



Multispecies break crops in the sugarcane system

Many sugarcane growers across the industry have been trialling the use of multispecies crops during the fallow period with positive results.

Why multispecies?

Planting multispecies crops during the sugarcane fallow period is still a relatively new concept for the majority of the sugarcane industry. Trials conducted in other industries, and countries, have shown many benefits achieved from planting a multispecies crop. The overall aim of multispecies planting is to improve soil health, and this is achieved through the following methods:

- Breaking the sugarcane monoculture and not replacing it with a legume monoculture
- Increase plant diversity which will lead to an increase in soil biology diversity
- Provide a food source for a broader range of soil biology
- Provide soil cover and protection from erosion
- Create a range of rooting depths to address compaction
- Stimulate nutrient mineralisation
- Include legumes for nitrogen fixation
- Increase soil organic matter
- Assist with weed suppression.



To ensure a successful crop, there are a number of management decisions that need to be considered prior to planting. This fact sheet steps through some of the key issues to consider during the decision making process.

Factors to consider

1 The key objectives behind planting the crop

As well as improving soil health, there are other specific benefits that can be targeted through correct species selection. These include:

- Soil protection – different rooting depths, plant height and canopy density reduces soil erosion and sediment movement and provides shade for the soil
- Nitrogen fixation – include legumes in the species mix
- Weed control – select species that can out-compete and suppress weed species
- Fodder – select species that can be used for grazing or silage.



2 Weed management

- Consider planting methods that allow the trash blanket to be maintained, which will assist in weed suppression.
- Multispecies crop selection can allow for chemical control of problem weeds. For instance, in a block with high guinea grass pressure it would be suitable to select a multi species mix that did not contain any grass species. A grass selective herbicide (such as Haloxyfop or Fluazifop) can be sprayed over the top to help control guinea grass without impacting on the multi species mix.
- Always consider the impact the herbicides used will have on future crops and management decisions. Issues such as withholding periods and plant back periods need to be taken into consideration.
- Consider timing of planting and termination. For instance, allow the first flush of weeds to germinate and apply knockdowns prior to planting. Crop termination may be determined based on flowering of weeds species in the crop
- Do not plant species that may cause problems in the following cane crop (eg, hard seeded species such as lab lab or forage sorghum).



3 Field history

Sugarcane is a fairly tolerant crop in regards to poor soil condition. Many other species are more sensitive to issues such as low pH, sodicity, high aluminum levels, salinity etc. Sugarcane fallow blocks require a soil sample to determine necessary nutrient requirements for the upcoming plant cane. Taking the soil sample prior to the multispecies crop can identify issues that need to be addressed to help ensure a successful break crop, which will also benefit the future plant cane.

Consider previous herbicide use which may impact on multispecies crops, eg the use of Imazethapyr which impacts on most multispecies crops.

4 Planting

a) Equipment

There are numerous options available to plant multispecies crops each with their own advantages and disadvantages. Some of these options include:

	Advantages	Disadvantages
Direct Drill Planter	<ul style="list-style-type: none"> Separate large and small seed boxes Control over depth of planting Good seed to soil contact Precise planting 	<ul style="list-style-type: none"> Expensive machine Heavy and difficult to transport
Air Seeder	<ul style="list-style-type: none"> Relatively cheap (\$3,500 - \$12,000) Can be used on a range of implements Light and easy to move between implements Easy to use 	<ul style="list-style-type: none"> Needs to be used with an existing implement All seed sizes are planted at a similar depth Can be difficult to calibrate
Spreader	<ul style="list-style-type: none"> Relatively cheap (\$3,500) Light and easy to move Easy to use 	<ul style="list-style-type: none"> Seeds are left on the soil surface Difficult to calibrate Some concern about seed sizes separating in the hopper

b) Seed sizes and inoculants

In a multispecies mix there will be different seed sizes and different planting depth requirements. Generally, plants with larger seeds will emerge faster than those with smaller seeds. They will also tend to have larger seedlings which can potentially outcompete other species in a multispecies mix. Species selection and planting rate (kg/ha) is important to allow the smaller seed species to germinate and establish. Higher planting rates can help compensate for this concern.

Inoculants contain living bacteria which form a symbiotic relationship with legume plants. Different legume species need different inoculant Groups. The following table highlights the most common species planted in the Central region and the relevant inoculant group.

