Kagera Agro-Ecosystems

gef

Kagera TAMP Regional Technical Workshop
Kabale, Uganda, 29-31 August 2011

Land Assessment and Planning Tools and Approaches

by
Sally Bunning, FAO Land and Water Division

Land Assessment and Planning Tools and Approaches

1. **Kagera TAMP goals, challenges, objectives**
2. **LADA-WOCAT Tools for LD & SLM assessment**
   - Assessment and mapping of LD and SLM (QM)
   - Assessment & Documentation of SLM best practices - Technologies (QT) and Approaches (QA)
   - Local level assessment of (state of resources / ecosystems, drivers & causes, impacts, responses)
3. **Tools for participatory land use planning**
   - Watershed planning and management
   - Community territory/village and landscape planning
   - Participatory negotiated territorial development

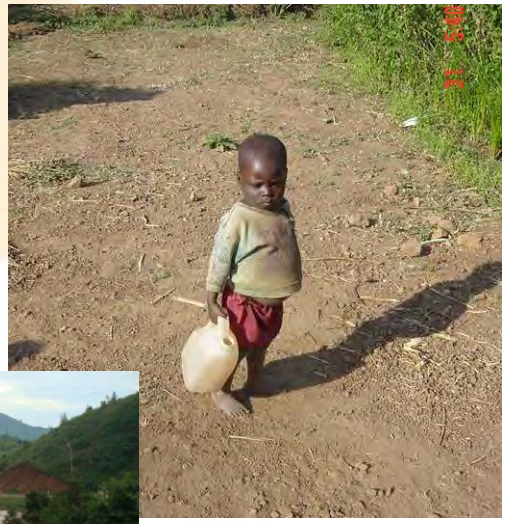
Kagera Basin Challenges

State: increasing degradation (soil productivity, water quality & flow, biodiversity loss, loss of ecosystem functions)

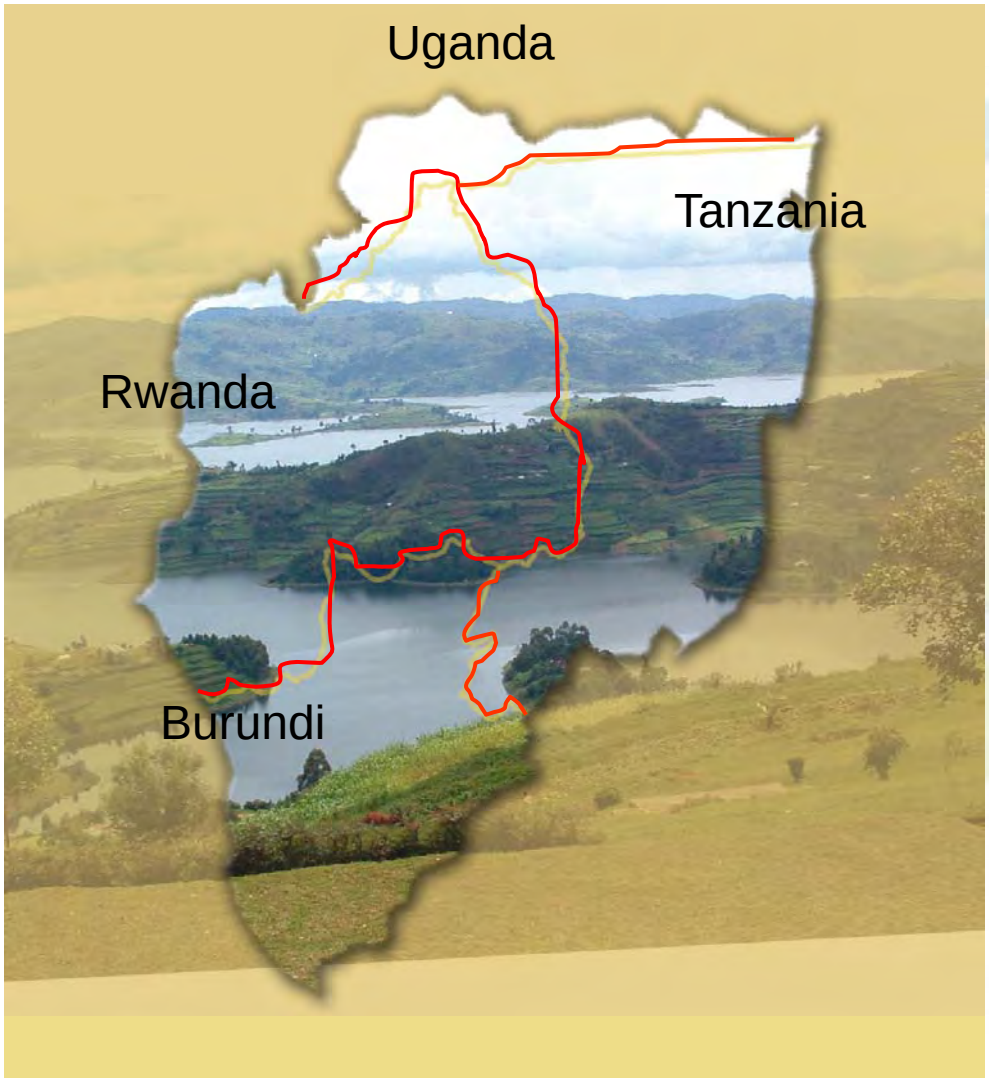
P**ressures** on natural resources and ecosystems → growing population, reduction in farm sizes, unsustainable land use and management practices

Drivers: population growth, agricultural/livestock Intensification for markets and urban growth

Impacts: poverty, food insecurity, conflict over resources, youth out-migration (labour shortage)



Kagera TAMP Goal



To adopt an integrated ecosystems approach for the management of land resources :

- to restore degraded lands and improve productivity
- to sequester carbon and adapt to climate change
- to conserve agro-biodiversity and ensure its sustainable use
- to improve food security and rural livelihoods

and thereby,

- contribute to the protection of international waters

http://www.fao.org/nr/kagera

Transboundary Issues

Poor land & water resources management
→Soil erosion and sedimentation
Loss of agricultural biodiversity

Affect on land and water quality
→ crop, livestock and aquatic productivity decline

- **Cross border crop & livestock pests & diseases**
- **Pressures on land (migrations ; settlement ...)**
- **Illicit use of resources in Protected Areas and wildlife - livestock interaction**
- **Burning (bush fires and charcoal production)**
- → P deposition in Lake Victoria
-

Population growth- pressures on steep slopes and wetlands

Project Outcomes

1. Transboundary coordination, information sharing and monitoring and assessment in place
2. Enabling policy, planning, and legislative conditions
3. Enhanced capacity and knowledge (all levels) for promotion of and technical support for Sustainable land and agro-ecosystem management (SLaM)
4. Improved management practices implemented and benefiting land users
5. Project management operational and effective.

Part of TerrAfrica/SIP addresses GEF Strategic programmes

SO 1 - Supporting Sustainable Agriculture and Rangeland Management

SO 3 - Investing in New and Innovative Approaches for SLM

Kagera Agro-Ecosystems Expected results mid 2014

- SLM on 100,000 ha.
  - 10% increase in crop, livestock and other products by trained farmers/ herders → improved nutrition, income, food security)
  - 30% increase in vegetation cover + 20% increase in carbon stores on 30,500 ha pasture and crop land →improved soil productivity and water management →reduced drought/degradation, erosion/flood
  - Control of soil erosion demonstrated (target micro-catchments and farmer plots) and Reduced sediment loads (in 4 micro-catchments)
- Capacity developed for SLM scaling up by community members/decision makers (120,000), FFS members (3600), technical staff (300), policy makers (250)
- Regional cooperation → effective support for transboundary SLM action plans

This workshop
How to Improve land use planning and land resources management?

- **What land use systems & SLM measures?**
- **For which type of land users?** (small/large; farmers/herders)
- **What organisations & methods for land use planning & management at what scales?**
- **How to secure land tenure and access to resources of vulnerable groups?**
- **What policy, legislation and land administration?**

How to incentivate SLM adoption?

Outcome 4:Transboundary coordination, information sharing, monitoring & assessment for SLaM

Step 1. Build a geographical information system to support:

- the selection of suitable project sites for demonstration and validation of SLM technologies and approaches and scaling up in the basin
- the development of the project SLM strategy (Where do we work? What on? Why? and Who with?)
- the monitoring and assessment of project interventions and impacts (on land resources, ecosystems and livelihoods)

Use of tools from LADA-WOCAT-DESIRE Partnership


Photo: H.P. Liniger

Until recently main policy focus on **Land Degradation**

Now: more attention to *assessing & promoting SLM*

WOCAT (1992+) Network and tools for assessing and sharing knowledge on SLM Technologies & Approaches

LADA-Mapping and Assessment of Land Degradation and SLM (2006+)

Use of LD/SLM maps and data and best practices to support decision making for upscaling of SLM

Assessment and Mapping of LD and SLM using LADA-WOCAT Tools

1. Compilation and sharing of baseline data (FAO-NBI-NELSAP)

2. Land use systems (LUS) mapping workshops in Rwanda (Eng.) and Burundi (Fr.) - on the job 21 participants, some GIS experts/ various institutions

→LUS maps of Rwanda + Burundi (country)

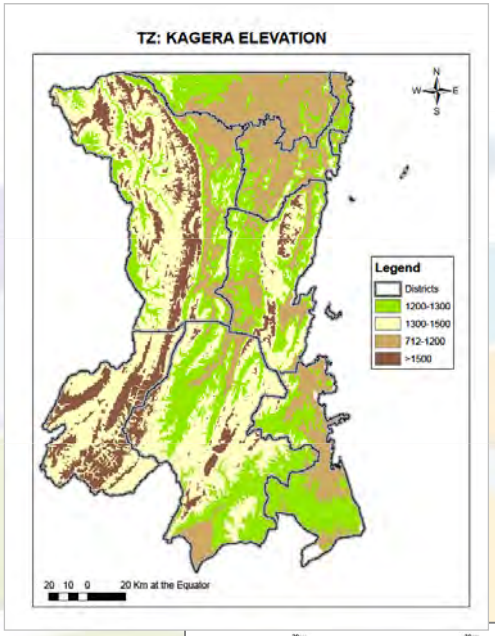
→LUS maps of target districts in Tanzania + Uganda

