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**TECHNOLOGY INNOVATION MANAGEMENT PRACTISE**  
**DIGITAL DAIRY**

**Napier Grass and Desmodium Intercrop**

**Introduction**

**Intercropping** is a multiple cropping practice involving growing two or more crops in proximity. The main goal of intercropping is to produce a greater yield on a given piece of land by making use of resources or ecological processes that would otherwise not be utilized by a single crop.

The technology aims to improve dry matter yield and nutritive value, intake and soil fertility under smallholder dairy farmers' conditions

- Growing grasses in association with legumes which fix nitrogen help to improve the quality of forages
- Such associations may fix 100 to 200 kg nitrogen per ha per year while they improve soil fertility, organic matter and moisture retention
- Tropical legumes have higher digestible protein than tropical grasses while the protein content decreases less with increasing maturity
- Napier grass can be intercropped with forage legume. The most commonly used legumes are: 1) Desmodium greenleaf (*Desmodium intortum*), 2. Desmodium silverleaf (*Desmodium uncinatum*) 3) Stylosanthes, and 4) *Macrotyloma axillare*.



Napier grass



Desmodium silverleaf



### Napier grass and desmodium intercrop

#### Description Napier grass (*Pennisetum purpureum*)

Varieties of Napier include French Cameroon, Kakamega 1,2 and 3, Ouma, Clone 13 and Bana among others.

#### Desmodium

- Desmodium is a creeping tropical legume that has high digestible protein content and an important feed resource for smallholder dairy farmers
- Desmodium can be established on a pure stand or in association with grasses like Napier grass

### Varieties of Desmodium

There are 2 main types of Desmodium grown and used as fodder for livestock in Kenya:



(i) Desmodium greenleaf  
(*Desmodium intortum*)



(ii) Desmodium silverleaf  
(*Desmodium uncinatum*)

### The benefits of inter planting Napier and Desmodium include:

- Soil fertility improvement through nitrogen fixation by Desmodium
- Saves on cost of labour for weeding and harvesting
- Effective land utilization and productivity
- Weed control and improved soil organic matter and water retention
- Persistence of Napier-Desmodium intercrop. A stand of intercropped Napier grass and Desmodium can persist for more than 5 years
- Increased herbage yield,
- Improved nutritive value of the fodder,
- Environmental and economic sustainability
- Intercropping Napier grass and Desmodium is recommended under integrated smallholder mixed crop and livestock systems to improve productivity

### Agronomic practices

- **Napier grass and Desmodium** are not ideal for direct grazing since this reduces their persistence

### Land preparation

- Desmodium requires a well-prepared seed bed due to the tiny seeds; this is achieved by ploughing and harrowing twice

### Seed inoculation

- It is recommended to mix Desmodium seed with recommended rhizobium inoculant before planting
- The most effective and cheapest method to inoculate Desmodium seed is to mix the seed with soil from the plot where Desmodium had been planted



a) Scoop soil from a plot of Desmodium    b) Mix soil with desmodium seed



c) Mixture of seed and soil

- *Desmodium seed inoculation using soil from Desmodium plot*

### Planting

- Drill Desmodium seed into shallow furrows 2.5 cm deep spaced at 45 cm and cover with a little soil
- For intercropping with Napier grass, plant Desmodium first and wait for it to germinate and grow to three leaves
- Where seed is unavailable grow Desmodium vegetatively through mature vines
- Use freshly cut vines measuring 30 cm long and plant at a spacing of 45 cm between and within rows
- Plant Napier grass using either splits (in low rainfall areas) or canes at a spacing of 100 by 60 cm
- Plant Napier grass using cane cuttings (3 nodes) and insert two nodes into the soil and one above the ground
- Plant the canes in every alternate Desmodium row i.e. 90 cm spacing between (Napier grass) rows and 60 cm within Napier grass rows



- Establishment of Napier grass in association with Desmodium
- Photo of Napier grass splits
- Napier spacing 90x60 cm
- Desmodium spacing at 45cm x drill or 45x45cm using vines



Early stage of Napier Desmodium intercrop establishment

Seed rate

The recommended seed rate for Desmodium is 2.5 kg/ha or 1 kg/acre or 20,000 vines. The seed rate for Napier grass is 18,500 canes/splits per ha (7,500 Per acre).

