

Green Manure Cropping in Horticulture

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Green manure crops are grown to protect soil from erosion and to improve soil structure, chemistry and biological health. Green manure crops play an important role in good horticultural farming practice in the NT. Among their many benefits are:

- Increased soil water holding capacity.
- Improved efficiency of soil nutrient use.
 - Green manures have deep roots that recover fertiliser leached below the root zone of shallow rooted horticultural crops, which is then recycled to the surface when the green manure crop is mulched;
 - Higher organic matter from green manuring leads to an increased capacity for soils to hold nutrients (increased cation exchange capacity);
 - Legume green manures add nitrogen to the soil (but they give less organic matter than non-legume green manure crops).
- Improved soil health and yield potential.
 - Improved soil structure allowing better aeration of the soil and less compaction therefore providing a better environment for root development;
 - Higher populations of beneficial microorganisms, therefore less incidence of soil borne disease;
 - Reduction in pest and disease build up by breaking the cycle of host plants;
 - Lower nematode populations after incorporation.
- Reduced soil erosion by providing a soil cover when land is not in use for horticultural crops during the Wet, or in the Dry as a standing or cut cover crop.
- Improved weed management by smothering weeds and preventing build up of weed seeds.



TYPES OF GREEN MANURES

There are three main classes of green manure crops in the NT, millets and sorghum which produce large amounts of organic matter, and legumes such as cowpeas which improve soil fertility by adding nitrogen. Due to the very low levels of organic matter in Top End soils it is best to go for bulk and grow millet or sorghum.

Millets and sorghums recommended for horticultural purposes in the Top End include forage sorghum hybrids of grain sorghum x Sudan grass such as Jumbo. Jumbo is a fast growing variety which gives high yields of dry

matter (20 t/ha) and is late seeding which limits its potential as a weed in later crops. A number of sorghum hybrids such as Jumbo are nematode resistant, so where nematodes are a problem, their numbers will not increase.

Pearl millets (Ingrid or Katherine pearl) are well suited to areas where dry spells can occur at the time of planting (e.g. Katherine). Their small seed also makes them desirable when limited seed drilling machinery is available. These millets are quick to establish and smother weeds.

SOWING AND MANAGEMENT

Green manures can be planted for the wet season, with a crop rotated immediately after in the dry season, or, preferably, planted for the wet season and left for 12 months over the dry season to break down into the soil and to rest the soil from intensive cultivation.

Early sowing (November/December) is preferred to obtain as much bulk over the wet season as possible. Green manure crops are grown during the wet season because this is not a good time to grow most vegetables, and usually there is no need for irrigation at this time of the year.

When sowing a green manure crop use a seeding rate of 20 kg/ha for sorghum and 8-12 kg/ha for millet in order to establish a high density plant population. This aids in smothering weeds gives high yields of organic matter and keeps the stems thin, which aids in breakdown after incorporation.

Green manures can be sown with a seed drill, which is the preferred method to achieving a good, even population. The alternative is to mix the seed with fertiliser and broadcast with a fertiliser spreader, before incorporating with harrows.

At the time of sowing on virgin soils, apply 150-200 kg/ha of a high analysis NPK mix or complex (NPK + trace elements).

It is desirable to cut or slash the crop several times during the wet season. The first cut should take place when the crop is about 2 m tall. The cut should not be too low, about 150-200 mm of stubble should be left standing to ensure rapid regrowth. After each cut a light side dressing of urea (50 kg/ha) encourages regrowth and improves the overall bulk of organic matter returned to the soil.

Never bale or cart away a green manure crop as the aim is to put as much organic matter back into the soil as possible. The greater the amount of organic matter returned to the soil, the greater the control of soil borne nematodes. The crop should be incorporated into the soil in good time for it to break down before vegetable planting begins. Turning in the crop is best done about the end of March in the Darwin region while there are still showers of rain around to hasten decomposition. For the Katherine region this should be done about mid February.

Table 1 shows the characteristics of green manure crops recommended for the Top End.

Table 1. Characteristics of green manure crops for the Top End

Green manure	Land suitability	Sowing rate kg/ha	Ease of establishment	Management advantages	Management disadvantages	Possible t/ha
Forage Sorghum	Grow on most soils	20	Seed size suits most drills. Easy to broadcast.	Late seeding, easy to grow	Will develop thick stalks at low density	Up to 20 t/ha
Millets	Cannot tolerate water logged soils	8-12	Small seed needs moist seedbed for successful establishment. Easy to broadcast, may need special small seed drill	Tolerant of dry conditions after establishment	Goes to seed before Forage Sorghum Must be cut to prevent thick stems	Up to 20 t/ha
Legume species	Not suited for rotation with most vegetables	Depends on species	Mostly quite easy to establish	Bacteria on roots fix nitrogen	Cannot be used in rotation with nematode susceptible crops	5-75/ha



Figure 1. Green manures can be planted in the open or under shade structures

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