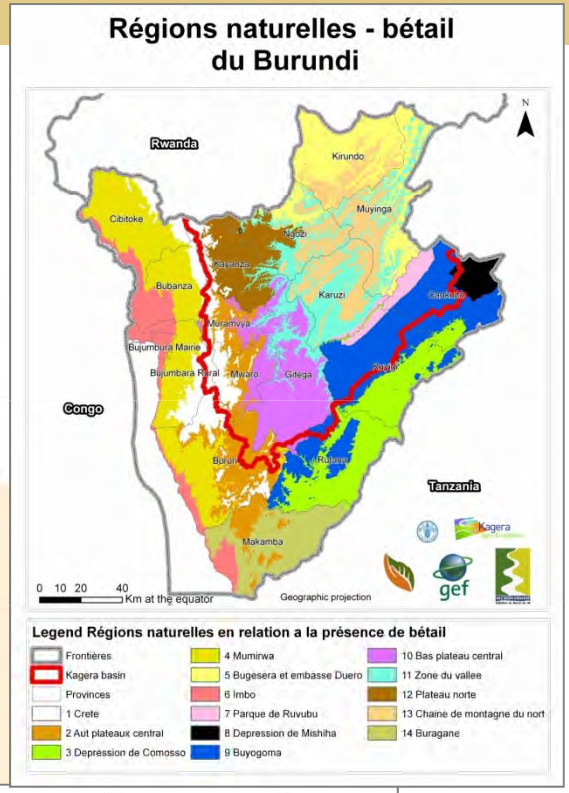
3. Participatory Expert assessment & mapping of LD & SLM - 3 workshops use of QM method - on the job 85 experts, multi-sector; district knowledge / experience) to assess

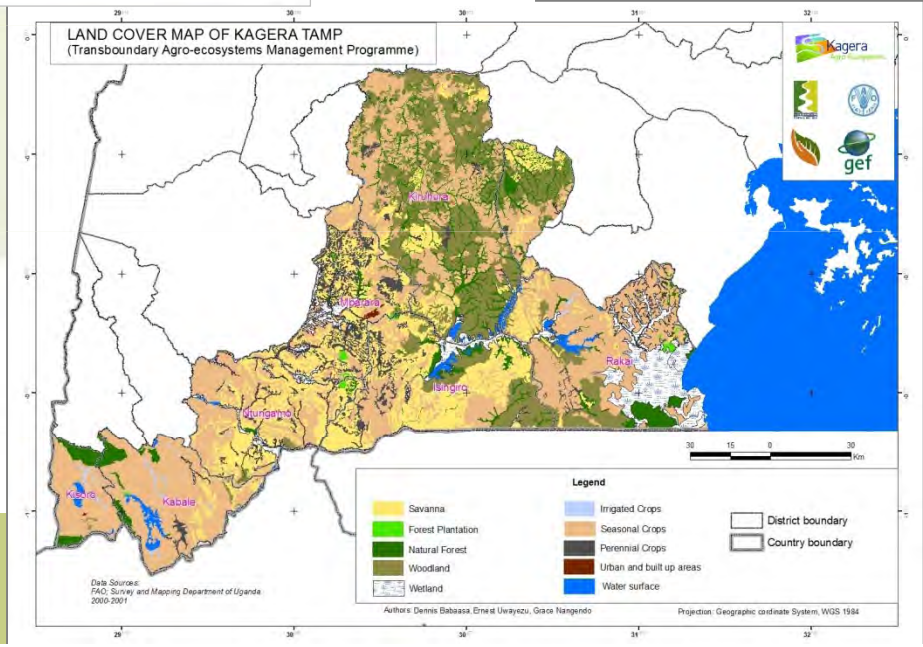
- LUS trend
- LD types, extent, degree, rate, causes
- SLM objectives, measures, extent, effectiveness
- LD & SLM impacts on Ecosystem services
- Future options (expert recommendations)

Land use database

Data	Map/Data
Land use	Main result
Land cover	Baseline data for LUS preparation
Livestock intensity	
Natural units for livestock	
Protected areas	
Crops type	**Use data**
Livestock spp.	
Elevation	**Resources base (environmental data)**
Slope	
Rainfall	
Temperature	
Soil classes	
Soil fertility	
Population density	**Socio Economic data**
Poverty	

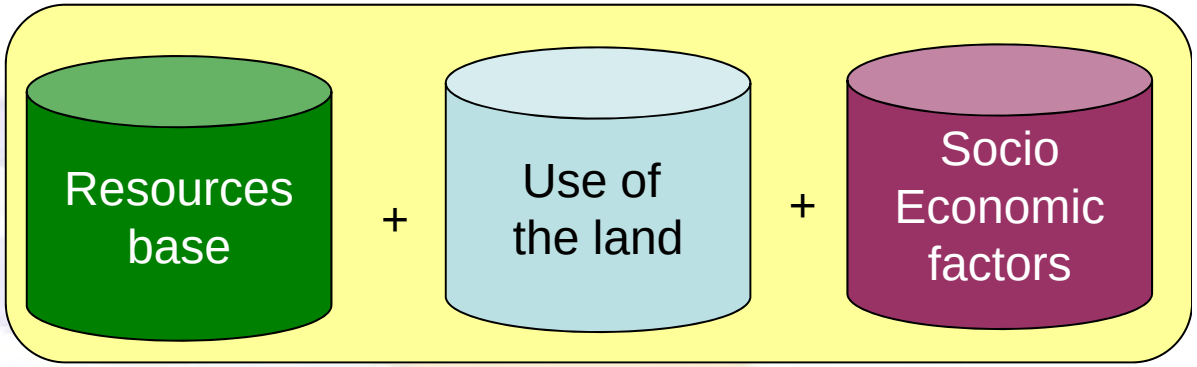






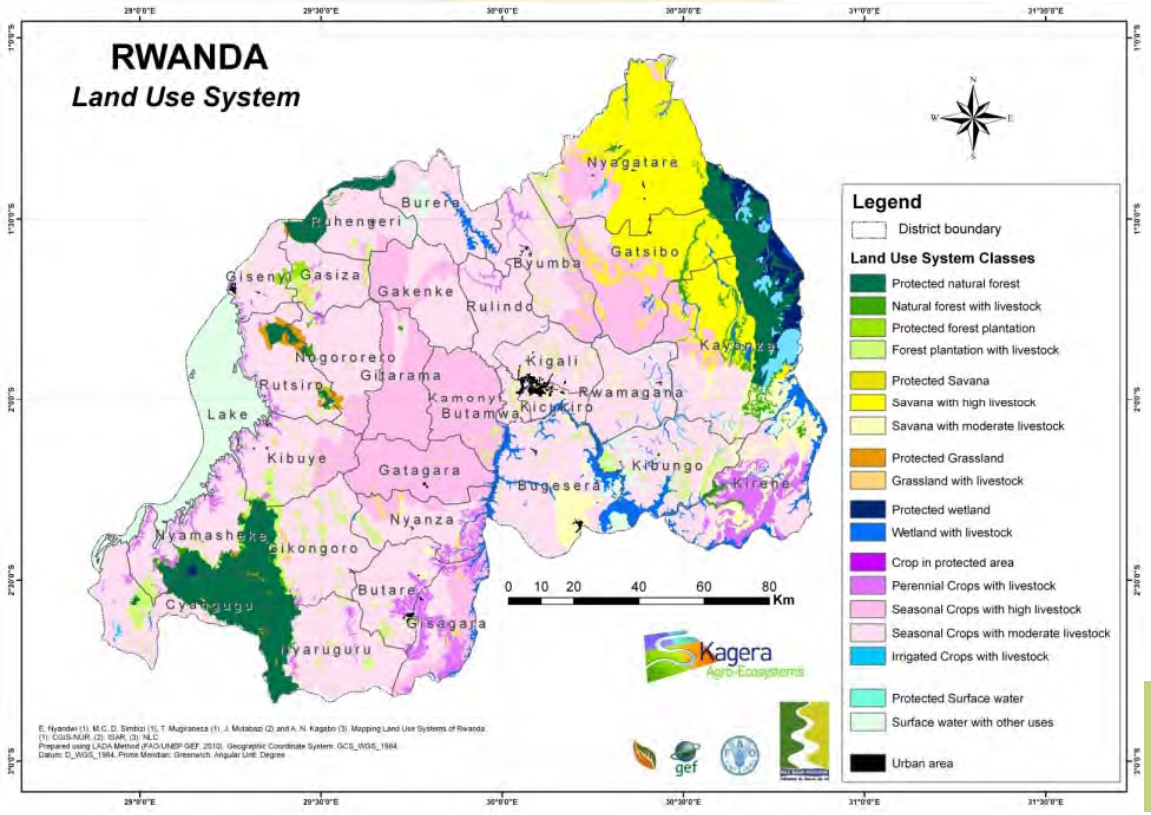
Step1: Land use systems and geographical baseline

Land use mapping and database



-Scale
1: 200.000 to 1:1.000.000 depending on country data and geographic projection

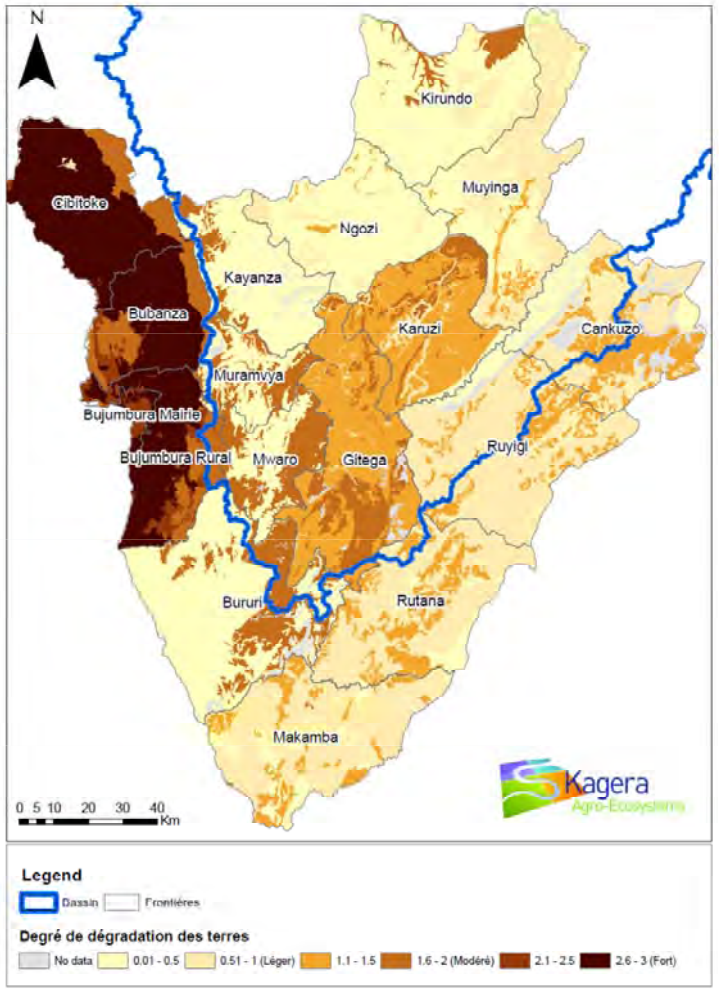
Resulting maps enable non GIS experts to use the database → 4 countries some 320 maps)



Degree of land degradation, Burundi

… weighted for the extent of the 3 LD groups (physical, biological, chemical)

