SUSTAINABLE LAND MANAGEMENT (SLM)

QUICK GUIDE

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Outline

Definition and Introduction of SLM

Definition:

Sustainable Land Management is an appropriate utilization of land resources inclusive of water, soil, animals and plants for the production of goods to meet the changing human needs while simultaneously ensuring the long term productive potential of these resources. The United Nations defines sustainable land management (SLM) as "the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions".

Introduction:

Agricultural production in Uganda puts more emphasis on the utilization and sustainable management of natural resources such as land. However for productivity to be optimized other factors such as water and nutrients availability are paramount.

Farm productivity of late is on a decline in most parts of eastern Uganda a trend greatly associated with soil infertility caused by increasing land degradation. Globally, land degradation is posing a great challenge to sustaining the biological, economic and social services provided by various ecosystems. The negative impacts of land degradation undermine livelihoods and their well being, environment and the nutritional status especially of a common man.

In response to such challenges especially in Ngora and Amuria, FRA has supported communities in Ngora and Amuria to adopt sustainable land management practices that are appropriate to the terrain in the two districts through capacity building trainings to enhance knowledge.

Guiding Notes ;

- Land a basic resource – the source of livelihood
- Sustainable water resource management
- Sustainable utilization of combined resources for farm production and productivity

- Need to appreciate and maintain naturally existing ecosystems
- Link degradation to the real situation in your area of operation – giving examples like eroded soils, gallies and bare land.
- Challenge the participants to predict the situation in the next 10 years if nothing is to be done today

The drivers of land degradation

Mainly social, political and economic aspects;

- Population increase putting pressure on the available limited resources like land, water due to a change in the land-use patterns for agriculture, land cover and water bodies to meet the daily demands of the growing population.
- Land segmentation that majorly occurs due to the imbalance of the ratio of land vice versa ve the settlements and use, leading to uncontrolled subdivision of the agricultural land hence reduced productivity that poses a threat to income and food security
- Untamed desire to possess more at the expense of Mother Nature especially the common goods such as wetlands, tributaries, water bodies and natural forests are exploited through overfishing, burning down of trees for charcoal, wood and drainage of water bodies
- Poor production practices e.g. Bush burning, cultivating along with the slope and nutrients imbalance whose impacts are detrimental to crop production and productivity, livestock survival and human habitats
- Poor implementation and review of associated laws making it difficult especially in cases were environmental officers have to deal with high profile personalities that engage in land degradation at the expense of communities

Guiding Notes

- Highlight the population trend in the region/ Uganda within 30 years – to stress out demands versus available resources. (2011- 33.5M & 2020- 45M).
- Give familiar examples of bad agricultural practices in your area
- Provide an abstract picture of what will become of the population if the current situation is not managed.

Why SLM

Sustainable Land Management is inevitable because the land is the source of livelihood to the majority – food, shelter and economic development. In Teso sub-region, 100% of any agricultural production is entirely based on land. Land provides important ecosystems services such as watershed protection and biodiversity conservation. Natural resources mainly minerals are majorly found in the land.

Currently, 67% of the land in Teso sub-region is degraded in different ways leading to the decline in agricultural productivity in a bid to meet the demands of the growing population, with evidence of a significant decline in soil fertility. Land degradation and productivity decline result from increased commercialisation of agriculture without adequate protection of socials from erosion, leaching and nutrient loss. Underlaying factors such as population growth, tenure insecurity, poverty, lack of access to roads, infrastructure and markets and limited knowledge on the appropriate technologies as farmers intensive land use.

The agricultural system in Teso and Uganda will suffer from the immense effects of climate change resulting from natural resource mismanagement, land degradation if sustainable land management is not merged into the national and district plans, thus threatening food production systems and therefore the livelihoods and food security of millions of people especially women who depend on agriculture.

Successful sustainable land management relies on multistakeholder support and integration of knowledge on land use and management, strengthening of the extension arm to merge sustainable land management practices into their implementation plans, continuous sensitization of communities on the impacts and benefits sustainable land management practices that can be incorporated into the traditional farming system.

Benefits of SLM

- Increased farm production and productivity as a result of the adaptation of good agronomic practices like mulching, crop rotation, intercropping that boost soil fertility, contain soil moistures and limits the spread of pests and diseases.
- Reduced hazards land disasters associated to poor production practices like floods, landslides, droughts due to the attainment of stable ecosystems in the communities as a result of the adaptation of technologies that reduce or mitigate their impacts on crop, livestock, fisheries or forestry production.
- Improved livelihoods resulting from a reduction in the inequality gaps, use, access to productive resources at individual, household and community level and sustainable and nutritional sensitive agriculture for the realization of food and income security.
- Public support for private investment in soil and water conservation through the adaptation and the implementation of climate-smart technologies and sustainable land management practices to sustainably practise agriculture amid climate change
- Sound macroeconomic management that does not discriminate against agriculture and natural resources, consistent to increase not only land productivity but also awareness of environmental problems and possible solutions at local levels during .agro industrialisation and land-based investments
- Promotion of climate-smart agriculture to restore rehabilitation/restoration of degraded agricultural landscapes

