibility and design stages, by implementing the contractor’s environmental management plan (EMP) and by effectively monitoring the environmental aspects during the rehabilitation works.”
- II. With respect to the related Formulation support document of 04/12/2011 entitled ‘Environmental Aspects of Feeder Roads in Rwanda’, generated at the request of the SEA team:
 - a. ‘ENVIRONMENTAL ISSUES’: the SEA team considered that the section dealing with ‘Drainage’ did not need supplementation but the section on ‘Slope Stabilisation’ and ‘Mitigation measures’ required supplementation;
 - b. ‘CONTRACTOR’S ENVIRONMENTAL MANAGEMENT PLAN (CEMP)’: the section was considered suitable (including matters related to borrow pits and land restoration) but the SEA team concluded that some supplementary measures should be included as described below.
- III. The Code of Practice and actual management systems of A) Supervising Engineers (who certify BOQ; quality of work; payments, etc.) and B) Road Rehabilitation and Maintenance Contractors needed to incorporate Environmental Capability which included capability related to the issues set out below at IV and V – should be a requirement.
- IV. The adopted Road Standard(s) must incorporate rigorous guidance and specifications for Vegetative Protection of Water Courses, Verges, Embankments and Cuttings and other earthen structures associated with RFR rehabilitation and maintenance, according to soil type and other geological and hydrological considerations – should be a requirement.
- V. Minimum road specifications applied to the respective implementation should require climate-proofing road design, so that roads and associated structures would be capable of sustaining greater intensity of rainfall as may be indicated by any officially recorded trends generated by official hydro-agro-meteorological information systems.

VI. In the event that MININFRA and RTDA deviated from the intended adoption of a 4m standard carriageway width (commensurate with most existing RFR carriageway widths), there would be need to incorporate the following conditionalities:

- a. Preparation and adoption of an environmentally sustainable road profile design;
- b. Redefinition and adoption of a safe buffer zone (forestry, etc.);
- c. Redrawing and re-surveying/registration of private property boundaries;
- d. Recalculation, assessment and policy clearance of respective changes in environmental impacts (e.g. more run-off; more murrum road fill/km); and
- e. Addressing any other new impact that could have the potential to be environmentally unsustainable or harmful.

Notes to Chapter 10: Systemic issue 1 (monitoring and evaluation)

¹ E.g. soil erosion, agro-forestry, use of fertilisers, use of pesticides, water quality, marshland development, farming practices, improved seeds, irrigation, environmental management in agro-industry and climate variability warning systems.

² EDPRS, section 5.14.

³ The JSR SWOT analysis of SPTA2 (26-27 Sept. 2011) identifies, as one of the weaknesses; ‘monitoring and evaluation perhaps took a back seat in the priority of the PSTA2, with the detailed log-frame not regularly followed up’.

⁴ See Chapman (2011) for more details.

Notes to Chapter 11: Systemic issue 2 (climate variability and climate change)

¹ These are: ‘Integrated Water Resources Management and Planning’; ‘sustainable land use management and planning’; ‘sustainable small-scale energy installations in rural areas’; ‘green industry and private sector investment’; ‘efficient resilient transport systems’; ‘ecotourism, conservation and PES promotion’; ‘sustainable forestry, agroforestry and biomass energy’; ‘disaster management and disease prevention’ and ‘climate data and projections’.

² E.g. in the past 36 years average annual temperature in Kigali has increased gradually by 0.9°C and variations of standardised absolute maximum temperatures in Kigali point to an increase of 2.7°C between 1983 and 2005; also erratic rainfall patterns are demonstrated from records at Kigali airport, and a tendency towards progressively shorter rainy seasons.

³ Although there isn’t global agreement between all GCMs applied.

⁴ There are initiatives from FAO, WB, UNDP and the UK Hadley Centre (Byamukama *et al*, 2011).

⁵ Famine Early Warning System.

Notes to Chapter 12: Systemic issue 3 (Environmental Impact Assessment system)

¹ Source: REMA, personal communication (comments to draft version of the SEA report).