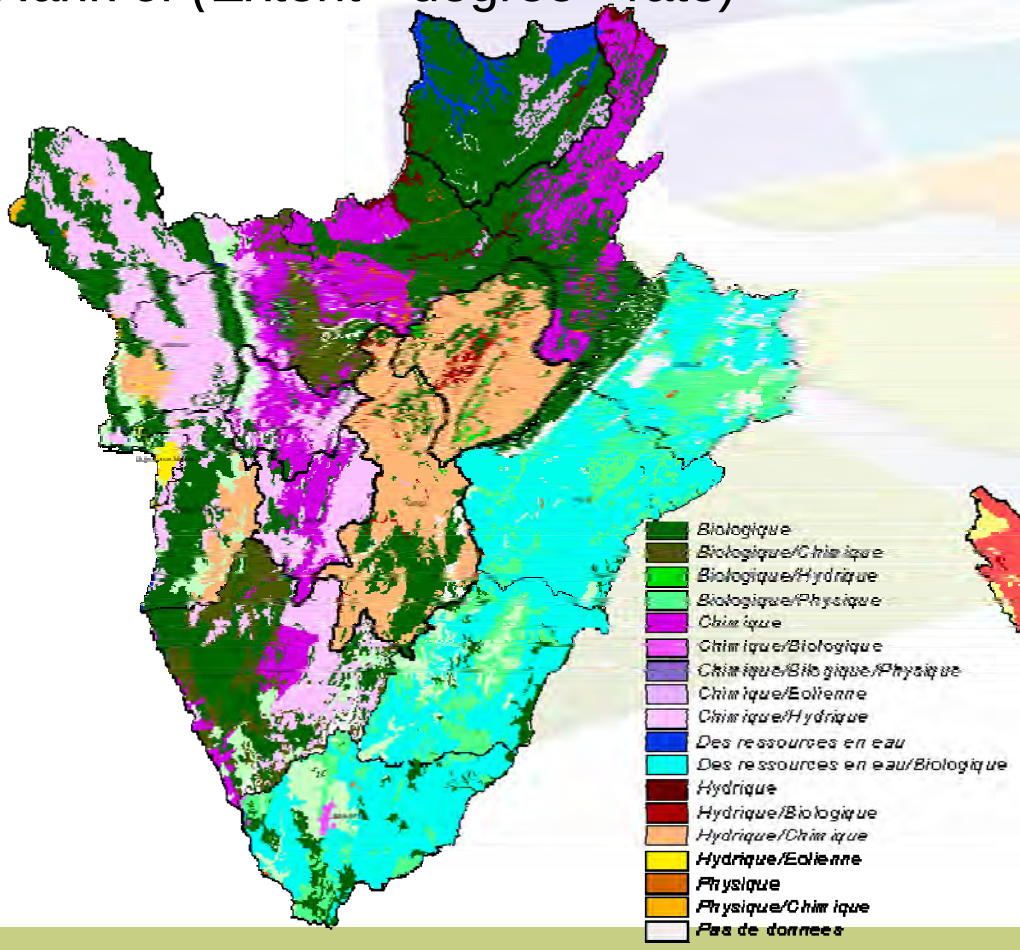
Degradation type	Extent	Degree	Degree legend	Results (ext * degree)
Type 1	10	3	Strong	0.3
Type 2	20	2	Moderate	0.4
Type 3	30	1	Light	0.3
Results (Sum)	**60**	**-**	**-**	**1**



Main degradation types and severity

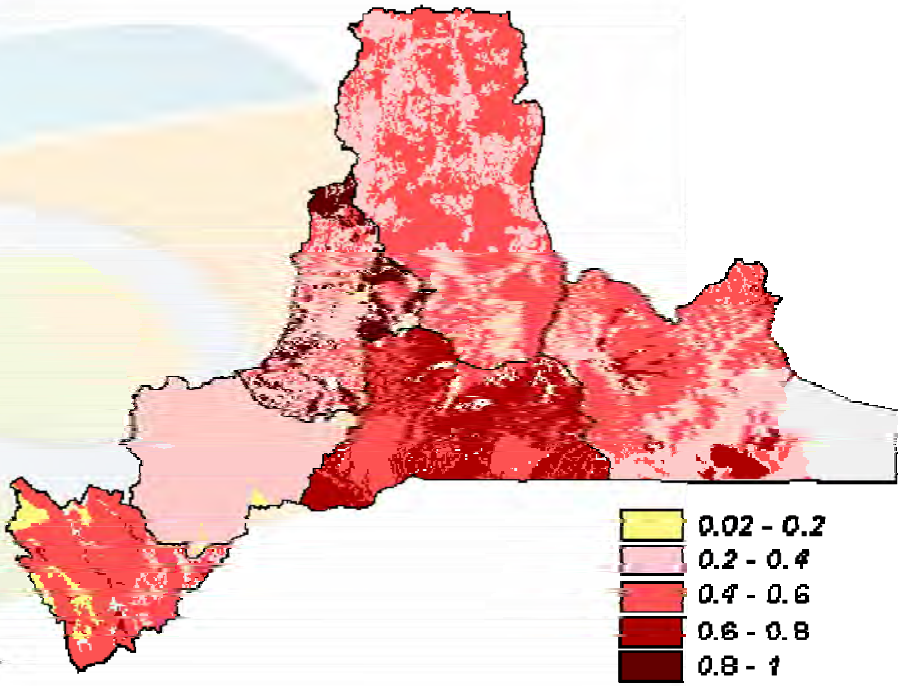
Principal type, Burundi

*Rank of (*Extent * degree * rate)



Severity, Uganda

*(*Extent * degree * rate)

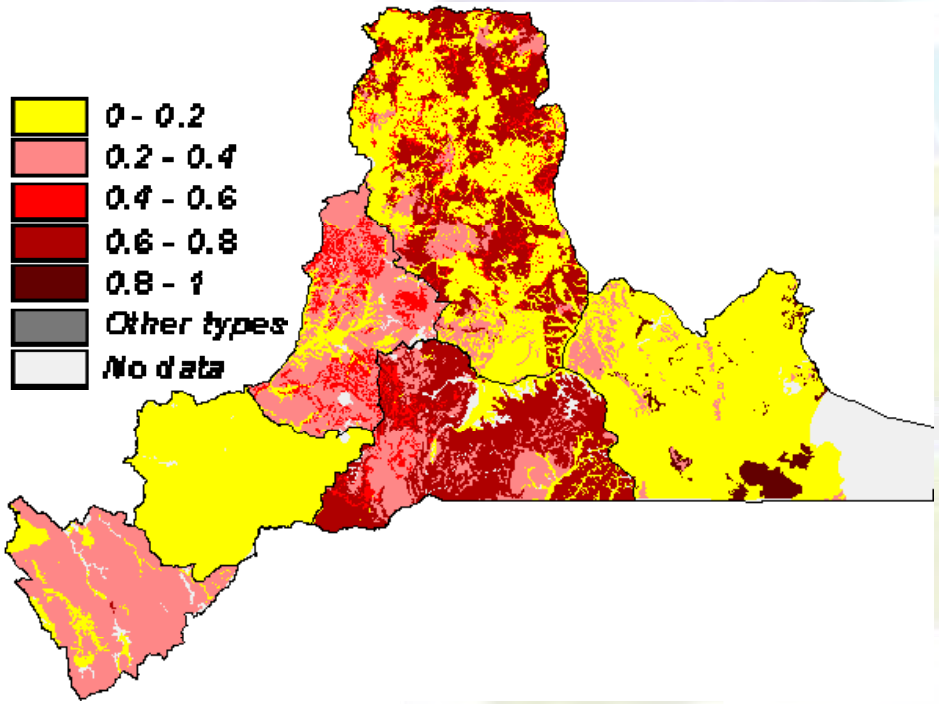


Principal types of LD were :
- biological
- erosion by water
- chemical (soil)

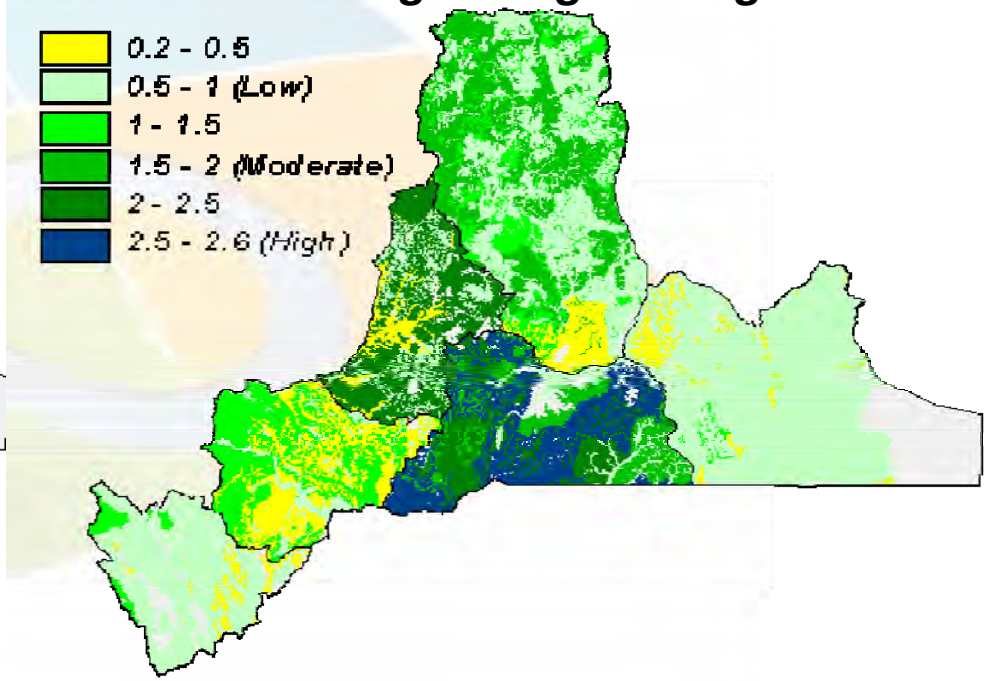
plus others with less extent

Comparison of degradation vs conservation, Uganda

Severity of
Biological degradation



Effectiveness of existing SLM technologies and measures
addressing biological degradation

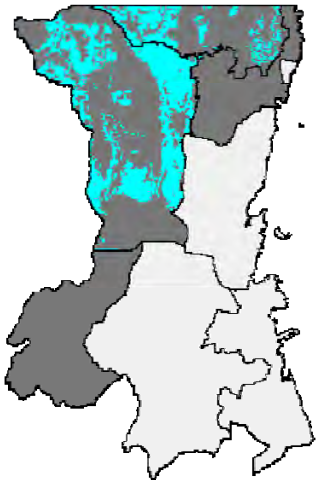


- Low effectiveness of SLM practices that address biological degradation over vast areas
- SLM practices are not closely related to severity of biological degradation

