A guiding manual for the utilization of cultivated oat-vetch and tree Lucerne fodder in the Africa RISING sites of the Ethiopian highlands

Melkamu Bezabih, Kindu Mekonnen, Aberra Adie and Peter Thorne

Produced by International Livestock Research Institute

Published by International Livestock Research Institute

November 2017

www.africa-rising.net

The Africa Research In Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-for-development projects supported by the United States Agency for International Development as part of the U.S. government's Feed the Future initiative.

Through action research and development partnerships, Africa RISING will create opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

The three regional projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads the program's monitoring, evaluation and impact assessment. http://africa-rising.net/

This document was made possible with support from the American people delivered through the United States Agency for International Development (USAID) as part of the US Government's Feed the Future Initiative. The contents are the responsibility of the producing organization and do not necessarily reflect the opinion of USAID or the U.S. Government.

Contents

Introduction

Grazing lands that have been serving as a source of natural pasture for livestock in the highlands of Ethiopia are continuously shrinking due to high population pressure, land degradation and conversion into arable lands. As a result feed shortage has become a major constraint for livestock production, and crop residues have emerged as the main components of livestock diet. Crop residues are generally poor in their nutritive value, with low crude protein content (4%) and digestible organic matter (<50%). To address some of the problems of feed shortage and poor quality of available feeds in the mixed farming system, feed related research protocols have been implemented in the Africa RISING action sites of the Ethiopian highlands. The action research aims to integrate production of multipurpose fodder legumes and grasses in the farming system, thereby increasing the quantity and quality of available feeds for livestock. Currently, farmer groups are able to produce oats-vetch fodder (intercropped), tree Lucerne, and desho grass in the intervention sites. Adaptation of sweet lupine varieties as feed and food crop is also underway in the last rainy season. These cultivated fodders have to be managed and utilized in a proper manner to maximize the benefit that can be obtained from them. This guiding note intends to outline how farmers should utilize the fodders, based on the preliminary results of the action research conducted in the last few seasons.

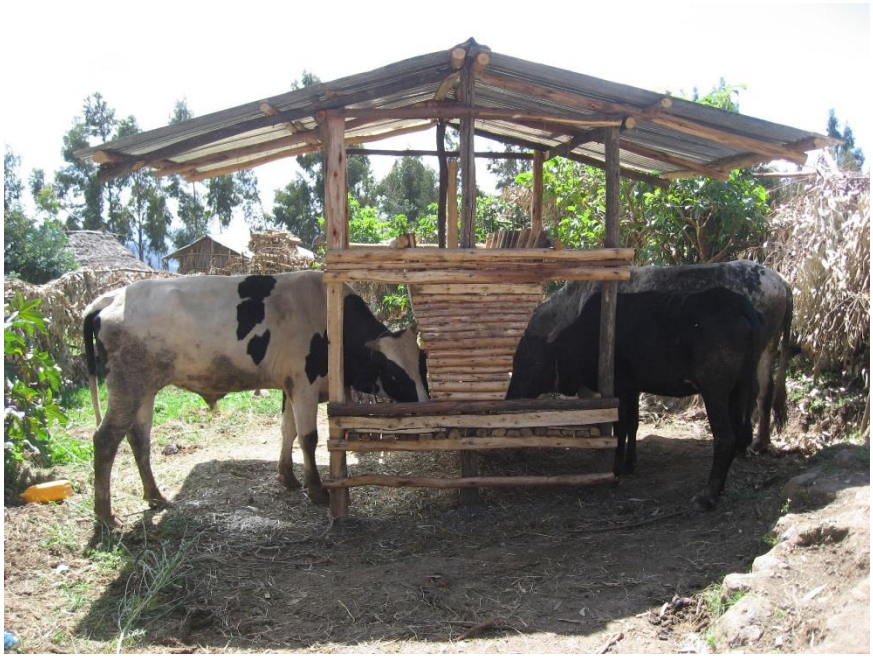

Photo 1: A farmer in Basona Africa RISING site, Amhara region using feed trough to feed his cattle (Photo credit-Kindu Mekonnen, ILRI) (2)

Oats-vetch fodder

Oats and vetch are suitable for intercropping. In order to get a balanced mixed biomass of oats and vetch, it is important to maintain appropriate seeding rate taking into account germination percentages of each seed type. In the Africa RISING research sites, the intercropped fodder has been observed to yield high biomass (11 – 19 tons/ha DM under rain fed condition) of good quality fodder which is rich in both protein (15%) and energy (9.5 MJ ME/kg DM).

Photo 2:Oat-vetch mixture planted by a farmer on a bigger plot in Sinana Africa RISING site, Oromia (Photo credit- Kindu Mekonnen, ILRI)

Cultivation

The optimal proportion of seeds is 3:1 of the recommended rate for oats (90 kg/ha) and vetch (30kg/ha), respectively. Sowing can be done using row planting or broadcasting. When row planting is used, it is recommended to sow oats and vetch seeds on alternate rows, with 15 cm space between rows.

