Improved Napier grass varieties for smallholder farmers in East Africa

Ben Lukuyu, David Ngunga and Mateete Bekunda

The need for growing improved Napier grass varieties

Improved Napier grass varieties offer the following advantages. They are tolerant to common Napier grass diseases such as head smut and stunting.

- They provide year-round supply of enough quality fodder.
- They help increase milk production from the intake of high-quality fodder.
- They improve the consumption and value of low-quality fodder when mixed as a component of feed ration.
- They contribute to increased household income from sale of excess fodder.
- They help enhance soil and water conservation when planted along contours and on contour bands in slopping crop fields.

Discussing characteristics of Napier grass varieties with farmers in Babati district (Photo credit: ILRI/Ben Lukuyu)

Requirements for growing Napier grass

Climate:

Rainfall: Performs best in high rainfall areas over 1500 mm per year, well distributed throughout the year.

Altitude: From sea level to 2,000 metres above sea level.

Soils: Performs best in deep, fertile and well-draining soils.

Temperature: Between 25 and 40 degrees celsius.

Where to grow Napier grass on the farm

Pure stand

Suitable where:

- land is available (Figure 1)
- the plot can be used for economic benefits (bulking to provide planting material for sale)
- the farmer plans to intercrop with legumes (Figure 2)

Figure 1: A pure stand of Kakamega 2

Photo: ILRI/Ben Lukuyu

Figure 2: Kakamega 1 intercropped with Desmodium green leaf

Photo: ILRI/Ben Lukuyu

Along contours and boundaries

Napier grass can be grown along contours or boundaries where:

- land is limited so the farmer cannot set aside land for growing Napier grass alone (Figure 4)
- land is sloping and the farmer uses it for soil conservation (Figure 3)

Figure 3: Napier grass planted along

Photo: ILRI/Ben Lukuyu

Figure 4: Napier grass planted along a field crop boundary

Photo: ILRI/Ben Lukuyu

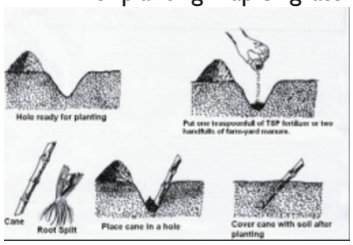
How to plant Napier grass

Common method

- Prepare land during the dry season in order to reduce weed impact.
- Plant at the start of the rainy season when the soil is moist. Allow two heavy downpours before panting.
- Dig holes 15–20 cm wide and 15–20 cm deep at a spacing of 0.5 m x 0.5 m in high rainfall areas and 0.5 m x 1 m in low rainfall areas.
- Apply 1–2 tablespoons of DAP fertilizer or 1 kg of farmyard manure into each hole and mix with soil.
- Place a 2–3-node cane cuttings at a slanting position in the soil ensuring that two nodes are covered by the soil. Root splits can be used in place of canes (Figure 5).

Napier canes ready for planting

Figure 5: Common method of planting Napier grass



Outlined by Ben Lukuyu and sketched Simon Ndonye

Tumbukiza method

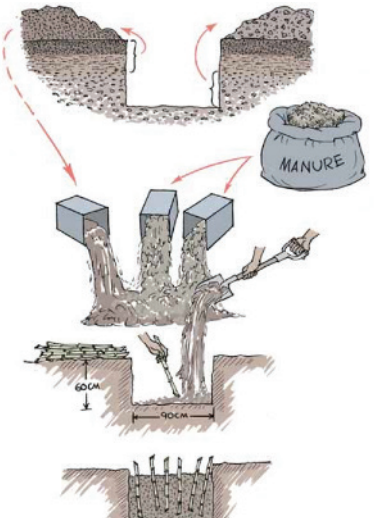
- Dig round pits 60 cm wide and 60 cm deep with 60 cm between the rows or rectangular pits 60 cm deep, 60–90 cm wide and 90 cm long. Separate topsoil (approximately top 15 cm) from sub soil.
- Mix 1 debe (20 litre tin) of topsoil with 1–2 debes of farmyard manure and put into the pit (1 debe = approximately 12 kg dry manure).
- Plant 5–10 cane cuttings or root splits in round pits.
- In rectangular pits, plant 5–10 cuttings or root splits for every 90 cm pit.
- Leave about 15 cm unfilled space at the top of each pit (Figure 6).

The tumbukiza method has the following advantages.