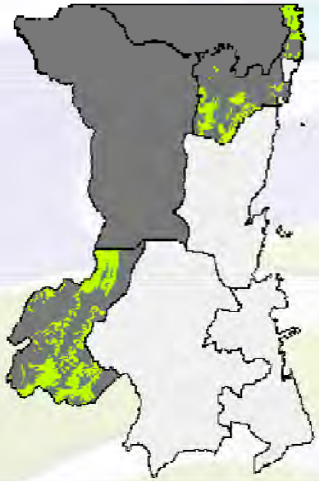
These maps can be used to select areas for targeted interventions

Direct Causes of Soil erosion by water, Tanzania

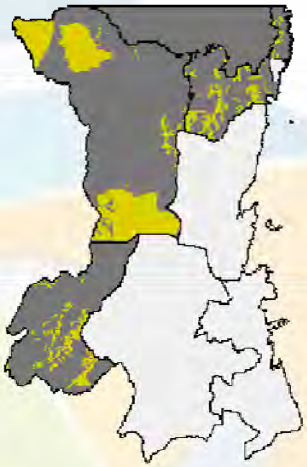
Natural causes



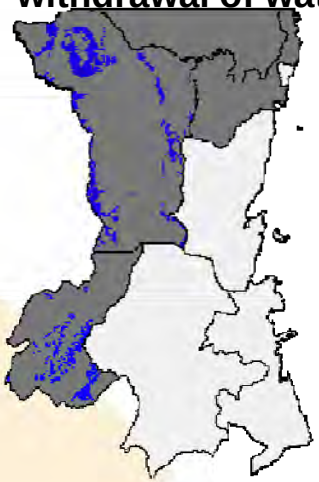
Crop and rangeland management



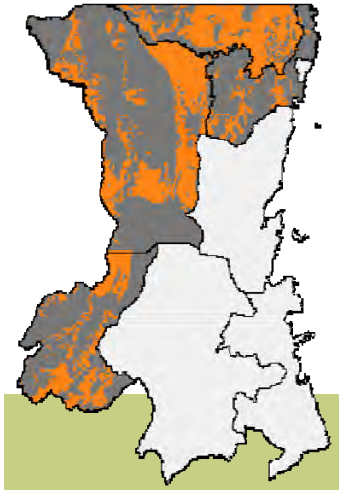
Over-exploitation of vegetation for domestic use



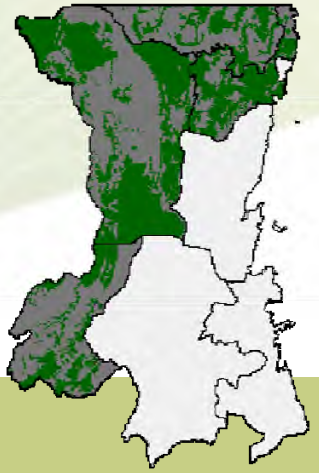
Over-abstraction/excess withdrawal of water



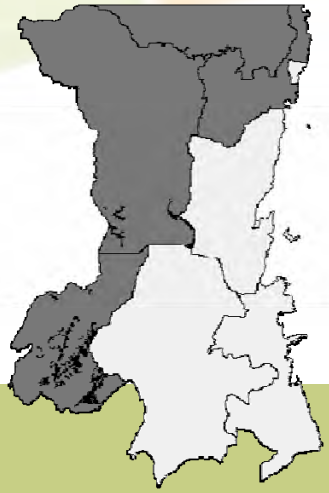
Overgrazing



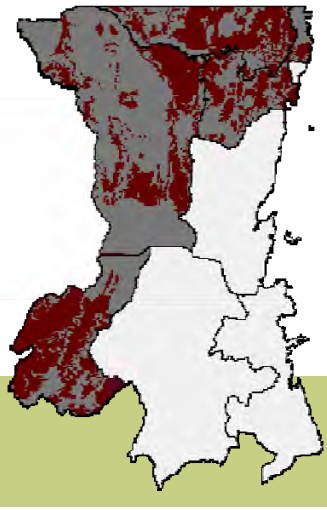
Deforestation and removal of natural vegetation



Urbanisation

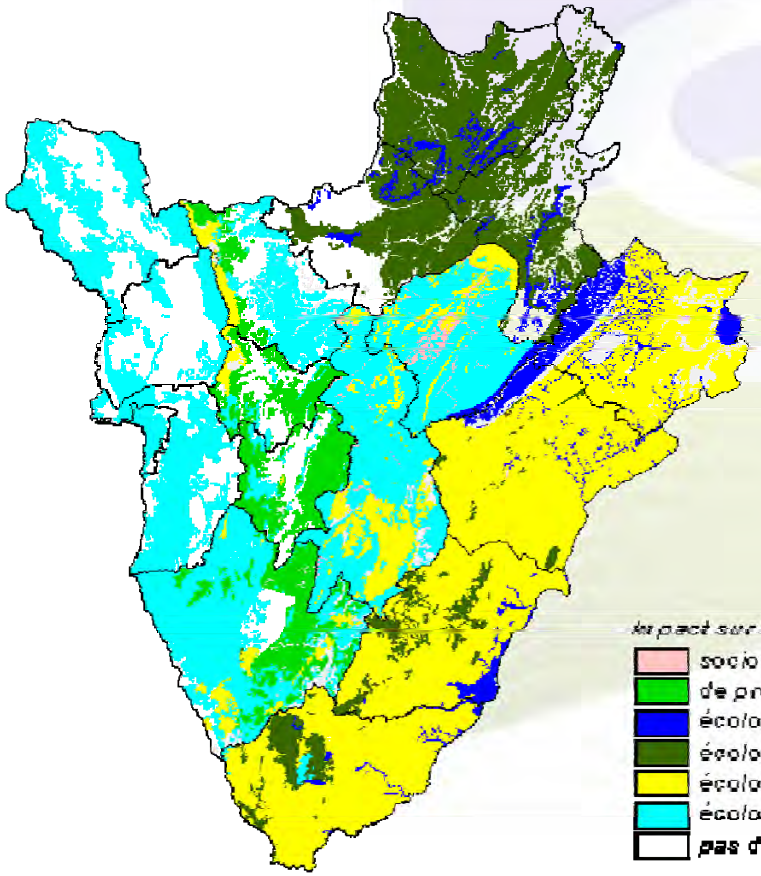


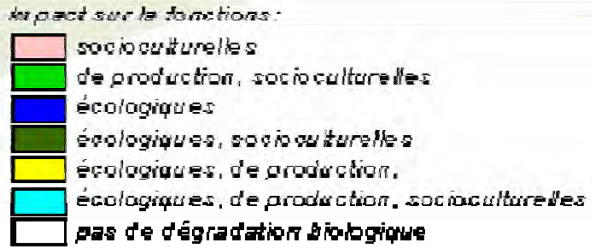
Soil management



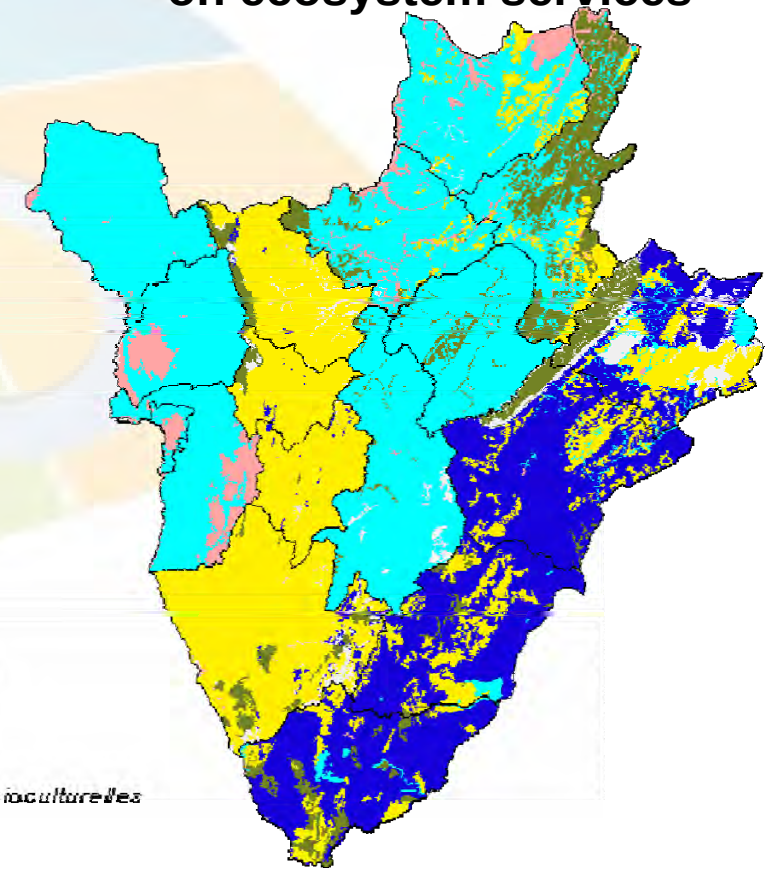
Impacts of SLM on biological degradation

Impacts of biological degradation
on ecosystem services in Burundi





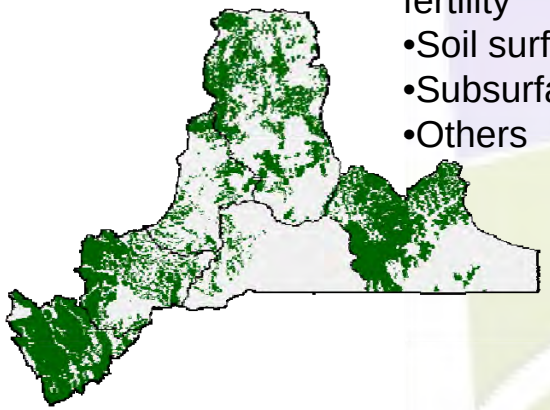
Impacts of conservation measures against biological degradation
on ecosystem services



Example: In the East *impacts on production* are not addressed by SLM

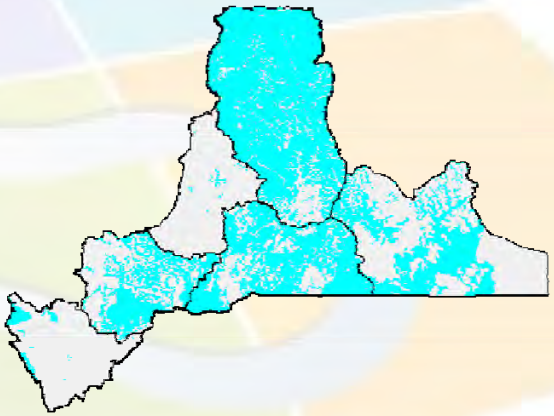
SLM Practices that address soil erosion by water, Uganda

