Fodder Sorghum for Dairy Cattle Feeding

Dual Purpose Sorghum

Irish Dairy Project at KALRO DRI Naivasha, 2020

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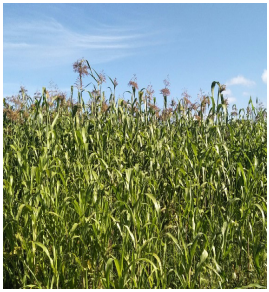


What is Fodder Sorghum?

Sorghum (*Sorghum bicolour*) is a coarse perennial grass adapted to various Agro-Ecological Zones. It requires relatively little water and fertilizer and its yield potential in the semi-arid tropics is high. Sorghum is mainly grown as a basic staple food for many rural communities and feed for their livestock. This is especially true in the more drought prone areas of Kenya where this hardy crop provides better feed /food security than maize for both human and livestock.

Where can sorghum grow?

Altitude

- Sorghum does well in areas below 1500m above sea level
- The yields are low in higher altitudes where the crop is prone to attack by pests like shoot flies among others

Temperature

- Cold to warm temperatures of between 15 - 35 ^{o}C are suitable for the growth and development of this crop
- Colder conditions may extend the maturity period of the crop, a frost-free period of approximately 120 to 140 days is necessary

Forage sorghum varieties

The varieties include:

1. Dual purpose: E6518, E1291, Ikinyaruka, BJ 28, BM 30
2. Fodder: Hybrid Sudan grass, Columbus grass

E1291

Ikinyaruka

E6518

Where to obtain sorghum seeds?

Sorghum seeds are obtained from KALRO Centres such as KALRO Ol Joro Orok, Naivasha, and Lanet. Other sources include seed companies like Kenya seed company.

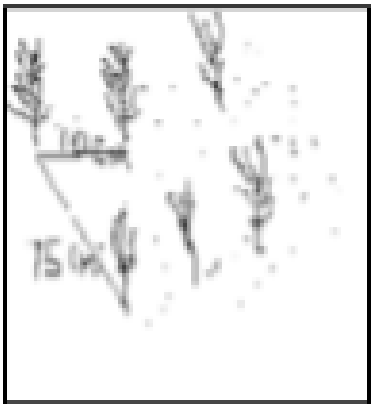
Establishing and management of forage sorghum

Land preparation

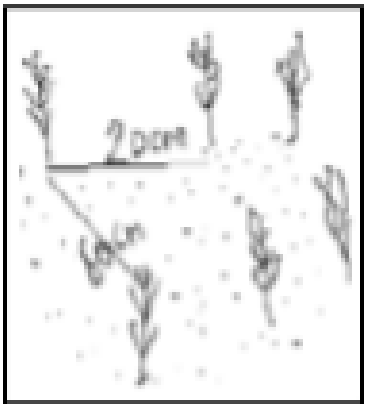
- Prepare the land at the end of the rains following a crop season
- Ensure a fine tilth to aid seed germination or practice zero tillage using herbicides

Seed rate and spacing

- **Seed rate:** 6 - 8 kg/ha. A higher seed can be used and plants thinned later to desired spacing
- **Spacing:** Seed forage sorghum at 75 x 10 cm,(133,333[plants per ha) dual-purpose and other sorghum varieties at 60 x 20 cm (83,333 plants per ha)
- This spacing for dual purpose sorghum allows for a high grain-to-herbage ratio.
- Germination occurs within 5-7 days after sowing



Forage sorghum



Dual purpose sorghum

Planting depth

- Sorghum has a small seed and should be planted at a depth of 25 mm where there is sufficient water
- Under drier conditions the seed should be planted at about 50 mm depth
- Planting depth should not be more than 25 mm in heavy soils, while on light soils, the depth should about be 50 mm
- It is important that the soil surrounding the seed is firm to ensure rapid absorption of water to aid germination

Young sorghum in the field

Fertilizer application

- The amount of fertilizer depends on the fertility of the soil
- Apply manure at the rate of 17.5 tons/ha (7 tons per acre)
- Apply basal fertilizers like DAP or NPK at 62.5 kg/ha (25 kg/acre, I teaspoonful per hole) at planting
- Top dress at knee high with 200 kg/ha (80 kg/acre) of CAN
- Foliar fertilizers can also be used at the recommended rates to supply macro and micro elements
- Timely application of fertilizer should be observed

Thinning

Thin when crop is 30 cm high or 30 days old, whichever comes first, to achieve spacing within rows of 10 cm for forage or 20 cm for dual-purpose

Weeding

- Sorghum field should be kept weed free especially during the early growth stages to minimize competition for moisture
- Hand weed at least twice, depending on weed growth, or apply herbicides either pre- or post-emergence, or practice zero tillage

Sorghum Intercropping

Dual purpose sorghum can be intercropped with leguminous crop like beans, cowpeas, soya beans or multipurpose fodder trees such as Calliandra and Leucaena species to increase production per unit area, enhance protein content in the feed and improve soil fertility.

Sorghum intercropped with fodder trees

Ratooning

Sorghum regenerates (ratoon) after harvesting which increases the total annual yield of herbage per unit area. This provides reserve feed during the dry period.