### Manure and fertilizer application

- Apply dry farmyard manure in furrows at planting and mix thoroughly with the soil
- Add 2 bags (2 x 50 kg bags) TSP or DAP fertilizer per hectare at planting and after every cut apply manure in a furrow and cover with soil



Application of DAP fertilizer before planting

### Weed and erosion control

- Napier grass is a pioneer species that competes very efficiently with weeds. In the Philippines, it has been used to control *Imperata cylindrica*. In Nigeria, Napier grass is used as mulch (25 cm layer) for weed control, for water storage and to reduce soil losses on slopes.
- Napier grass develops a vigorous root system that may help to prevent river bank erosion.
- The grass can be planted in hedgerow to fence houses and crops and to provide windbreaks.
- Greenleaf Desmodium can be used for ground cover as it needs only 4 months to cover the soil and hence prevents weeds from growing. It has been used as ground cover in coffee plantations.
- Weeding of Napier grass intercropped with Desmodium is mainly critical in the initial stages of establishment. Desmodium is slow in establishment and can easily be smothered by weeds. Weed control is done to reduce competition by weeds for soil nutrients, water, light and space.

**Comment [r1]:** How much? A handful per plant? A bottle top of fertilizer per plant?

**Comment [r2]:** Or is it at planting? Heavy rains will leach

### Disease and Pest Management

- In Kenya, there are no known pests documented in Napier grass and Desmodium intercropping. However, Napier grass can be affected by stunting and headsmut diseases. Farmers are advised to use Napier grass varieties with tolerance such as Kakamega I, Kakamega II and Ouma.
- The mixed culture of Napier and Desmodium is a form of integrated pest management and is known to control stem borer. The practice has been used in Push-Pull technology for control of stem borer in maize and Napier grass fields.
- Greenleaf Desmodium is susceptible to pests such as the Pyralidae caterpillars *Hedylepta dnopheralis* Mab. and *Hedylepta indicata* F., that can cause heavy losses. The larvae of the weevil *Amnemos* spp. may destroy the roots, impairing the persistence of Greenleaf Desmodium in *Setaria* pasture after 3-4 years.



Napier grass with Headsmut (L) and stunting disease (R )

### Harvesting and biomass yield of mixture of Napier grass

- Age at first harvesting is 3 to 5 months for Desmodium and Napier grass respectively
- Subsequent harvesting is done at 8-10 weeks

Yield and Nutritive value of Napier grass, Desmodium and mixture of Napier and Desmodium

Forage/fodder	DM Yield t/ha	DM g/kg fresh weight	ME Mj/kg DM	CP g/kg DM	Ca g/kg DM	P g/kg DM
Napier	20-80	175	8.4	5-6	6.0	4.0
Desmodium	12-19	400	10.4	13-14	3.2	2.8
Mixture	30-100	-	-	9-10	-	-

**Comment [r3]:** Column not important since it depends on time of harvesting

### Harvesting and utilization

- Napier grass should be harvested at a height of 90-100 cm to optimize on biomass yield and nutritive value
- Harvesting at longer intervals produces higher DM yields but lower quality of forage

### Feeding

- Chop the forage to reduce selection of leaves and stems and maximize intake
- It can be manually or mechanically chopped prior to feeding
- Wilting in the sun for several hours reduces moisture, stimulates appetite, facilitates rumination and thus improves forage utilization
- Greenleaf Desmodium can be grazed as a long-term pasture and is a valuable ground cover that decomposes slowly in the soil

### Economic benefit

- A dairy cow offered good quality Napier grass can derive enough nutrients for maintenance and 7 kg of milk daily
- Desmodium in Napier grass at a ratio of 1:1 on fresh basis can increase voluntary intake adequate for maintenance and over **10 litres of milk daily**
- Total costs invested per acre Kshs. 120,000/-, Positive net benefits realized after second year and stands at Ksh 71,000 during 2<sup>nd</sup> year and 82,142 coming from value of milk, heifer calf and manure

### Limitations

- High cost of Desmodium seed
- Inadequate technical agronomic skills



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9. Grow Desmodium for Seed FOR MORE INFORMATION CONTACT: Compiled by Dr FN Muyeckho, Dr Cheruiyot, KARI Headquarters Library resource.center@kari.org ICIPE Po Box 30722 Nairobi KARI/Kitale Box450 Kitale
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