Agronomic



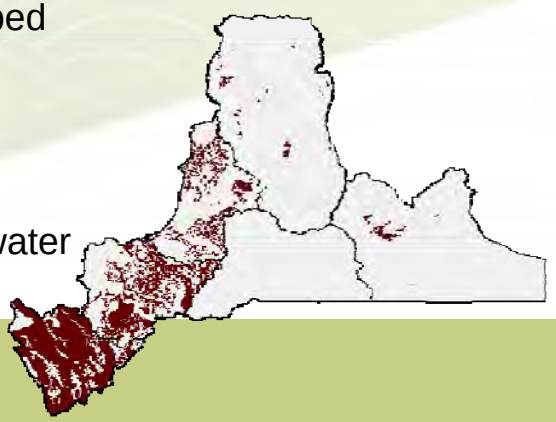
- Vegetation / soil cover
- Organic matter / soil fertility
- Soil surface treatment
- Subsurface treatment
- Others

Management



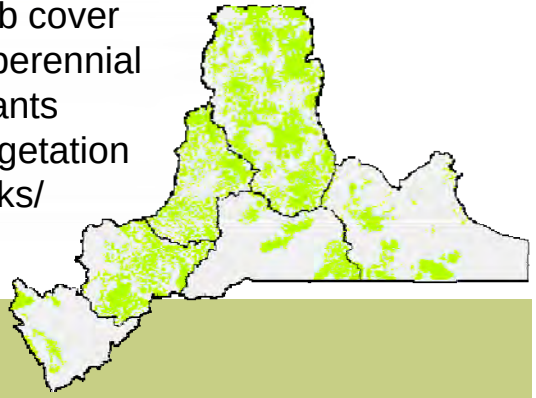
- Change of land use type
- Change of management / intensity level
- Layout according to natural and human environment
- Major change in timing of activities
- Control / change of species composition Waste Management
- Others

Structural



- Bench terraces (bed slope <6%)
- Forward sloping terraces (bed slope >6%)
- Bunds/banks
- Graded ditches/waterways
- Level ditches / pits
- Dams/pans: store excess water
- Reshaping surface
- Walls/barriers/palisades
- Others

Vegetative

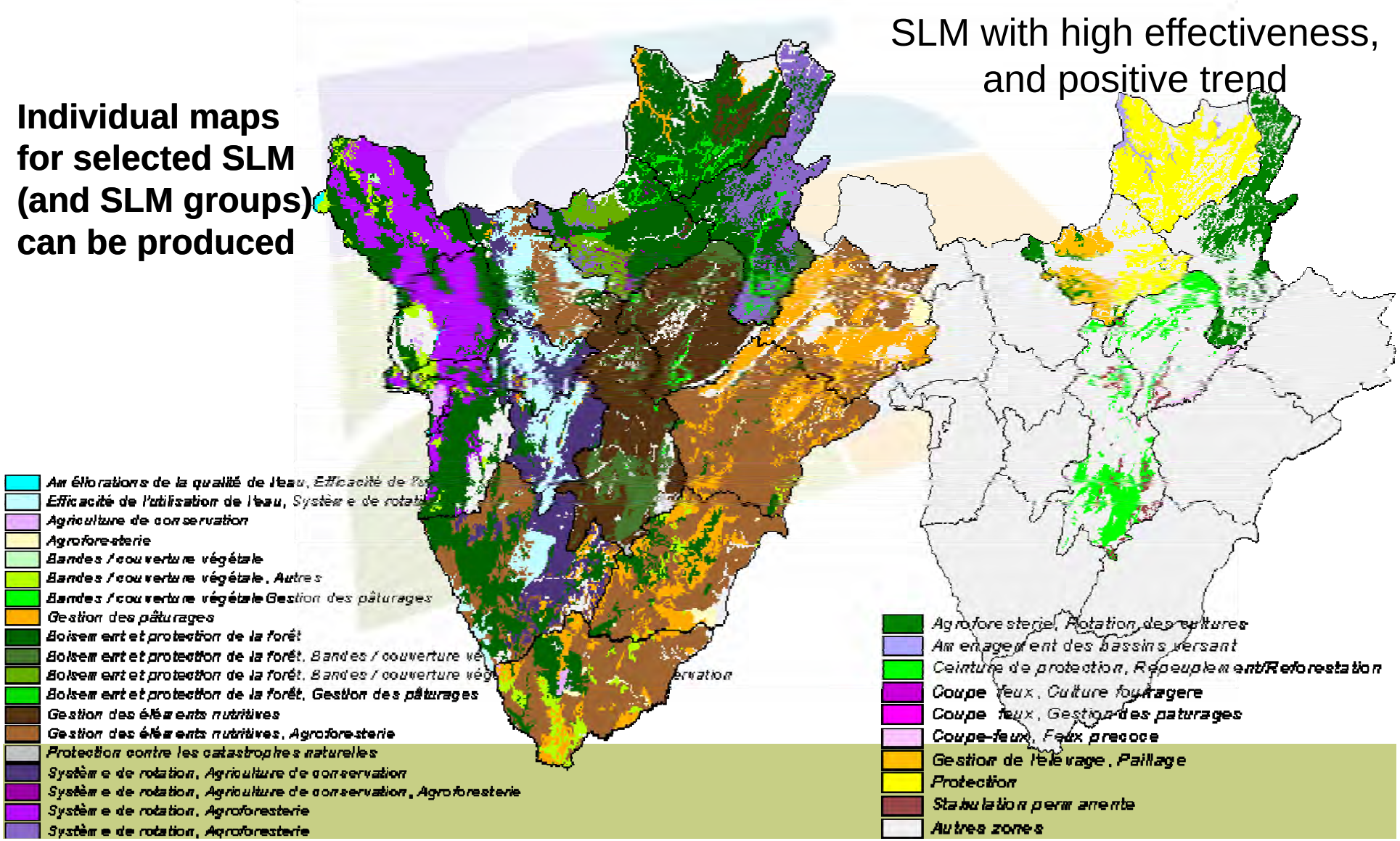


- Tree and shrub cover
- Grasses and perennial herbaceous plants
- Clearing of vegetation (e.g.g fire breaks/ reduced fuel)
- Others

SLM to address biological degradation in Burundi

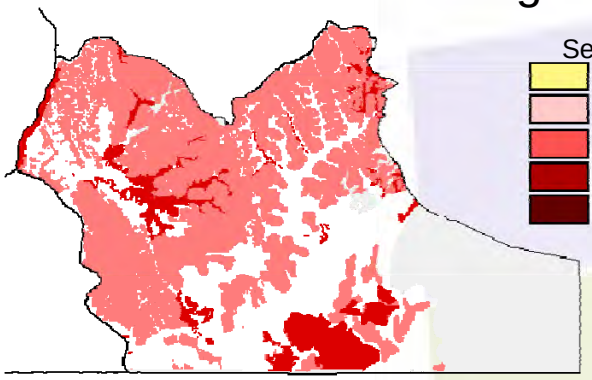
Individual maps for selected SLM (and SLM groups) can be produced

SLM with high effectiveness, and positive trend

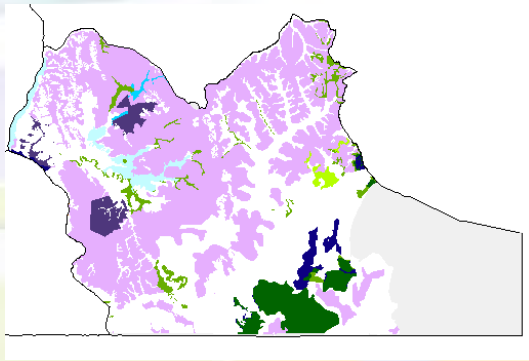


Degradation in Rakai district, Uganda

Degradation > 0.4

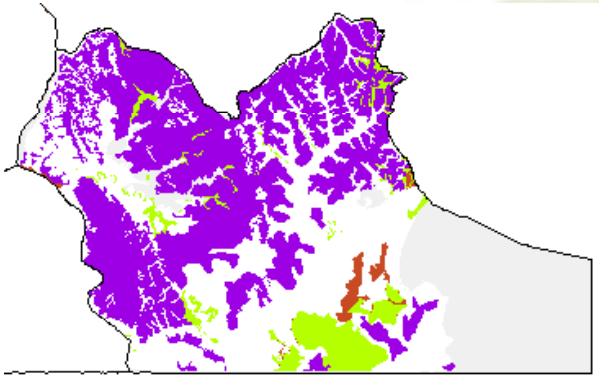


Land use



- Protected natural forest and swamp forest
- Natural forest high livestock
- Natural forest low to moderate livestock
- Protected Forest Plantation
- Forest plantation with livestock
- Protected woodland
- Woodland high livestock
- Woodland low to moderate livestock
- Protected savanna
- Savanna high livestock
- Savanna low livestock
- Protected wetland
- Wetlands high livestock
- Wetlands low to moderate livestock
- Croplands in protected areas
- Perennial crops high livestock
- Perennial crops low to moderate livestock
- Seasonal crops high livestock
- Seasonal crops moderate livestock
- Seasonal crops low livestock
- Irrigated crops with livestock
- Urban areas
- Water surface

Principal Types of degradation



- Biological
- Biological/Physical
- Biological/Physical/Soil erosion by water
- Biological/Soil erosion by water
- Chemical
- Chemical/Biological
- Chemical/Biological/Soil erosion by water
- Chemical/Physical/Soil erosion by water
- Chemical/Soil erosion by water
- Chemical/Water chemical
- Physical/Soil erosion by water
- Soil erosion by water
- Soil erosion by water/Biological
- Soil erosion by water/Biological/Water degradation
- Soil erosion by water/Chemical
- Soil erosion by water/Chemical/Biological
- Soil erosion by water/Physical
- Soil erosion by wind/Water chemical/Chemical
- Soil erosion by wind/Water degradation
- Soil erosion by wind/Water degradation/Chemical
- Water degradation
- Water degradation/Biological
- Water degradation/Soil erosion by water
- No data

- Interestingly, in the most degraded areas there are “protected forests” due to physical degradation
- Areas under seasonal crops also show severe biological degradation and soil erosion

Finalisation and use of maps

Reconnaissance visit of basin (NPMs) and

GIS review (ongoing) for quality control & harmonization of LUS, LD and SLM databases and maps (→ planned to make available data and maps to partners)

