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GROWING LEGUME AND MIXED SPECIES FALLOW CROPS IN THE MACKAY WHITSUNDAY REGION - THINGS YOU NEED TO CONSIDER

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DISCLAIMER This guide is adapted from the joint HCPSL, SRA & Project Catalyst publication Growing Legume and Mixed Species Fallow Crops in the Herbert Region - Things You Need to Know (published 2019). This guide provides information to support fallow cropping in the Mackay Whitsunday region specifically and Project Catalyst acknowledges the authors of the original Herbert region guide.



GROWING LEGUME AND MIXED SPECIES FALLOW CROPS

Why grow a cover crop? - Legume cover crops can provide a range of benefits to your farming system and soil health conditions. Cover crops can provide a significant source of nutrients, especially nitrogen for subsequent crops. Other benefits include reducing erosion and runoff, capturing soil nitrogen that might otherwise be lost to leaching; increasing organic matter in the soil; improving soil physical properties; disrupting insect and disease life cycles; and suppressing pathogenic nematode populations and weed growth.

Cover crops add organic matter to the soil - Organic matter provides benefits to the soil and the subsequent crop in many ways. Organic matter improves the physical condition of the soil by improving soil tilth, stability of soil aggregates, water infiltration, air diffusion, and by reducing soil crusting. The addition of organic matter can also increase the populations of soil microbes and earthworms, which in turn, contribute to efficient nutrient cycling and improvements in soil structure. Finally, organic matter additions can also increase nutrient retention in the root zone.

Cover crops reduce soil erosion - Cover crops can help reduce soil erosion by keeping the soil covered during high rainfall periods when it would normally be bare. There is also evidence of improved soil structure, stability and permeability, decreased crusting, and increased water infiltration.

Cover crops can enhance nitrogen cycling within the plant-soil system - Leguminous cover crops, such as cowpea, sunn hemp, soybean, and many other legume crops can “fix” significant amounts of nitrogen for use by the subsequent crop. This happens through a symbiotic association with the legume, and Rhizobium bacteria which convert atmospheric nitrogen into a form that the legume can use for its own growth. When legume cover crops are killed or incorporated, soil microorganisms decompose the residue, in a process called mineralisation. The nitrogen cover crop residue is converted by soil microbes into a nitrate form that subsequent plants can use. Nitrogen in the above ground biomass of the cover crops varies considerably between species, but legumes generally contribute anywhere from 60-300kg of nitrogen per hectare. This nitrogen is mineralized over an extended period, becoming available to subsequent crops.

A CHECKLIST FOR GROWING THESE FALLOW CROPS

1. Have you checked your soil pH?

Soil pH should be above 5.5 to grow legumes successfully. If not, amendments like lime need to be applied. Remember that lime will take up to four months to shift pH values. Some legumes are more acid tolerant than others including Sunn Hemp, so plant and seed selection is important.

2. Pre-form mounds?

This keeps legumes from waterlogging during the wet season. Legumes are prone to Phytophthora, Pythium and other bacterial and fungal diseases. By pre-mounding, you can reduce your risk to these diseases and ensure the survival of legumes over the wet season.



Photo left- The impact of mounding when heavy rainfall occurs.
Photo right- Effective legume establishment using mounding

Photo supplied by HCPSL

3. Do you have the right inoculant for the right legume?

This is important to gain the most benefits from your legumes. Without the correct inoculant for the selected legume (refer table below), nitrogen nodules will not be made by the legume. Your legumes may still grow without inoculant, but the opportunity to fix nitrogen may be lost and some legume species may not grow as well.

The inoculant promotes strong nodulation on the legume roots which is supplying nitrogen to your legume and subsequent cane crops. This allows you to reduce your nitrogen fertiliser in your plant cane. Make sure the inoculant is kept in the fridge as they are living bacteria. Temperatures greater than 30°C can kill rhizobia. In addition, it is always good to check the soil temperature when planting over summer as temperatures of 35°C or more can start to cook the seed, with soybean being particularly sensitive. Mix the inoculant in water as per packet instructions and coat legume seeds thoroughly with the inoculant. Some bean planters have inoculant sprayers. Ensure that the tank is free of any chemical residues and don't leave in direct sunlight as inoculant will overheat.

See below for Legume Inoculant.

