Climate Smart Agriculture (CSA): Improved Fodder Management

Climate Smart Agriculture addresses the challenges which climate change (CC) poses to agricultural production. It is a pathway towards sustainable development and food security and is built on three pillars:

- Increasing agricultural productivity (crops, livestock and fisheries) and income
- Enhancing resilience or adaptation of livelihoods and ecosystems towards climate extremes
- Reducing and removing GHG emissions from the atmosphere (FAO 2016)

An agricultural technique or practice that contributes to the achievement of these pillars can be considered climate smart. But often, different techniques perform differently over the three pillars, and therefore have to be combined in an integrated CSA approach to complement each other and maximize their benefits (Worldbank 2015, FAO 2015).

Climate-smartness Categories

In the 15 climate-smart villages established by CGIAR in Western Kenya for example, a farm is only counted as climate smart if it applies practices that are strong in all climate-smartness categories:

- Soil and water conservation structures
- Integrate perennial and annual crops
- Improved livestock enterprises
- Diversification of enterprises
- Readiness of a farm plan

Sometimes it is difficult to assess how climate smart a specific agricultural technology is in a certain context. Climate-smartness indicators, divided in three categories, try to indicate this and thereby support implementation.

- CSA-Technology indicators evaluate beforehand how well technologies will achieve CSA goals.
- CSA-Policy indicators asses to which extent the enabling environment (e.g. policies) support the implementation of CSA.
- CSA-Result indicators monitor the short term impacts of CSA interventions (Rawlins 2015).

The World Bank in collaboration with international partners has developed three indicator sets to support CSA implementation at the national and sub-national levels. The indicators will guide CSA investment decisions, and assist national governments, agricultural specialists and natural resource managers in evaluating the productivity and climate benefits of sustainable land management operations.

How do you implement CSA?

CSA requires site-specific assessments to identify suitable agricultural production technologies and practices (FAO 2015).

For Kenya adapted practices include:

- Soil and Water conservation measures increase ground cover and use little water.
- Manure and compost can decrease use of chemical fertilizers and adequate manure management for biogas production can reduce methane release.
- In agroforestry systems trees and crops coexist and benefit from each other.

Activities that amplify Climate Change effects include:

- Inadequate tillage practices that expose the soil release carbon stored in the soil.
- Indiscriminative use and wrong timing of agrochemicals harm the ecosystem.
- Clearing land and burning plant biomass for farming releases carbon stored in the soil.

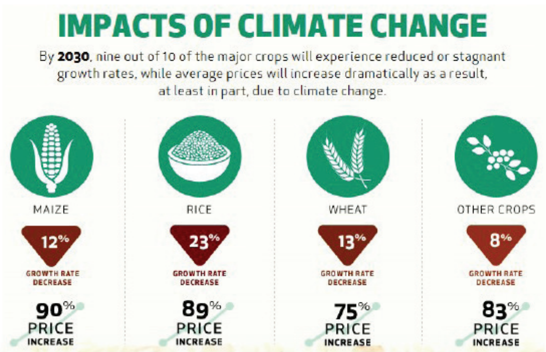
Why CSA?

Therefore CSA is a basket of agricultural practices and techniques that not only aims at increasing profits and resilience for farmers but does so without harming, often even bettering, environmental parameters. It improves input efficiency, soil quality and benefit-cost returns for farmers while limiting the expected negative effects of climate change on Kenyan agriculture for producers and consumers (Worldbank 2015, FAO 2016).

What is climate change?

Climate change (CC) is the long-term or permanent shift of average climatic conditions (FAO 2015). They result in changes of weather patterns and directly affect agricultural production. Kenya is highly vulnerable to the impacts of climate change. Some of the most visible changes are:

- Increase in mean temperature:
- Shifts in the onset and end of the rainy seasons;
- Changes in duration, amounts and intensity of rainfall;
- Higher frequency of droughts and floods;
- Changing strength and direction of winds;
- Higher temperatures and stronger solar radiation;
- Occurrence of more and new pests and diseases (FAO 2015, Worldbank 2015).



Kenya's agriculture is especially vulnerable to climate changes[1] because of its large dependence (98%) on rainfed agriculture (Worldbank 2015). Depletion of water and pasture resources are expected consequences under which mainly smallholder farmers will suffer. They might lose income and livelihoods through crop failure and livestock losses. A 30% drop is expected for the productivity of crops, livestock,forestry, fisheries and aquaculture, endangering Kenya's foodsecurity and rural livelihoods (FAO 2015).