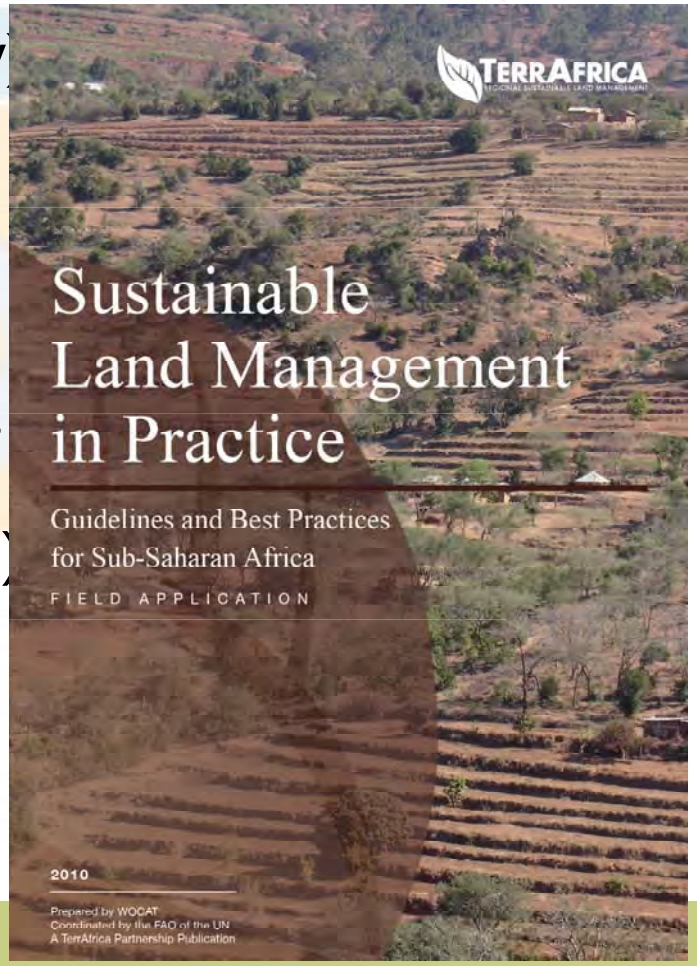
Participatory review of maps and data by NPMs with districts /local experts/knowledge using project selection criteria → to select project intervention areas + required SLM interventions

- → to address identified LD (soil, water, vegetation)
- → to upscale best practices (crop, pasture, range, forest lands)
- → to protect /sustain productivity of high potential lands
- → to conserve biodiversity and mitigate and adapt to climate change
- → and contribute to food security and livelihoods

Assessment + Selection of SLM interventions

1. Training of 12 experts (2 + NPMs/country) in use of SLM Technology (QT) & Approaches (QA) assessment → documentation of best practices

3. District assessment of SLM technologies & approaches with land users+ extension/technical staff ((QT+QA ongoing)
   →documented case studies for scaling up



Documenting SLM knowledge

WOCAT Technologies QT 16 Specification

2.4.3.2 Establishment and maintenance methods for vegetative measures

Initial establishment

activity (in sequence)

1 ...Digging...

2 ...Cutting...

...planting...

3 ...Transporting...

4 ...Transplanting...

5 ...

WOCAT Technologies Questionnaire (Specification - Purpose)

Questionnaire Id	CHN1
Institution Name	Fujian Ningde Perfecture Soil & Water Conservation Office
SWC Technology Name	Horsetail Beefwood Windbreak along seaside

2.2.2. Characterisation and purpose of the technology		as % of total area utilized by land users (who applied the SWC Technology)	only where SWC Techn. is applied
2.2.2.1 Indicate land use types	Intensive grazing	10	☐
	Forest/woodlands	5	☐
	Perennial crops	5	☐
	Annual crops	50	☑
		Total: 100%	
2.2.2.2. Which measures does the technology use?	agronomic measures	3	
	vegetative measures	1	
	structural measures	2	
2.2.2.3. In which of the following categories does the technology fit?	Reduction of land degradation	1	
	Prevention of land degradation	3	
2.2.2.4 Which categories of soil degradation are mainly addressed by the technology?	Soil erosion by water	2	
	Wind erosion	1	
	Soil fertility problem	2	
2.2.2.5 What are the main means by which the technology achieves its observed impact?	Control of raindrop splash	2	
	Control of concentrated runoff (retain/trap)	3	

3 que
techn

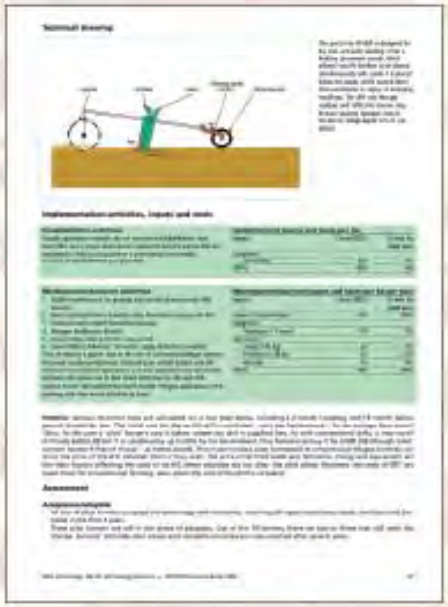
Docu
from

Enteri

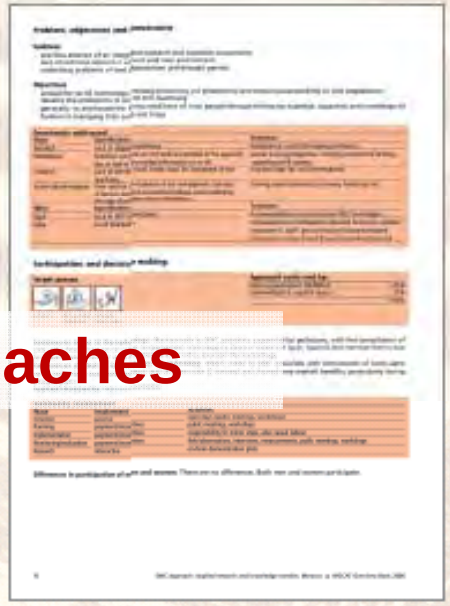
En

Computer data entry form

Standardized documentation of experiences



SLM Technologies

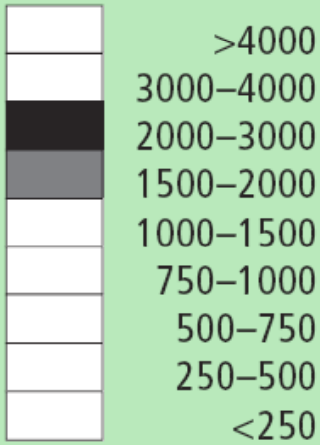


SLM Approaches

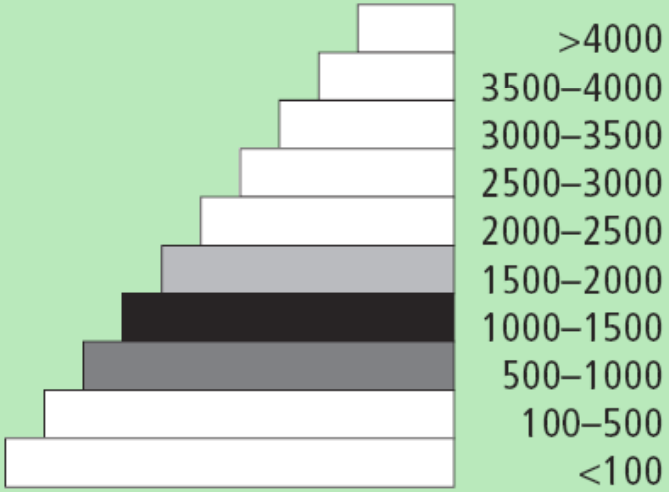
Natural and human environment

Natural environment

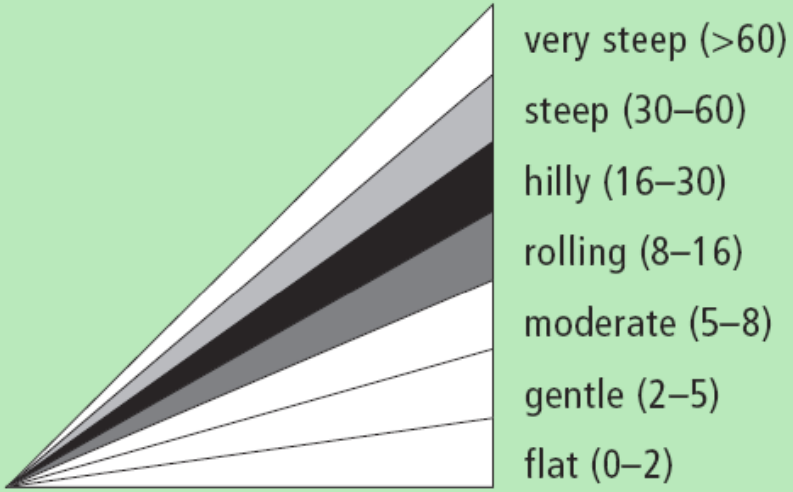
Average annual rainfall (mm)



Altitude (m a.s.l.)

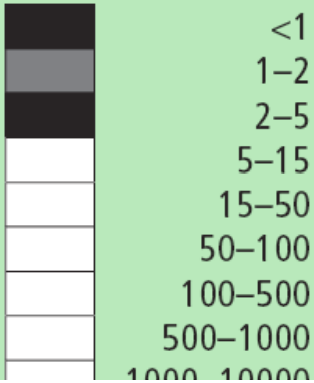


Slope (%)



Human environment

Cropland per household (ha)



Land use rights: mainly individual, partly leased
Land ownership: mainly individual titled, partly individual not titled
Market orientation: mixed (subsistence and commercial)
Level of technical knowledge required: field staff/extension worke
Importance of off-farm income: 10–50% of all income: carpentry, t
farms with intensive agricultural activities (eg vegetable production)

… economics

Establishment inputs and costs per ha

Inputs	Costs (US$)	% met by land user
Labour (5 person days)	15	100%
Equipment		
- Animal traction (32 hours)	40	100%
- Tools (2): Plough and harrow	25	100%
- Stakes (pegs)	4	100%
TOTAL	**84**	**100%**

Benefits compared with costs	short-term:	long-term:
establishment	positive	very positive
maintenance/recurrent	positive	very positive

Impacts (on- / offsite)

Production and socio-economic benefits

+	+	+	fodder production/quality increase (or biomass as mulch)
+	+	+	very low inputs required
+	+		farm income increase
+			crop yield increase

Socio-cultural benefits

+	+	+	improved knowledge SWC/erosion
+	+		community institution strengthenin
+	+		national institution strengthening (
			educational institutions)

Ecological benefits

+	+	+	soil cover improvement
+	+	+	soil loss reduction
+	+	+	soil structure improvement
+			increase in soil moisture
+			increase in soil fertility
+			biodiversity enhancement

Off-site benefits

Grazing land (Pasture)

MONCAT

Rehabilitation of native vegetation cover

To cut wormwood from degraded pastureland in order to rehabilitate native vegetation cover

Researchers have determined that about 70 percent of Mongolia's pastureland is degraded to some degree. The most degraded pastureland is located in the steppe region. The main cause of the degradation is overgrazing, particularly in the summertime when herders settle in one place for a longer time period.
Wormwood (*Artemisia dracunculus*), *Peganum harmala* and *Artemisia pectinata* – all