Guiding Notes

- State the possibilities of having improved farm harvests and provide estimates per acre once SLM is observed.
- Link the current hazards to natural ecosystem distortion to drive home a point of SLM

Practices of SLM

Prevent and mitigate land degradation and restore degraded land. These are practices aimed at bettering the productivity of the land and reversing the negative impact of the degraded land. They include but not limited to practices such as;

Reducing soil erosion through; The creation of grass bands, live fence etc. in the boundaries Planting grass on steep land, creating ridges in the garden to limit eroding of the fertile soils that can be washed away through running water or blown by the wind, digging of basin-like holes within the gardens to reduce the speed of running water that could pose a risk of erosion to reduce soil being carried away by running water and the adaptation of good agronomic practices i.e. the farm planning model to Guide how to operate farms, through visual drawing and identifying appropriate crop enterprises for sale and food nutrition to boost food security at the household level.

Improve soil water storage; through Carrying out mulching of cultivable land, conducting minimum tillage/ zero tillage Maintaining soil cover purposed to reduce digging that could lead to exposure and loss of the nutrients in the soils.

Control soil erosion; through water and soil traps, ploughing across the slopes and maintaining grass or soil cover at all times. Manage soil organic matter for soil carbon sequestration Through, conducting carbon farming – use of trees to trap CO2 by planting long-rooted crops and incorporating organic matter into the soil, afforestation and reforestation and Practicing agroforestry, through the planting of gardens or plantations together with trees.

Use of fertilizers as supplements for the organic manure, through proper usage and handling, to reduce negative impacts on the soils. Producing green manure, through growing crops to a certain stage, cut down the leaves in the garden to decompose and produce manure.

Manage and enhance soil fertility through the application of organic matter to Soil, Carry out crop rotation to prevent land conversion and protect vulnerable land, i.e. the use of organic manure from the dropping of animals or interchange kraals to gardens. Crop rotation according to what crop was favourable in what season, intercropping both dip and shallow-rooted crops to improve soil quality.

Guiding Notes

- Request for familiar practices from the participants
- Focus on applicable practices to the participants

Categories of SLM measures

Structural measures;

Creation of terraces, dams, pans and ditches

Management measures;

Such as zero-grazing (cut and carry system) not very common in the sub-region

Vegetable measures;

Grass strips, hedges/ live fences and tree crows

Agronomic measures;

Green cover, organic manure, conservation tillage

Factors that determine soil fertility

- Soil depth. Deep soils afford plant roots greater volume for penetration.
- Good drainage to avoid waterlogging.
- Good aeration to promote healthy root development and functioning.
- High water retention capacity.
- High levels of nutrients. The nutrients should be in a form that is readily available to plants.
- Optimal soil PH. Soil pH should not be alkaline or acidic but instead, be neutral.
- Freedom from soil pests and diseases.
- Presence of adequate organic matter and living organisms.
- Soil texture and structure.

Ways in which soil fertility is lost

Soil fertility may be lost in many ways. Some of these areas a result of human activity while others may be out of our control. The most common ways in which soil fertility may be lost include:

- Soil erosion through various agents like water, wind and animals.
- Soil capping – This is the formation of an impermeable layer of soil on the surface which obstructs water infiltration leading to run-offs.
- Leaching of nutrients – This is especially serious with nutrients such as nitrogen, which is highly soluble in water, very common on sandy soils.
- Loss of nutrients through the sale of farm produce off the land without replenishing the nutrients removed in produce.
- Development of a hardpan a short distance below the surface of the soil,

which impedes water percolation as well as root penetration. Hard pans may be caused by repeatedly ploughing at the same depth or settlement of fertilizers residues underneath the top-soil layer.

- Loss of organic matter through rapid oxidation by soil microorganisms due to unduly too frequent cultivation.
- Weeds – These compete with crops for nutrients and moisture.
- Burning of weed and crop residues in the gardens.
- Alteration of soil life, through misuse of certain fertilizers.
- The sun - In the tropics, too much exposure to the sun may lead to high soil temperatures and thus loss of soil fertility through less active soil life and drying, among others.

Guiding Notes

- Emphasise on applicable categories – no terraces in the low lying areas of Teso sub-region.
- Improve on the existing categories practised to the level technically recommended.
- Emphasis on the determinants of soil fertility and ways in which soil fertility is lost

Replenishment and Reduced Loss of Soil Nutrient

Soil nutrients remain key for any productivity to be realized. The reduced loss and replenishment of soil nutrients can be achieved by feeding the soil.