Three or more ratoons are economically, possible depending on how the crop is managed. To achieve good yields, the crop is thinned to 2-3 tillers per hill.

Forage sorghum, E6518 variety, with high tillering ability

Soghum Pests

Pest	Symptoms	Control Method
Cutworms 	Cutting off young plants at or slightly below the soil level. Attacked plants die.	Dress seeds with insecticide or apply at planting

Chafer grubs 	Feed on the roots and may kill young seedlings.	Dress seeds with insecticide or apply at planting
Sorghum shoot fly 	feed on the young shoot killing the growing point and the youngest leaf which turns brownish and withers (dead heart)	Apply recommended insecticides at the early stages of growth.
Stem borer	The young plants are more susceptible to attack by stem borers. Others bore holes straight into the centre of the stem.	Apply recommended insecticides at the early stages of growth
Termites	Cause serious damages during the dry periods, whereby they attack the plant by hollowing out its root system and filling it with soil.	Properly prepared seedbed Reduce trash as much. Apply pesticide during land preparation
Armyworm 	Causes serious damages to mostly the young plants by eating away the leaves	Use the recommended pesticide at the right stage

Sorghum aphids 	They suck sap on the ear heads or on the undersides of the leaves and produce honeydew which encourages formation of sooty mold. Infested plants become stunted, leaves dry up and yield is considerably reduced	Use the recommended pesticide at the right stage Intergrated pest Management (insects, beetles)
Sorghum midge	feed on the developing seeds causing them to shrink and flatten. Damaged panicles have small, transparent midge pupae attached to the tips of the damaged spikelet.	Use the recommended pesticide at the right stage
Head bugs	feed on the developing kernels as panicles emerge by sucking sap from them. Kernels shrivel, become small and discoloured, especially if attacked in early development stages.	Use the recommended pesticide at the right stage
Birds	Feed on the seeds causing heavy yield losses.	Scare them away and destroy their nests.

Sorghum Diseases

Disease	Symptoms	Control Method
Damping off	Infection causes rotting of seeds before they emerge and seedlings after emergence	Use the right spacing Use fungicide where possible
Leaf blight	Small reddish purple or yellow-brown spots develop on the leaves of the infected plants. In severe cases, the spots combine to cover the entire leaf giving it a burnt appearance.	Use the right spacing Use fungicide where possible
Loose kernel smut	Infection leads to formation of thin pointed galls, which burst out releasing dark brown spores which are carried on the seed. Infected plant is stunted and numerous side branches may develop.	Uproot the affected plants Use certified seeds
Covered kernel smut	The kernels are destroyed and replaced with cone shaped galls. These galls break releasing spores which contaminate the other kernels.	Uproot the affected plants Use certified seeds
Top downy mildew	Infected plants develop thick, stiff, twisted, pale green leaves with bumpy surfaces. The plants do not produce heads in severe cases.	Uproot the affected plants Use certified seeds Use fungicide where possible

Leaf rust	Rust appears on both sides of the leaves as small, raised pustules which rapture releasing reddish brown spores.	Use fungicide where possible, Use certified seeds Crop rotation
Head smut	Large dark brown smut galls replace the panicle.	Crop rotation with leguninous crops Plant smut torelant varieties

Head smut on young sorghum plant

Some nutritional deficiencies in sorghum

Nutrient	Symptoms	Remedial measures
Potassium	Leaves develop marginal chlorosis then necrosis starting with the older ones to the young ones. Stunted growth occurs in severe cases of deficiency.	This can be corrected by using organic manure, fertilizers and foliar fertilizers at recommended rates and the right stage of growth (refer to section on fertilizer application). Soil analysis is recommended for guidance on fertilizer usage.
Nitrogen	The growth rate is highly reduced and leaves turn yellow, starting with the older ones. Plants become stunted as deficiency continues.	
Phosphorous	Plants turn dark green and leaves show reddish purple discolouration starting with the older to the young leaves. Plants are stunted.	
Zinc	Leaves develop broad bands of yellow coloration which later turn pale brown or grey. Symptoms start with young leaves and progress towards the older ones.	

Multiple Deficiencies

Nitrogen deficiency

Phosphorous deficiency

Zinc deficiency

Maturity, harvesting and storage

- Sorghum is ready for harvesting 3-4 months after planting, depending on the variety and ecological factors
- The heads are cut with a knife or sickle or the entire plant can be cut and the heads removed later
- For large scale farming, combine harvesters are used

- If the crop is meant for seed production, harvesting should be done at maturity while material for fodder should be cut when green and fresh
- Seeds are obtained through threshing the dry heads, winnowing and may be seed-dressed to increase shelf life
- Annual forage yield ranges from 13.5 – 30.6 tons DM/ha (5.4 – 12.2 tons/acre)
- The forage DM is about 30%, 7% crude protein (values can be higher depending on amount of grain) and 25% crude fibre

Sorghum Yields for different varieties

Variety	Days to maturity	Grain yield (tons/ha)	Forage DM yield (tons/ha)
E6518	230	3	26
E1291	160	6	18
Ikinyaruka	160	7	18
BJ 28	110	3	14
BM 30	210	6	22
Sudan Grass hybrid	100	-	15
Columbus Grass	100	-	10

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