Left: After clearing

Right: Before intervention

Location: Bayangol soum, Selenge aimag, Mongolia.
Technology area: 1-10sq km

From assessment to documentation and piloting/demonstration of SLM

1. Planned multi-disciplinary expert workshop (in 2011?) for

- quality control/ review → document SLM in Practice (Ts + As) in Kagera basin (supplement TerrAfrica book)
- Training in catchment /watershed mapping (QW) & management and assessing SLM practices for climate change resilience (adaptation and mitigation- C sequestration)

2. Participatory selection and testing/adaptation of SLM "best" practices with target communities

3. Demonstrate SLM best practices and diversified farming systems (FFS, catchment, watershed/landscape, community territory) → adapt and diversify SLM measures for improved cost-benefit and impacts (2011-2012)

3. Monitoring impacts - local livelihoods, commmunity/district NRM, & global environmental benefits

Targeting, Adapting & Improving SLM

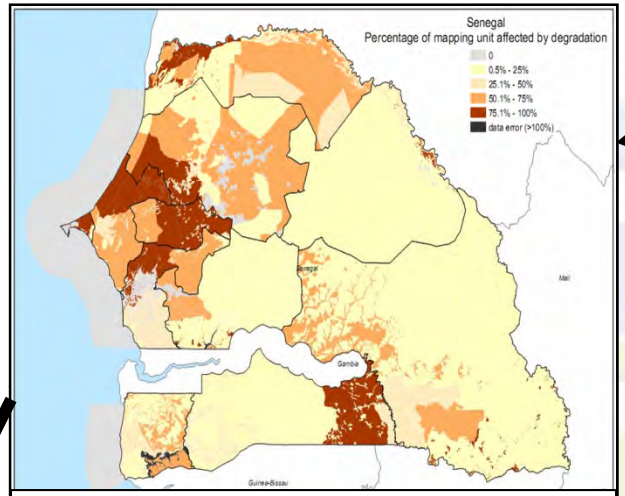
1. Conduct local level LADA-WOCAT LD & SLM assessments in selected watersheds/ community territories →better understanding of LD & SLM responses (DPSIR); causes and impacts on livelihoods and ecosystem services, constraints and incentives

2. Community/catchment planning of land use and SLM practices → land use plans implemented and monitored, bye laws and measures to enhance tenure security, access to resurces

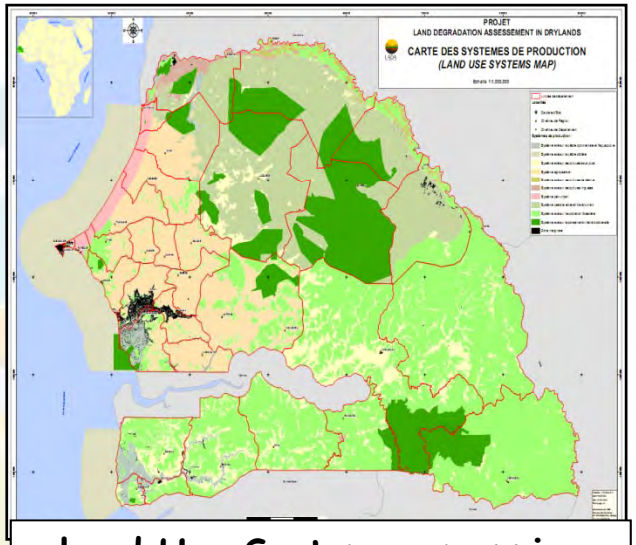
3. Review of Policies, plans (NAP) , legislation and institutional capacities at all levels and identify ways to improve application through
→district and village planning and
→ incentive measures
→ capacity building (training, materials, exchange visits etc)

Selection of Local Assessment Areas

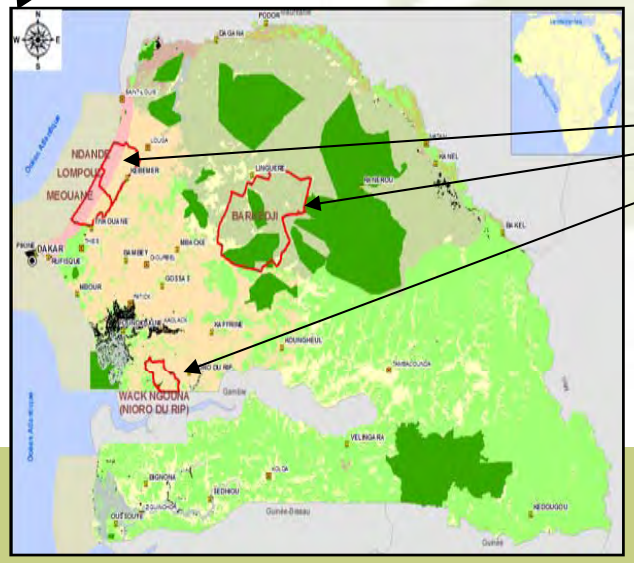
Example of Senegal



% area affected by land degradation



Land Use Systems – mapping unit



3 Local Assessment Areas

- 100's -1000's km2
- in LUS of priority development interest
- contain significant LD and SLM
- representative socioeconomic and agro-ecological context

The steps of local assessment

1. Study area Characterisation

2. Reconnaissance Visit and Transect Walk

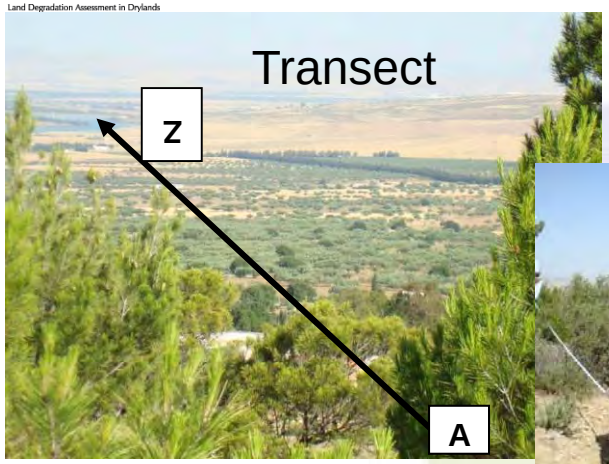
3. Assessing soil, water, vegetation status & trends in relation to LUS/T

4. Key informants, Land users & Household Livelihoods Interviews

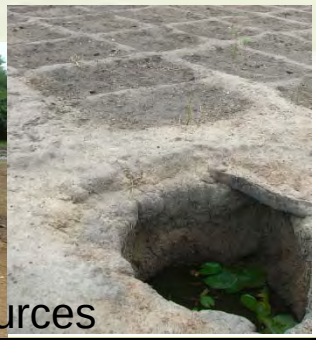
5. Assess SLM best practices in area and efefctiveness

6. Analyse LD impacts & SLM benefits on ecosystem services

The steps of local assessment



Soil erosion / soil properties

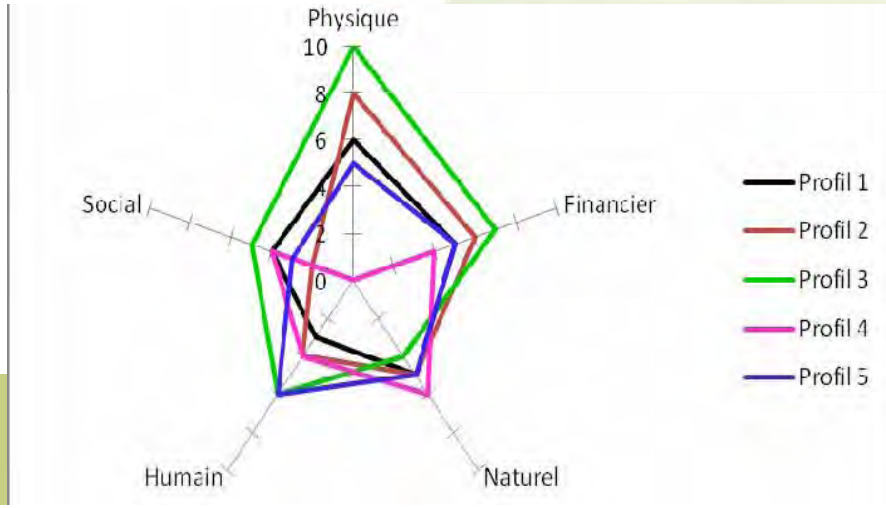


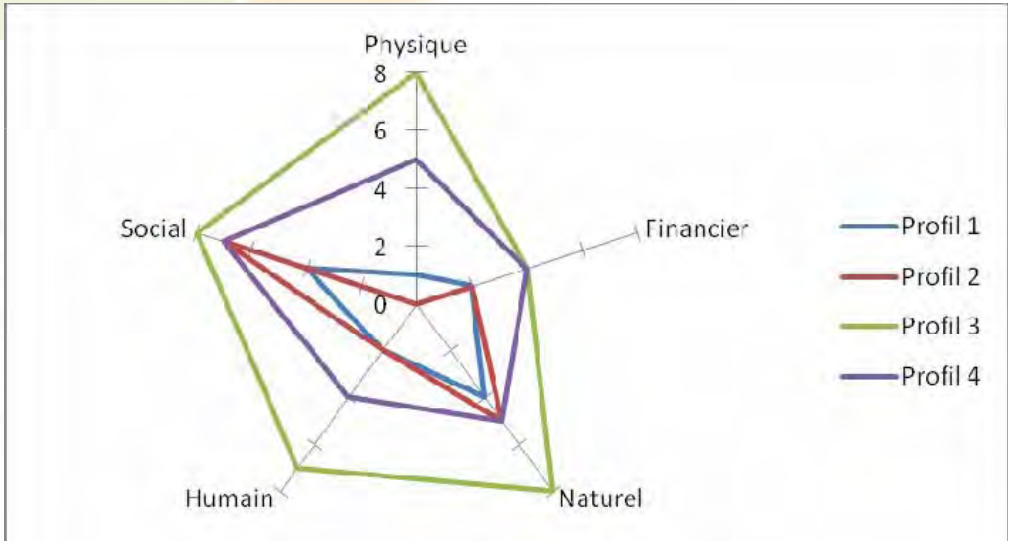
The land use systems and types and resources being assessed determine which indicators and tools are required (e.g. pasture, crop, forest, surface/ ground water)

LADA Local Assessment Results

Improved knowledge & understanding (baseline for monitoring):

- on **LD status and trends**, **causes** (direct & indirect) and **impacts** on land resources/ecosystems and on livelihoods
- on effects of land use/management **practices of different land users** (nature, extent, effectiveness, constraints)
- → **analyse effectiveness of interventions and identify SLM measures for scaling up**





LADA Local Assessment Results

Inform on progress & improve SLM design, planning and implementation:

- sustain/enhance **productivity** (quality, quantity, product diversity)
- sustain/restore **soil, water, biological resources** (quality, quantity, diversity)
- sustain/restore **ecosystem functions** (carbon, water & nutrient cycles, pest, disease and climate regulation and soil formation) and **livelihood**

Costs/benefits		
Production/ economic	**Socio-cultural**	**Ecological**
• Diversified Yield	Food Security	Water retention/supply

36

Participatory land use development

PLUD is a bottom-up approach with focus on planning at local level based on knowledge and consensus among the stakeholders.