Form of use

- Oats-vetch fodder can be used in the form of green feed, or conserved in the form of hay and used as needed.
- In both cases, the right time of harvest is when about 50% of the oats starts to flower.
- To prepare hay, the fodder is harvested to the ground and spread-thin under a well ventilated shed or in the sun.

- The biomass should be gently turned upside down once daily to ensure even drying of the biomass.
- A sunny and windy weather is necessary to make hay and it is thus important to check weather forecast and choose the right days for this activity.
- Under good weather condition, the hay can be sufficiently dry within 48 hours, to be stored safely. However, longer periods may be needed depending on the weather condition.
- Under field condition, to check whether the hay is sufficiently dry, the farmer can do the following test:
    - Take a handful of hay stock, break it half way or twist it in a circular motion.
    - If the stems break and crack cleanly, that is an indication that the hay is well dried (with a moisture content of about 20%), and can be stored safely
    - If the stems bend and don't not crack well, it is an indication that the hay needs more drying.
- A good quality hay maintains its greenish color and is leafy. Leaf shattering and bleaching reduce the quality of the hay produced. It is therefore important to avoid over-drying to minimize leaf shattering and bleaching.
- For green feeding, the fodder may be harvested in the morning, wilted for some time and fed in the afternoon.

How much to feed and in what proportion with other feed resources?

Oats-vetch mixture is a balanced and good quality fodder. However, for maximum benefit, it is advisable to use this fodder as a supplement to the locally available feed resources.

Cattle

a. Cattle which are fed only on cereal crop residues
    - **4 kg of green oats-vetch fodder mixed with 3.5 kg of cereal crop residue per head per day**

      or
    - **1.5 kg of oats-vetch hay mixed with 3.5 kg of cereal crop residues per head per day**

b. Cattle fed on a mixture of cereal and legume residues
    - **3 kg of green oats-vetch fodder mixed with 4 kg of crop residue per head per day**

      or
    - **1 kg of oats-vetch hay mixed with 4 kg of crop residues per head per day**

c. Cattle which are fed on cut-and-carry grasses with supplemental grazing

- **2 kg of green oats-vetch fodder mixed with about 6-7 kg of fresh grasses per head per day**

  or
- **0.6 kg of oats-vetch hay mixed with about 6-7 kg of fresh grasses per head per day**

d. Cattle which are fed on cut-and-carry grasses and crop residues with supplemental grazing
   - **2.5 kg of green oats-vetch fodder mixed with locally available feeds per head per day**

     or
   - **0.7 kg of oats-vetch hay mixed with locally available feeds per head per day**

Sheep and goats

- **1 kg of green oats-vetch fodder mixed with locally available feed per head per day**

  or
- **300 g of oats-vetch hay mixed with locally available feeds per head per day**

Note: *In some of the Africa RISING research sites, it has been observed that the oats-vetch fodder is either dominated by the oats or the vetch plant. In such cases it may be necessary to adjust the supplement depending on the specific situation. Where the oats fodder is dominant, it is advisable to increase the quantity of the supplement (oats-vetch) by about 15% than what is indicated above. On the other hand, if the vetch is the dominant fodder, it is possible to reduce the quantity of the supplement by about 15%.*

Tree Lucerne fodder

The leaf and edible branches of tree Lucerne are very good sources of nutrients for ruminant livestock, containing high amounts of crude protein and (app 20-25%) and digestible organic matter (>= 70%). The foliage of this fodder can be fed green or preserved in the form of hay and used as needed.