Table 1. Inoculant groups for various legume species

Commercial Inoculant Group	Legume Species
H	Soybean
I	Cowpea, mung bean
P	Peanut
B	Red Clover, White Clover
E or F	Vetch, field pea
M or I	Sunn hemp
N	Chickpea
AL	Lucerne



5 Fodder management

Many of the species grown in the multi species crop are capable of being grazed and/or cut for hay or silage.

Issues to consider for grazing include:

- Allowing cattle access to the paddock for short time periods to prevent selective overgrazing.
- Do not allow cattle to graze below 4-6cm species height.
- Allow the block to recover before grazing again.
- Carefully consider herbicide selection as many will have withholding periods for grazing or slaughter.
- Ensure species selection is appropriate for cattle feed – high legume or brassica content can lead to cattle health issues.

Issues to consider when cutting the crop for hay or silage include:

- Species selection will be important when cutting for hay as each species will dry down at different times. Try to have species of similar sizes to better co-ordinate the timing of dry down.
- Due to the issue of dry down it may be more practical to bale the crop for silage. Making high quality silage involves some key steps which should be investigated prior to planting the multispecies crop (cutting early; quick wilting and harvesting; make compact bales; sealing airtight as soon as possible etc).
- Ensuring high quality hay or silage as stock feed takes careful planning and management, but if done correctly will provide an additional revenue source from your fallow blocks.

6 Crop termination

Once the fallow crop is cultivated, the nitrogen in the legume crops will begin to mineralise and turn into a more plant-available form (ammonium and then nitrates). Once in the nitrate form, it is very easily lost from the paddock through either leaching, run off or denitrification.

Ideally the crop should be sprayed out or crimp rolled, and the stubble left uncultivated until closer to the time of sugarcane planting. This will reduce the potential for losses and allow a greater amount of nitrates for the coming plant cane crop.

Terminating the crop may also be determined by weed pressure. If the block has vine problems, then termination should occur prior to vine flowering. The multispecies crop and any problem vines can be sprayed prior to the vines flowering, with the crop stubble left undisturbed.

When planting multispecies crops for soil health benefits, it is also necessary to consider the amount of tillage undertaken to prepare the block for sugarcane. Heavy tillage will destroy soil biology and structure that may have developed during the multispecies crop. Many growers planting multispecies crops have planted the following sugarcane using either zonal tillage or zero tillage options.



7 Species selection

After taking into account all of the issues discussed previously, the next step is determining what species to plant. There are many resources promoting the use of species from each of the following 5 plant groups – legumes, cereals, grasses, brassicas and forbes (eg, sunflowers). However, it is not always sensible to plant species from each of these groups especially when considering issues such as grass weed control.

Species selection should be determined based on your objectives for planting, as well as other factors to consider. For instance:

- To address compaction plant species like tillage radish, chicory, sunflowers
- For phosphorus scavenging plant buckwheat, sunflowers
- For grazing plant species like plantain, chicory, barley
- To fix nitrogen plant legume species such as cowpea, sunn hemp, vetch, soybean.



There is a wide variety of potential species to plant, each with different soil or management benefits. Seeding rate of each species in the mix is also an important consideration, as is the cost of the seed per kilogram. It is important to address these issues to develop the most economical and productive mix for your farm. We recommend discussing these issues with your local Farmacist agronomist.

Summary

There are many soil health benefits that can be realised through planting multispecies crops and reducing ground tillage. By addressing the management factors listed in this fact sheet, these benefits can be maximised.

For more detailed information and videos, visit <https://www.farmacist.com.au/multispecies-fallow>. For on-farm assistance, please contact your nearest Farmacist office.

About Che



Farmacist Senior Agronomist Che Trendell has worked extensively to promote the planting of multispecies break crops during the sugarcane fallow period. The major benefit of multispecies crops is improvements to soil health through:

- Breaking the sugarcane monoculture – decrease pest and disease pressure
- Include legumes for nitrogen fixation which leads to reduced fertiliser inputs in the following sugarcane crop
- Increase soil microbial activity which leads to more mineralisation of other nutrients for the following sugarcane crop
- Increase soil conditioning – different roots structures will break up soil compaction and aerate the soil
- Maintain ground cover over the wet season to reduce soil losses.

Che has developed detailed knowledge to identify suitable planting mixes and rates for different situations, numerous planting methods based on available equipment, weed management within the multi-species crop, crop termination options (timing and method), and general management to ensure success.



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