Its main goal is to improve land use planning and land resources management by local users, based on dialogue between all concerned parties

Outcome 3: Build SLM capacity in districts & communities

District land use planning

- LD and SLM assessment (LADA-WOCAT) → priority setting
- SLM best practices documented (WOCAT technologies and approaches databases)
- regulations/ bye laws and conflict resolution
- integrated multi-sector approaches

Community-based land /NR management

- **Decentralized participatory land planning, land tenure and resource management**
- **Participatory Catchment Approaches to Soil and Water Conservation** (contour bunds, vegetation strips, terracing, rainwater harvesting etc)
- **Community Investment** (grants, micro-credit, income generating activities and improved livelihoods).
- **PES: Incentives to rural communities for preserving environmental services**

Identification and inventory of a catchment/community territory

Aim for improved NRM and rural/ agricultural development

Characterization of the Territory?

Sæbø today – Typical Norwegian scattered housing

→A piece of land

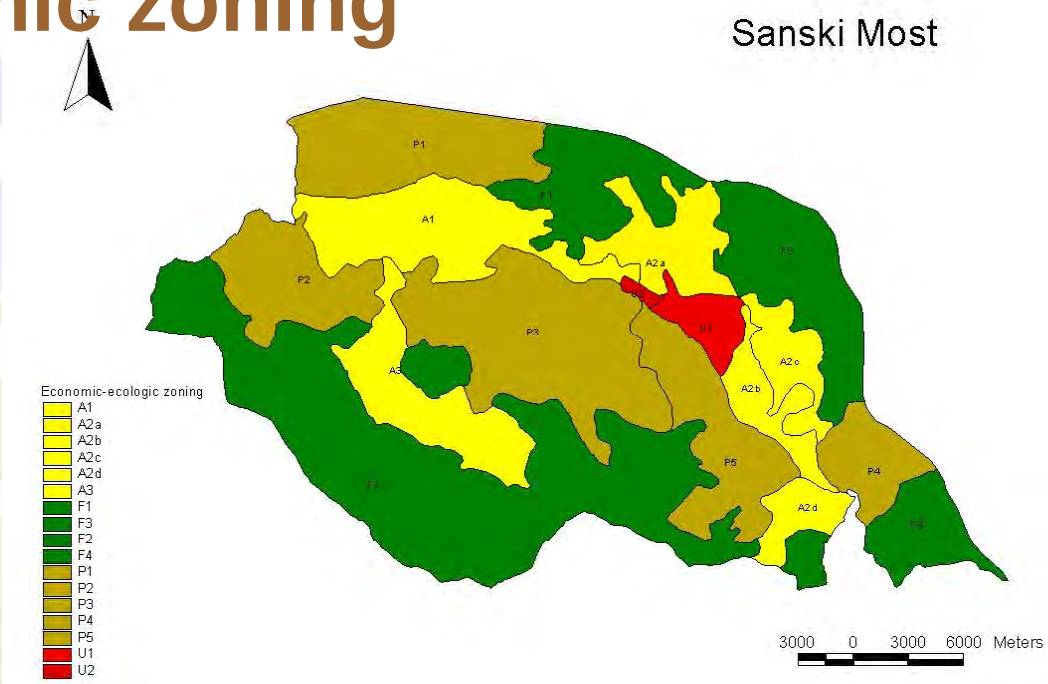
- with its resources
- with the people who can take decisions on it

Sæbø could have looked like this…

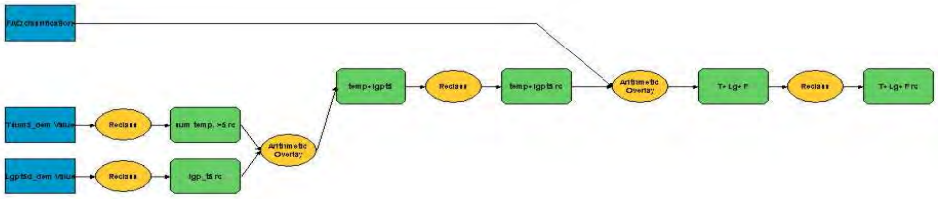
Agro-ecological or agro-economic zoning

- Cadastral borders
- Agricultural land in %
- Cultivable land in %
- Population density
- Size of agricultural fields
- Other…

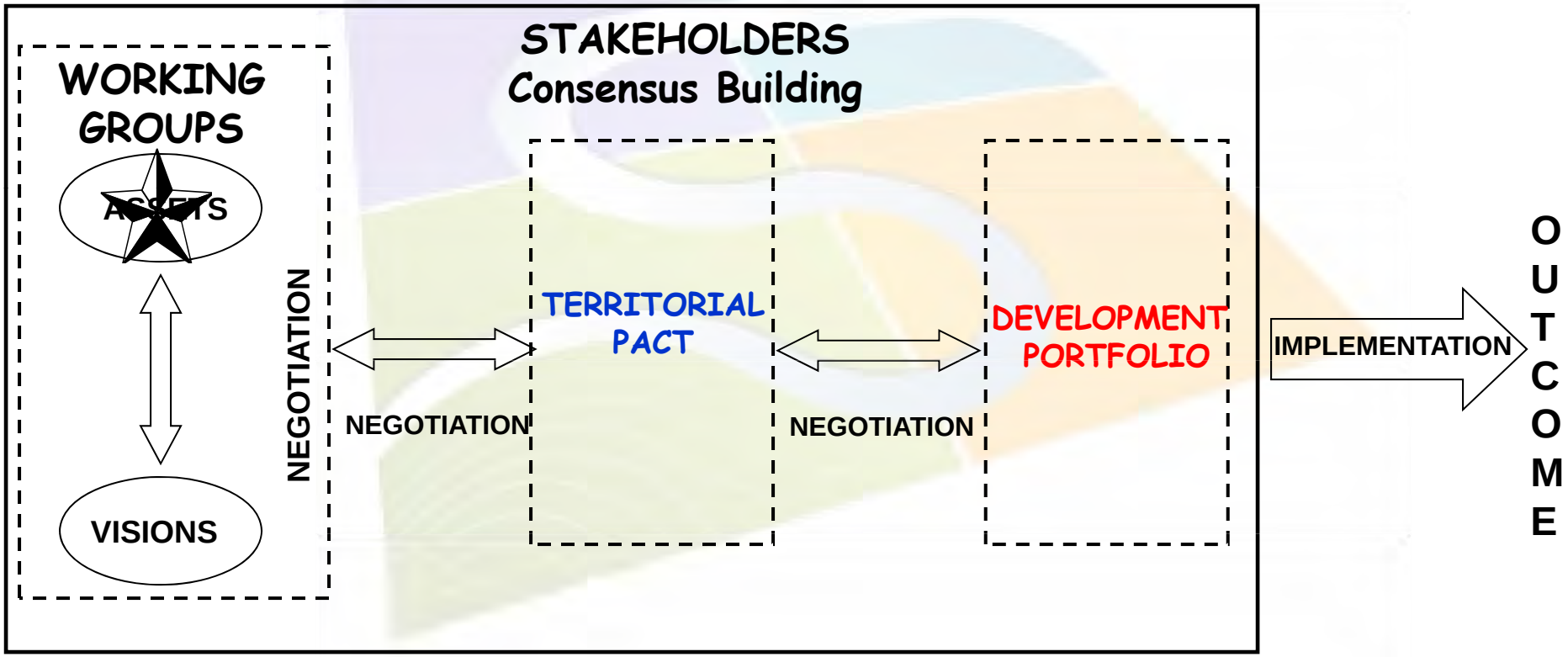
AEZ/EEZ allows the representation of a territory in a static form



- Comparing natural conditions with crop requirements



A Territorial Pact on future land use is a negotiated agreement between the main stakeholders on how land could and eventually should be used in the future.



Development Portfolio is a list of well defined projects in order to implement those priorities.

Watershed management

A watershed is the geographic area drained by a water course. The concept applies at multiple scales from a farm crossed by a stream to a micro-watershed (managed by several farmers) to a large river or lake basin

The Kagera river basin reflects the complex system of watersheds and sub watersheds crossed by this major river and its tributaries while flowing from the source in Rwanda and Burundi to the mouth in Lake Victoria

For effective land and water management each part of the basin and each community territory should be seen in terms of its relation to the river (water regime-flow, hydrology, water supply, water use)

Watershed management

Watershed management is necessary to sustain the multiple services of watersheds for local people, their livelihoods and downstream

- Improvement or stabilisation of water flow (rainy and dry seasons → water users and suppliers (drinking, livestock, irrigation, ...)
- Minimise runoff on the land and resulting soil erosion and suspended sediments → land users (fertility), settlements (reduce damage/risk), water users and suppliers
- Maintain water and soil quality - minimise pollutants (fertiliser and pesticide residues, pollution from local agro-industry etc.) and nutrient load (washed out soil nutrients; eutrophication)→ communities; water suppliers

Community planning and watershed management approaches

Active participation and organisation of land users- they should own and drive the process!

Participatory negotiated process among all stakeholders in developing the land use plan to meet their needs (production, water, energy..)

+ address conflict Strengthen community & farmers organisations, technical support and district LUP capacities

Environmental education upstream and downstream (exchange visits, film, radio)

Incentive measures- added value farm products, marketing, Payments for environmental services (C, biodiversity, water supply)

Participatory negotiated territorial development

Usefulness of technical information

- Definition of territory - inventory of resources and assessment (:D/SLM potential)
- To make realistic and sustainable plans
- To develop projects/actions to ensure efficient use of resources – including finance
- It favours negotiations and brokering – confidence building

Incentivating and Upscaling SLM

5. Design & test Payments for environmental services (PES)

- Carbon sequestration (soil carbon - crops, woodlots; grazing)
- Biodiversity conservation (niche products and ecotourism)
- Water supply downstream for cities (green water credits).

6. Partnership/collaboration with projects/partners for scaling up SLM (2012-2014)

- use of LD and SLM assessment tools (LADA-WOCAT)
- use of catchment/community planning tools
- SLM best practices (techniques and FFS + watershed + PNTD approaches) - testing, adaptation and scaling up
- Implement policies/strategies through district technical and budget support and develop SLM Strategic investment programmes (e.g. TerrAfrica-Uganda)

See websites Kagera www.fao.org/nr/kagera

LADA www.fao.org/nr/lada

WOCAT www.wocat.org

Thank you for your kind attention