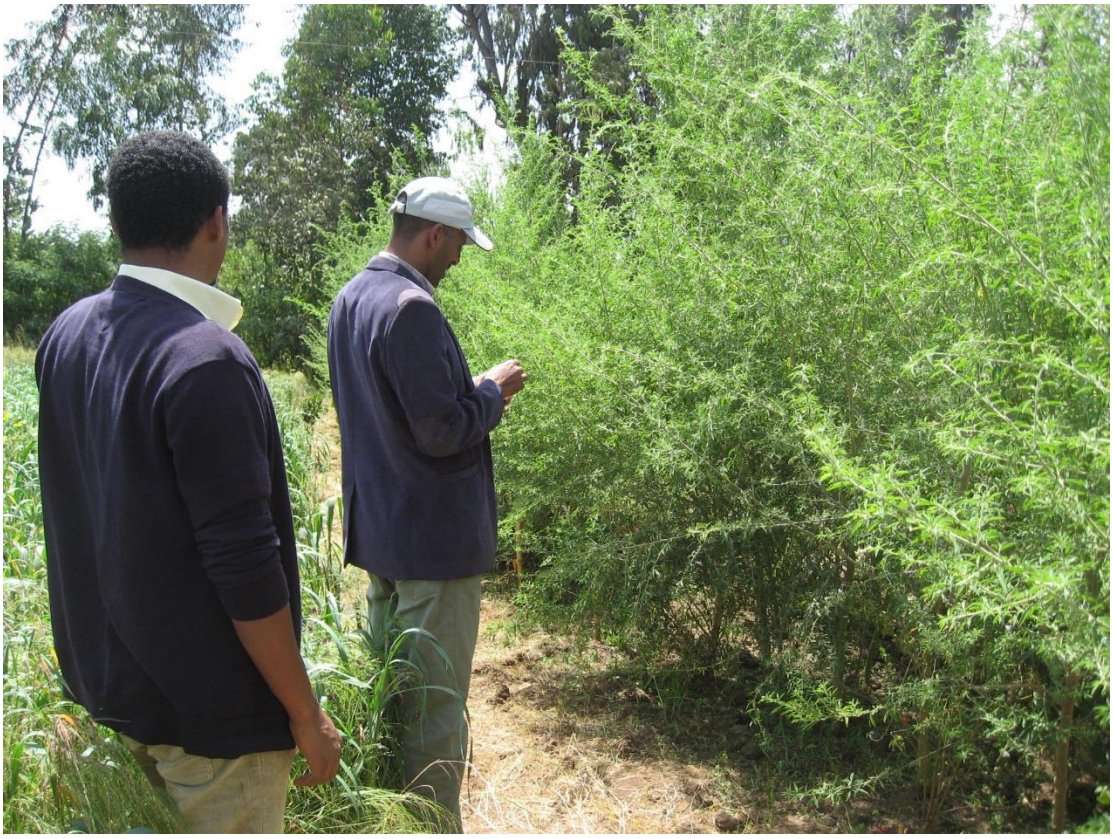

Photo 3: Fodder tree- Tree lucerne on a farmer field in Lemo Africa RISING site, SNNPR (Photo credit-Kindu Mekonnen, ILRI)

Cultivation

Seedlings of tree lucrene can be planted on soil bunds, backyard or along fence lines as a hedge. A planting space of 1-1.5m between plants can yield satisfactory growth, reaching as high as 2m height within 9 months of planting provided that the soil is well drained and the seedlings are fenced and watered at the young stage. Results derived from the Africa RISING sites indicated that a cutting height of 1.5m gives better fodder biomass yield for tree Lucerne. Depending on rainfall patterns and growing niche, the fodder may be harvested in 3-4 months interval. Hay can be made out of the foliage and preserved for future use. The procedures highlighted for oats-vetch hay making (above) also applies for tree Lucerne. Once the foliage is dry it can be stored in sacks and placed in a dry place for later use. Previous trials indicate that cattle prefer the hay, whereas sheep and goats readily consume the green fodder.

How much to feed and in what proportion with other feeds

Tree Lucerne foliage is mainly used as a protein supplement to the locally available feeds. The following mixing ratio would optimize rumen function, increase the digestibility of available feeds and hence improves animal performance.

Cattle

a. Cattle which are fed only on cereal crop residues

- **2.5 kg of green tree Lucerne fodder mixed with 4.1 kg of cereal crop residue per head per day**

  or
- **950 grams of tree Lucerne hay mixed with 4.1 kg of cereal crop residues per head per day**

b. Cattle fed on a mixture of cereal and legume residues

- **2 kg of green tree Lucerne fodder mixed with 4.25 kg of crop residue per head per day**

  or
- **750 kg of tree Lucerne hay mixed with 4.25 kg of crop residues per head per day**

c. Cattle which are fed on cut-and-carry grasses with supplemental grazing

- **740 grams of green tree Lucerne fodder mixed with fresh grass on offer per head per day**

  or
- **280 grams of tree Lucerne hay mixed with fresh grass on offer per head per day**

d. Cattle which are fed on cut-and-carry grasses and crop residues with supplemental grazing

- **1.4 kg of green tree Lucerne fodder mixed with locally available feeds per head per day**

  or
- **530 grams of tree Lucerne hay mixed with locally available feeds per head per day**

Sheep and goats: fed on cut-and-carry grasses, residues and with some grazing

- **800 grams of green tree Lucerne fodder mixed with locally available feed per head per day**

  or
- **300 g of tree Lucerne hay mixed with locally available feeds per head per day**

Table 1. Oats-vetch supplementation in the form of either green fodder or hay for cattle and small ruminants fed with different locally available resources

No	Type of Animal	Type basal feed	Mixture/head of animal/day*		
			Oats-vetch green (kg)	Oats-vetch hay (kg)	Basal feed (kg)
	Cattle	Cereal residues	2.5	0.95	4.05
		Cereal & legume residues	2.0	0.75	4.25
		Cut-and-carry grasses, grazing	0.74	0.28	4.72
		Grasses, grazing and residues	1.4	0.53	4.07
	Sheep	Grasses, grazing and residues	0.80	0.30	as consumed

* Depending on the physiological state, the animals may show higher feed intake than indicated. In such cases farmers should increase the amount of basal feed offer.

Table 2. Tree Lucerne supplementation in the form of either green fodder or hay for cattle and small ruminants fed with different locally available resources

No	Type of Animal	Type basal feed	Mixture/head of animal/day*		
			Tree Lucerne green (kg)	Tree Lucerne hay (kg)	Basal feed (kg)
	Cattle	Cereal residues	4	1.5	3.5
		Cereal & legume residues	3	1	4
		Cut-and-carry grasses, grazing	2	0.6	4.4
		Grasses, grazing and residues	2.5	0.7	6-7
	Sheep	Grasses, grazing and residues	1	0.3	as consumed