² Categories are: IL1 ‘projects not requiring further environmental analysis’; IL2 ‘projects not requiring a full EIA but necessitate a further level of assessment’ and IL3 ‘projects requiring a full EIA’.

³ The responsibilities of REMA are defined in Law N°16/2006, and which include the examination and approval of EIA reports.

⁴ This concern is widely shared amongst actors in environmental protection. As an example, a recent on-site review of EMP implementation of agriculture project carried out by MINAGRI found an unsatisfactory degree of implementation.

Notes to Chapter 13: Systemic issue 4 (local capacities)

¹ For example, in the framework of Organic Law N°04/2005 ‘determining the modalities of protection, conservation and promotion of environment in Rwanda’, decentralised entities are responsible for, *inter alia*: (1) ensuring activities related to better management of land, especially controlling soil erosion and tap rain water; (2) afforestation, protection and proper management of forests; (3) efficient management of rivers, lakes, sources of water and underground water; (4) efficient management and effective use of swamps; and (5) protection and proper management of reserved areas, historical sites, endangered animal and plant species.

² Other initiatives include: in 2008 functional reviews were prepared for the main line ministries; in the same year a ‘District capacity building needs assessment and planning’ document was prepared (MINALOC and MIFOTRA, 2008); in 2009 a National Skills Audit was conducted by MIFOTRA.

³ These include; Housing, Urban Affairs and Infrastructure; Planning and Economic Affairs; Education; Youth and Sports; Health; Good Governance and Special Programmes; and Revenue Collection.

⁴ As a notable exception to the general pattern, in 2011 Nyagatare District supplemented its already advanced ICT system (integrating Sector offices) with supply of internet-linked mobile phones to all officers at District and Sector level.

⁵ The general responsibilities of Environment Committees include: (1) ensuring the implementation of the laws, policies, programmes and plans relating to the protection, conservation and promotion of the environment in Rwanda; (2) monitoring issues relating to awareness raising of the population on environment protection, and proper land use; and (3) ensuring that persons who destroy the environment are pursued by the competent institutions. As well, every Environment Committee is in charge of overseeing the functioning of the committee below it in hierarchy.

⁶ While Nyagatare has elected to invest significantly in ICT and mobile communications, Ngororero District has established the precedent of devoting recurrent budget resources to the creation of the new post (2011) of Infrastructure and Land Officer in all Sectors, due to the identification of the inability of Sector Agronomists to effectively cope with their Agro-environment responsibilities alongside the multiple tasks inherent to settlement of land adjudication/ titling questions and to civil works of both buildings and rural roads.

Notes to Chapter 14: Recommendations to the GoR to enhance environmental performance of the agriculture sector

¹ With the aim of facilitating the task of addressing the recommendations in the SPTA3 document, Annex C14.1 presents the recommendations in relation to the SPTA2 log-frame.

² According to NISR (2008).

³ ‘*Improved farming methods refer to the use of chemical as well as organic fertilisers*’ (NISR, 2008).

⁴ These indicators are consistent with those recommended to the EC for inclusion as indicators associated to the disbursement of SBS variable tranches.

⁵ Key issues whose recommendations are not reflected in proposed indicators for the CPAF include: soil erosion control (as already part of the CPAF); rural feeder roads (as recommendations were provided for the corresponding EC SPSP formulation); M&E system; EIA system; and local capacities. These last three key systemic issues were not deemed necessary to reflect at the CPAF level, as the associated recommendations are of a more specific nature and not exclusive to the agriculture sector.

Notes to Chapter 15: Recommendations to the European Commission

¹ Vision 2020 includes an indicator on ‘*use of fertilisers (kg/ha/yr)*’, whereas the EDPRS includes the following indicators: ‘*% of farms using inorganic mineral fertilisers*’; as well the ASWG is measuring ‘*mineral fertilisers used (MT)*’ as part of the AJSR.

² The EDPRS includes an indicator on ‘*% of farm households using insecticides*’.