Mankind is, however, not only negatively affected by CC, they also contribute to it by emitting greenhouse gas (GHG) emissions to the atmosphere. Agricultural production is next to industry and transportation a key contributor to CC. Several activities, such as clearing land, burning of biomass or wood, some tillage practices or indiscriminate use of agro-chemicals all amplify the effects of CC by releasing GHG (FAO 2015, Worldbank 2015). On the other hand, agriculture has the potential to contribute to reducing GHG emissions. A variety of adapted agricultural practices, summed up under the term "climate smart agriculture", minimize harmful effects or even reduce emission or absorb GHG.

1 However, more positively, such climate change projections suggest that, in some places, opportunities for crop diversification and intensification may emerge, including options for expanding into places where cultivation is not currently possible.

Improved fodder management

Improved fodder management comprises a broad range of agricultural activities. Next to silage and hay making, which are presented here, the planting of adequate fodder crops (e.g. desmodium, dolichos lablab or napier grass) is a crucial contribution.

Haymaking

The main steps in haymaking are:

- Mowing grass down.
- Turning grass to ensure even drying, this helps to dissipate heat and reduce the danger of mold development and fermentation.
- Windrow, i.e., organizing the mowed herbage into rows for collection. In hot and arid condition, this protects the crop against shattering and bleaching.
- Trussing or collecting into small stacks is a possible interim step of drying.
- Removing from field and storing safely, with or without baling (FAO 2015).

Harvesting and baling of fodder grass

How to make silage

Silage making is the conservation of moist fodder material with a high water-soluble sugar content through fermentation in the absence of oxygen.

Step 1: Select a water-proof tube and tie the bottom

Step 2: Pack the fodder material tightly into the tube

Step 3: Cover the tube and store the tube silage safely

Why improved pasture and fodder management?

Improved fodder management techniques are very important to ensure constant supply of feed for animal husbandry. If pasture production depends on rainfall only, droughts can lead to fodder scarcity and livestock losses. Without storing techniques, like hay or silage making, a surplus of forage cannot be used to ensure fodder in drought times. Hay and silage production also allow stall feeding instead of grazing, which leaves meadows time to regenerate and boosts productivity through increased nutrient content.

High roof hay store

But before that, a good pasture management is crucial to ensure good quality forage production. Some species such as Desmodium or Napier grass function as a natural pest control. Adequate fodder species also protect the soil below functioning as a vegetation cover that prevents erosion and drying out. The removal of a vegetative cover and soil erosion reduce not only the pastureland's productivity but at the same time its capability to sequestrate carbon dioxide. Thus it further releases soil-carbon into the atmosphere and fosters climate change (FAO 2015).

How does improved fodder management contribute to the three pillars of CSA?

Improved fodder management practices' contribution to the three pillars of climate change differs significantly:

1. Increasing agricultural productivity and income: Improved soil cover and high-yielding quality pastures contribute to livestock productivity and thus income if applied properly.

2. Enhancing resilience or adaptation of livelihoods and ecosystems towards climate extremes: Adequate, less drought affected, fodder species increase the drought resilience of livestock keepers. Storage methods like hay or silage making further decrease drought vulnerability because even if the fodder crops dry out, a certain stock is still available to survive the worst drought months.

3. Reducing and removing GHG emissions from the atmosphere: Fodder management that ensures vegetative cover and avoids soil erosion, protects the pastureland's capability to equestrate carbon dioxide. High-yielding quality pastures further reduce methane emissions from ruminants. FAO also expects very high positive impacts on Nitrogen and high positive impacts on CO_2 emissions (Worldbank 2015, FAO 2015).

Main sources:

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Diagrams:

Page 1: CSA Pillars, CalCAN 2010; http://calclimateag.org/what-is-climate-smart-agriculture/
Page 2: Projected impacts of climate change on main crops in Kenya by 2030, Tegemeo Institute 2010
Page 3: Climate Smart Agriculture. Training Manual for Extension Agents in Kenya. FAO, Ministry of Agriculture, Livestock and Fisheries - State Department of Agriculture. FAO Kenya, 2015, pp. 59, 60

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