- Higher biomass production per stool.
- Better growth during the dry season because the pits retain more water and nutrients.
- Efficient use of manure because the manure is confined in the pit and is not subject to runoff.
- Faster regrowth after harvest and less need for weeding.
- Longer lifespan.
- Better yield during drought because of the water and nutrient reserves in the pits.
- Easy to irrigate during the dry season.

The main disadvantage of tumbukiza method is the high initial cost of labour for digging pits and the higher quantity of manure applied into the pits. However, the advantages in the subsequent seasons or years may outweigh the initial higher cost.

Figure 6: Tumbukiza method of planting Napier grass



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Based on dry matter yields:

- In the humid highlands the best performing variety is ILRI 16835, in the semi-humid uplands is ILRI 16837 and in the semi-humid/semi-arid midlands is Kakamega 1.

When selecting Napier grass varieties for smallholder farmers, it is important to consider multiple factors rather than dry matter yields only. Examples of factors (in their order of importance) for consideration based on farmer observations include:

- high biomass yield (number of leaves and shoots)
- tolerance to drought
- rapid regrowth after harvest
- length of stem

Potential yields of improved Napier grass varieties

Table 1: Dry matter yield of six Napier grass varieties under different climatic zones of Babati district, Tanzania

	Pure stand dry matter yield in tons per hectare per harvest					
Climatic zone	Kakamega 1	Kakamega 2	ILRI 16837	ILRI 16835	ILRI 14984	ILRI 16803
Humid highlands (long) Altitude: 2,150–2,450 masl Rainfall: 1,200 mm/yr	12.15	17.4	7.83	23.23	3.68	10.85
Semi-humid uplands (Seloto) Altitude: 1,500–1,850 Rainfall: 900–1,100	6.58	12.25	30.2	-	-	-
Semi-humid/semi-arid midlands (Sabilo) Altitude: 1,200–1,500 Rainfall: 750–900 mm	22.03	15.83	7.9	15.3	21.23	4.33

Although Napier grass may be cultivated in a wide range of climatic zones, the performance of various Napier grass varieties may differ under different climatic conditions. Hence, there is need to select varieties suitable for specific climatic conditions. Table 1 above shows that:

- Kakamega 1 performed best under semi-humid conditions while Kakamega 2 performed better in the humid highlands.
- Among the ILRI varieties, ILRI 16837 performed better in the semi-humid uplands, ILRI 16835 and 16803 in the humid highlands and ILRI 14984 in the semi-humid/semi-arid midlands.

Based on the four main factors, farmers ranked Kakamega 1 first, ILRI 16835 second and ILRI 16837 third as their preferred Napier grass varieties (Sikumba et al. 2015).[1]

Threats to Napier grass

The smut disease

The smut disease was first observed in Kenya, but it has also been reported in Meru district of Tanzania.

Signs of the disease include:

- Napier flowers early with smutted heads
- Plant is stunted, has thin leaves and lots of stems

1 Sikumba, G.N., Mangesho, W., Lukuyu, B., Ngulu, F. and Bekunda, M. 2015. Participatory evaluation of farmer preferences and productivity of selected Napier grass (Pennisetum purpureum) accessions in northern Tanzania. Poster prepared for the International Conference on Integrated Systems Research, Ibadan, Nigeria, 3-6 March 2015. Nairobi, Kenya: ILRI.

- Eventually, the tillers die. The disease is first seen on some tillers, but it eventually affects the whole plant.

Figure 7: Napier head smut disease

Source: KARI

Napier stunting disease

Napier grass affected by the stunting disease becomes:

- yellow
- soft
- stunted
- streaked or red leading to tillers dying. Symptoms start on some tillers and eventually affect the whole plant.

Napier stunt disease has been observed in Tanzania in Muheza, Meru and Tarime districts.

Figure 8: Napier stunting disease and the leaf hopper that transmits the disease

Source: KARI

How to control Napier smut and stunting diseases

- Use disease tolerant varieties such as Kakamega 1 and 2.
- Obtain planting materials (splits and canes) from plots that are free from disease, preferably at research centers.
- Keep the fodder crop strong by applying manure and fertilizer.
- Avoid using manure from livestock fed on infected plants.
- Keep the fodder plot free from weeds.
- Uproot and burn affected materials.

Figure 9: A sole healthy Napier grass plot on a farm in Long village

Photo credit: ILRI/Ben Lukuyu

Ben Lukuyu and David Ngunga work for the International Livestock Resarch Institute. Mateete Bekunda works for International Institute of Tropical Agriculture. This brochure was complied by Margaret L Nyawira, an independent consultant.

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 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 an associated project on monitoring, evaluation, and impact assessment.

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