Legume Inoculant Selector	
Strain	Host Plant
"H" Soys	Soybean
"I" Mung Bean	Sunn Hemp, Cowpea and Mungbean
"J" Lablab	Dolichos Lablab and Pigeon Pea
"M" Siratro	Sunn Hemp and Velvet Bean
"N" Chickpea	All Chickpeas
"P" Peanuts	Peanuts

Getting good inoculum coverage is essential!

4. Plant fallow legumes and mixed species crops

Plant either with a bean planter (for all seed types) or spinner spreader & harrow (for harder seed types). Soybean germination and establishment is significantly better when planted through a bean planter. Planting depth needs to be considered before planting with a bean planter. Seeds should be planted at 25-50mm deep into the soil profile. Planting too deep or into too dry soil may affect the germination and result in a poor strike.

► Which type of plants?

Traditionally farmers have planted a single legume species in their fallow (like cowpea, soybean or Lablab).

Research has shown that there are significant benefits when planting a mixed fallow legume crop, compared to a single species crop. The benefits of a mixed fallow legume crop are:

- Potentially increase soil biodiversity
- Weed suppression in the fallow and subsequent cane crop
- Increased organic matter in the soil
- Capture nitrogen in root system of the legume crop, which in turn can be used by the subsequent cane crop
- Ensures a permanent soil cover over the fallow period because different legume types will dominate in different climatic conditions.

► Mixed fallow options to consider:

Project Catalyst trial work to date suggests that the following mixes are beneficial and easy to add into your farming systems.

Traditional legume mix requirements	Rates per Ha
Cowpea	15kg/ha
Lablab	15kg/ha
Total planting rate for traditional mix is:	30kg/ha

Nematode suppressant legume mix requirements	Rates per Ha
Cowpea	10kg/ha
Lablab	12kg/ha
Sunn Hemp	8kg/ha
Total planting rate for nematode suppressant mix is:	30kg/ha

High biomass legume mix requirements	Rates per Ha
Cowpea	10kg/ha
Lablab	12kg/ha
Soybean	10kg/ha
Sunn Hemp	8kg/ha
Total planting rate for high biomass mix is:	40kg/ha

5. Spray out volunteer cane and grasses

- Present in legume crops with Verdict @ 0.4-0.8L/ha rate (depending on the cane variety being targeted).

6. Legumes grow for 3 to 4 months

- Depending on soil moisture content. Terminate fallow crops before soil moisture is depleted from the subsequent cane or rotational crop & before seed sets.

*This is a very important step and needs to be monitored and managed well.
Spraying out your fallow with an aircraft or ground rig is ideal for terminating the fallow crop.*



Photo above: Incorporation of stubble with a bed renovator after slashing and knockdown herbicide.

Photo below: Incorporation of stubble with a bed renovator after a knockdown herbicide for late planted cane.

Photos supplied by HCPSL



7. Crop Stubble Management

- a. **Stubble management Option 1** - Roll or slash down legumes. When legume growth returns, spray out with knockdown herbicides and leave for two weeks before incorporation. Incorporate legume stubble into soil just prior to planting sugarcane.
- b. **Stubble management Option 2** - Spray out legumes and leave standing until they have dried down and you are ready to incorporate into soil. Delay the incorporation of dead stubble just before planting, to maintain the maximum amount of nitrogen for the subsequent crop.

8. Assessing nutrient input after legumes

- a. Did you have plenty of healthy nodules? Yes or No?



Above: Healthy nodules



Photos supplied by SRA Soil Health Project.

- b. How is your crop looking? Good crop or Poor crop?



ABOVE: Good Crop



Above: Poor Crop *Photos supplied by SRA Soil Health Project.*

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A DECISION SUPPORT TREE WHEN CONSIDERING NITROGEN FROM A FALLOW LEGUME CROP

N Fertilising After Legumes

Plenty of healthy nodules present?

YES

How is the crop standing?

NO

Plough in or spray out at convenience

GOOD CROP / UNIFORM

When will cane be planted?

POOR CROP / GAPPY

Is it consistently gappy?

Little N being produced, top dress at 6ES rate

EARLY

Spray, slash, down

LATE

Spray out, delay cultivation

YES

Normal N top dress

NO

Variable N application

Adjust N rates to take into consideration the residual nitrogen by using the 6 Easy Steps Table 8 "Calculation of Nitrogen rate discount following legume crop"

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