The soil should be treated as a living entity. Like a human being, it needs to be well fed to live, thrive and be productive. Soil conservation measures should be put in place and increased biological activities in the soil promoted. This will help the soil to build humus, which is the cornerstone of the soil and its ecosystem. Humus is crumbly, dark-black stuff that makes plants grow and is a product of soil biological activity. It is full of nutrients, offers a favourable soil pH, is porous and spongy to permit air penetration and can hold moisture without becoming too soggy. The following are ways to preserve and build humus in the soil:

- **Nutrient release.** The process by which organic matter and humus break down and release nutrients into the soil is called mineralization. Humus is the end product of organic matter decomposition, but it too can be mineralized under the right conditions. Adding organic matter to the soil will lead to the formation of new humus to replace the reserves lost due to mineralisation. Direct ways to increase humus in the soil include adding organic matter to the soil in the form of dry or green material (mulch), green manure and compost, among others. During the dry season, a lot of nitrogen accumulates in the air and is released as nitrogen flush at the onset of the rains for use by crops.

- **Manure:** Use manures that have been composted to kill plant pathogens and weed seed. Manures vary greatly in their content of nutrients. Their composition varies according to the type of animals, age, and condition of the animal, kind of feed used, degree of decomposition, moisture content and the amount of bedding litter. Some of the best features of animal manures are that they provide most of the micronutrients needed. It also helps to establish biological activity from the microorganisms in the manure

- **Mulching.** Mulching is mostly used to suppress weeds, protect the soil from extreme temperatures, reduce the impact of raindrops and improve water infiltration as it holds water. It is also important as a means of building soil

humus. Materials that can be used as mulching include crop residues, grasses cut from the surrounding pastures or fallow lands and waste plant materials or by-products from the processing of crops such as sunflower cake. Mulch does not only build the soil humus but also conserves the soil moisture and prevents contamination of the plants from soil-borne diseases arising from water splashes during the wet season. It also helps the environment around the plant to dry quickly after the rains and minimize the development of damaging moulds and fungus that thrive on the plant when the air around it is damp.

- **Green manures.** Green manure is any crop grown for purposes of feeding the soil organisms as opposed to being harvested for human or animal consumption. It requires very little from the farmer, just the cost of seed and labour, and produces good organic matter where it is needed. Green manure crops include sun hemp, lablab beans, velvet beans, and a wide range of other leguminous crops and non-legumes such as mustard. Agro-forestry plants such as pigeon peas, tephrosia and sesbania sesban, among others, can be used.

- **Compost.** Adding compost manure to the soil increases the levels of organic matter that is in short supply in the majority of tropic soils. The effects last for several years. When you add compost, you increase the levels of nutrients available to the crops leading to better yields. Also, the soil can store moisture for longer periods, thus helping to protect crops from drought. The soil structure is improved and strengthened, making it less vulnerable to erosion.

- **Agroforestry.** This refers to land-use systems and practices where trees and shrubs are deliberately combined on the same piece of land with crops. The trees will add or improve the soil humus, as the leaves fall, cover the soil and later rot. The roots will hold the soil particles together, hence control erosion. Leguminous trees will fix nitrogen. Agro-forestry helps the soil to recycle nutrients.
- **Residue management** – during any harvesting, it's greatly advised only the edible parts to be picked and the entire plant or crop parts retained within the garden. It's bad practice to harvest corn /maize for example and also carry away the stalk.

Stalk left in the field after harvesting maize cobs

Minimum tillage- also known as zero tillage, It's a concept of ensuring that there is no much disturbance of the soil through continuous tilling.

Application of composite manure; the seven steps involved are;

- Choosing type of the compost bin- open pile or bin
- Location for composting – location that is flat, well-drained and sunny is preferable and perhaps at the backyard
- Create alternate layers – start with the layer of course material like the twigs to allow for the drainage and aeration, cover this layer with the leaves. Then simply alternate between layers of green material carbon-rich materials
- Add kitchen and yard waste as they accumulate
- Continue to add layers repetitively until the bin gets full
- Maintain your bin through keeping the material wet and also turning the compost once a week to help the breakdown process and eliminate odour
- When ready after complete decomposition then utilize the compost in the gardens

Recommended Practices for Teso Sub-Region

Depending on the level of the farmers' interest within Teso sub-region, but the highly recommended practices include but not limited to the following;

- Agro-forestry especially along with the vulnerable landscapes and prone to flooding areas, that act as windbreakers and to reduce soil erosion.

- Crop rotation for easy utilization of soil nutrients from all levels across the soil profile, also according to what crop is favourable in what season, it is a means to improve their soil quality.

- Maintaining the soil cover at all times to reduce on soil water losses through pruning of leaves within the garden, which decompose and produce manure, or harvesting, for instance, cassava and living the leaves within the garden that decompose to form manure, or harvesting both the cassava and leaves and replanting them.

- Practice compost manure for the addition of organic matter to the soil to boost soil fertility, organic manure can be made through the decomposition of waste i.e. peeling.
- Kitchen gardening to utilize resources like water, organic manure accessible within the household to enhance the production of early maturing crops like vegetables to enhance nutritional values consumed daily.

- Intercropping of both shallow and deep-rooted crops to boost fertility, destroy pest and disease cycles for optimum agricultural production and productivity

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