



Ministry of Agriculture and Livestock Development  
State Department for Crop Development  
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Emergency Locust Response Program  
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## **Sustainable Agricultural Livelihood Restoration, Rehabilitation and Resilience in Kenya**

### **Training Manual**

#### **2.4.3 SUB-MODULE 3: PASTURE AND FODDER CONSERVATION**

To sustain production, availability of good quality feeds all year round is essential. Feed availability dwindles, particularly during the dry seasons and most farmers turn to crop residues. The crop-residues utilization is limited by low quality, often too low to support satisfactory milk production and reproduction performance. Poor handling at farm level further exacerbate deterioration of their feeding value. Poor handling (processing and poor storage) results in loss of palatability, quality decline and therefore ineffective utilization by the dairy cattle. As a result, the farm ruminants suffer severe nutritional stresses during the dry-season. This includes a whole range of consequences such as: low calving rate, low birth weight, high animal mortality (especially, that of calves), low weaning weight, reduced mature body size, low growth rate (delayed maturity) and more importantly low milk production. The feed shortage in the dry season is further compounded by farmers' lack of feed conservation skills. This impacts negatively on the overall household food security and income.



Poor conservation and utilization of maize stovers leading to poor dairy cattle performance  
(Photo: J. Ouda)

To alleviate the problem, it is important for farmers to embrace appropriate feed conservation practices. These include hay making, silage making, stover conservation, stover processing (e.g. by grinding).

#### **Hay making**

Livestock prefer fresh grass and other leafy vegetation, but they can also eat dry grass or hay. To ensure enough feed is available especially during dry periods, grass and other forages can be



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conserved as hay. Farmers often use grass from areas restricted to grazing such roadsides and steep valleys. A farmer without cattle or with excess hay may also sell hay bales for income. The following are some tips of making good hay:

- Cut grass when it starts to flower. Both natural and planted grass and other fodders can be used
- Spread the grass on dry and clean surface where drying is not prohibited. This can last 2-3 days. Turn the grass so that it dries evenly and prevent rotting. This also ensures that destruction e.g. by insects (terminates) is detected and prevented
- Make sure the grass is not over heated by the sun, as over drying will destroy nutrients
- You may mix hay of a protein source forage with that of grass to boost quality
- Bale the dried hay. Bales are easier to transport and store than the loose hay. Mechanical baling is convenient where possible. For smallholders, manual baler can be used. A simple manual baler is made of rectangular box with an open top and bottom. To use the baler, place it on the ground. Lay two pieces of sisal twine across the box. Make sure the ends are long enough to be tied when the bale is ready. Put hay into the box and trample on it to compact thoroughly until the hay cannot be compacted any more. Bind strongly the finished bale with the twine.
- Store hay safely in a shed to protect it from the sun and rain. It should be stacked in a raised platform to away from pests. If a shed is not available, clear a patch of the ground and store the hay in a heap. Cover the hay to prevent moisture penetration and excessive sun.



Grass hay and Lucerne hay made by a smallholder dairy farmer  
(Photo: T. Lanyasunya and J. Ouda)



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#### **Conservation of maize stovers**

Maize is the third most produced grain after wheat and rice but leads in crop fodder production both globally and in Africa. Annual maize fodder yields have been estimated to be 1,816 and 340 million tonnes in the world and Africa, respectively. Maize is largely grown and left to dry to less than 20% grain moisture content before harvesting. The dry grain is a widely used staple in tropical regions. In Africa, many communities differently prepare ‘porridge’ and ‘cakes’ from maize meal e.g. ‘Ugali’, ‘Fofu’, ‘Kita’ and ‘Pap’ which are popular in East, West, North and South Africa, respectively.



Harvesting maize at dry grain stage widely practiced (Photo: J. Ouda)

Harvesting maize at grain milk stage for human food (roasting and boiling) is also popular. Stovers harvested at grain milk are greener and more appealing to ruminants, hence generally have high palatability. More importantly, they have been shown to have higher nutritive quality due to lower fibre content as compared to stovers harvested at later maturity stage.





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Maize harvested at grain milk stage suitable for food (Photo: J. Ouda)

Given that maize stover is potentially an important source of roughage for dairy cattle production, improvement in their utilization is expected to result into considerable positive impact on the overall productivity.



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#### **Conservation of maize stover**



Maize ready for harvest showing high proportion of leaves (Photo: J. Ouda)

Maize stovers can be conserved in the field in pyramidal heaps that reduce chances of penetration by rain water and direct sun heat. The leaf is the most nutritious component of maize stovers hence it is important to prevent loss of leaves in the process of conservation.



Maize stovers conservation in the field for utilization by livestock (Photo: J. Ouda)

There are high chances of pest, especially insects attack on stored maize stovers. Thus there should be regular inspection of the stored stovers and corrective measurements undertaken in case of such damages. The bulkiness of maize stovers limits intake. Processing the stovers by grinding enhances the intake and prevents losses due to pests.



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Damage of conserved maize stovers by pests (Photo J. Ouda)



Chaff cutter (can be used to chop maize stovers (Photo: T. Lanyasunya)

Chopped/grinded stovers should be stored safely with regular inspection to monitor any spoilage e.g. mould growth or rotting





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Processing and conservation of maize stovers (Photo: J. Ouda and T. Lanyasunya)

### **Making pit silage**

Silage is fermented crop of grass or other green material. Forage, grown in the wet season, can be stored as silage to be fed to the cows in the dry season, when there is no fresh forage available. The store must be airtight to prevent loss of nutrients and the formation of mould. Silage can be made in plastic bags or pits.

### ***Steps in making silage***

The crop should be ready to harvest: The seed of forage sorghum or maize to be soft but not milky when you squeeze it open



- Napier grass needs to be about a metre high (up to a man's waist)



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- If there are legumes growing between the crop or bana grass, make sure the legumes have young pods which are not dry.
- If it has been raining and the forage is wet, or if the forage seems immature (the seed is very milky) then it is best to harvest it and leave it in the sun for a few hours to wilt (too much water in the forage can spoil the silage).
- The chopping and bagging area or silage pit must be clean and ready for the forage. If possible, a big piece of plastic should be spread out as shown below
- Ensure proper compaction whether pit or bag silage is being made



Chopping and bagging of silage material



Part of Pit silage making (companion process (Photo: J. Ouda)

- Seal the silage material by ensuring no air can penetrate. Silage is formed through anaerobic fermentation by microorganisms.





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- Carefully and step by step open a small portion of the silage when need arises for feeding and seal the remaining silage immediately after the removal.



Sorghum silage made in a pit by smallholder dairy farmer (Photo: J. Ouda)