While all four steps are very important, if the initial sample collection is not representative, then the following steps will be affected. Another important part of sample collection is the discussions that should be happening before the sample is collected. No farm or management practices are the same so an element of sampling is to understand the type of analyses that's required and how the results will be used in decision making.

After discussions have taken place, it may be necessary to make adjustments to site selection due to controlled traffic, soil type, fence lines and poor growth. Less obvious influences may also affect the area to be sampled. Sample areas are usually blocks or management zones with the same soil type and with the assumption they have been and will be "treated the same". It is important that the soil sample is representative of the area to be analysed. Samples are typically collected after harvest and prior to planting.

A soil collection protocol should involve discussions and appreciation of the management intentions and expectations to maximise the benefits of farm nutrient inputs. When the samples collected are representative of the whole management area, you are far more likely to apply appropriate soil inputs at the right time, increase yield potential and ensure production costs are suitable. Ultimately, soil analyses results are only as good as the sample collected.

**Here are just a few examples of questions a farmer should ask themselves, or discuss with a contractor, before collecting soil for analysis:**

- **What depth do I want to sample to and why?**
- **Are there old dump sites of lime or mill mud etc.?**
- **Are there areas of compaction (old headlands, fence lines etc.) which should be avoided?**
- **What is the recent fertiliser application timing and history?**
- **Is the equipment used for collection suitable or likely to contaminate the sample (such as painted or galvanised shovels/buckets/auger)?**
- **What sampling pattern will be used to ensure a representative sample is collected?**
- **Does the farming system (e.g. burnt/green) affect the sample collection?**
- **Is the collection area mapped and aligned with reference or historical data?**
- **Would using GPS reference points to collect from the same area each year be appropriate?**
- **Where will the sample be sent for analysis?**

EXTENSION

# Fallow management worth considering in dry years

*After harvesting a final ratoon it can be tempting to plough the field out and go directly into another cycle of sugarcane.* ***By Belinda Billing***

This is not recommended, with the negative effects of continual cropping of sugarcane recognised as early as 1935, when the loss of fertility in some Australian sugarcane growing districts was first noted.

With the Bureau of Meteorology indicating we are in the early stages of a hot, dry El Niño weather event, the importance of careful fallow management is heightened.

In an irrigated farming system, fallowing 15-20 percent of your farm will allow for better use of your water allocation along with the benefit of improving the fertility of the land.

The yield from the reduced area may be no lower than what you would have achieved from 100 percent production due to better soil health from fallowing and more strategic use of irrigation water.

Plough-out-replant requires heavy tillage to remove old cane stool and compaction, allows for the build-up of pests and disease, and has been shown to result in an average reduction in yield of 20 tonnes to the hectare when compared to fallowing land.

The benefits of breaking the sugarcane cropping cycle are well documented and numerous. Fallow management options include:

### Fallow (bare or weed)

Harvest the final ratoon and remove stool through cultivation or herbicide. The paddock is left bare or allowed to become weedy.

### Fallow plant

After the removal of the final ratoon a crop is grown, this is typically a legume crop, however other crops can be successfully grown (such as corn or rice).

The recognised benefits of either fallow management system are many.

Growers are encouraged to look at the benefits of planting a rotation crop after the final ratoon – but also weigh up their irrigation supplies with an El Niño forecast.

- **A reduction in the build-up of harmful soil biota, pests and diseases.** Research undertaken through Sugar Yield Decline Joint Venture (SYDJV) showed that incorporating a fallow into the sugarcane cycle resulted in reduced populations of harmful soil biota, including plant parasitic and free living nematodes.

- **Increased yield in the following sugarcane crop.** Studies have shown that breaking the sugarcane monoculture through either bare fallow or legume rotation regularly resulted in yield increases (see Table 1).

- **Improved soil properties.** Fallowing results in improved soil structure and less compaction as a result of a reduction in tillage.

These effects are generally enhanced by the planting of a break crop which offers the benefits of breaking the monoculture (if a non-grass crop is planted) improved weed control, ground cover to protect against soil erosion, the ability to provide organic nitrogen for the next cropping system and, if harvested, an alternative source of farm income. Break crops with strong root systems may also further reduce compaction.

While a fallow results in a percentage of the farm not growing sugarcane for twelve months (or more for an extended fallow) studies show that the resulting yield increase in plant and early ratoons will offset the lost production.

### Fallow cropping in a dry year

Growing legumes for grain will likely require irrigation to reduce water stress and maximise yield, particularly soybeans and peanuts. In a very dry year, where water is scarce it is recommended to grow legume varieties for green manure and consider early spray out to allow for early planting of cane with a full soil moisture profile.

If irrigation water is available it is recommended you complete an irrigation budget for your farm when deciding whether to grow crops for grain. Planting densities differ for grain crops and green manure crops. A general guide can be found in Table 2.

| Site and crop class | Cane yield (t/ha) in a ploughout/replant system | Cane yield (t/ha) following a legume fallow crop | Tonnes increase/ha |
|---|---|---|---|
| Tully (P*) | 88 | 102 | 14 |
| Ingham (P) | 48 | 61 | 13 |
| Mackay (P) | 63 | 90 | 27 |
| Mackay (R1) | 92 | 116 | 24 |
| Bundaberg (P) | 107 | 124 | 17 |
| Bundaberg (R1) | 110 | 138 | 28 |
| Bundaberg (R2) | 107 | 125 | 18 |
| **Average** | **88** | **108** | **20** |

***Table 1:*** Cane yields from crops planted with a ploughout/replant system and a fallow planting system.
*Example data from SYDJV rotation experiments taken from Smartcane: Fallow and Land Management.*

| Legume | Target population[1] | Planting time[2] | Water requirement |
|---|---|---|---|
| **Soybean** – All regions<br>*Leichhardt is highly susceptible to root rot nematode; nematodes will multiply to high population densities; Stuart and A6785 are resistant to root rot nematode; there will be limited nematode reproduction.* | • 250-300 000 plants/ha for cover crops; increase to 300-400 000 if planting late<br>• 300-400 000 for grain crops | • Cover crops: from late October to December<br>• Grain crops: mid-December to early/mid- January | • High |
| **Lablab** (Dolichos) – All regions | • 60-100 000 plants/ha | • October to December (before the wet season) | • Medium |
| **Cowpea** – All regions<br>*Highly susceptible to root rot nematode except Meringa which is moderately susceptible; nematodes will readily multiply.* | • 150-250 000 plants/ha | • October to December (before the wet season) | • Low to medium |
| **Mungbean** – Burdekin | • 200-300 000 plants/ha for dryland<br>• 300-400 000 plants/ha for irrigated | • Early plant: September to end of November<br>• Late plant: January to end of February | • Low to medium |
| **Peanut** – Southern, Central, Atherton Tableland<br>*Highly resistant to root rot nematode; no nematode reproduction.* | • Irrigated: 130-200 000 plants/ha, depending on type<br>• Dryland: 50-80 000 plants/ha in southern Qld, depending on type; 80-90 000 plants/ha in north Qld, depending on type | • Bundaberg – early September to mid-December.<br>• Northern NSW & southern Qld – mid-October to late November.<br>• Other areas: mid-November to mid-December. | • High |

***Table 2:*** Recommended legume planting densities for grain vs green manure and water requirement.

*[1] target population can vary by district and planting time – seek local advice from your seed merchant or productivity officer*

*[2] planting time can vary by district and variety – seek local advice*