HCPSL
Herbert Cane Productivity Services Ltd.

THE CANE STALK

December 2017

Courses on Offer to all Growers:

- Six Easy Steps
- Integrated Weed Management
- Safechem (Chemcert)

INSIDE THIS ISSUE:

A word from the Manager

At the recent HCPSL AGM, the Board announced the continuation of the HCPSL **Target 85** for a further 3 years. Early in 2018, the HCPSL Board and management will be asking you, our grower members, what services you believe are essential for the local industry to move forward and to re-evaluate the targets to be set in the **Target 85** program. We would appreciate your input.

Some of the activities undertaken by HCPSL and its partners under the **Target 85** program are:

- A 360% increase in the amount of approved clean seed from HCPSL plots;
- The establishment of the Ratoon Variety Trials (RVTs) and Introgression program, with SRA being the major partner;
- The evaluation and use of Enhanced Efficiency Fertilisers (like Agromaster and Entec) by industry;
- Working with the harvesting sector to reduce sugar losses and capture more cane from the field (with SRA, SRI and Wilmar);
- Assessment and subsequent better use of mill by-products (mill mud and ash) in a cane farming system;
- Continued investment into the Hinchinbrook Community Feral Pig Management Program;
- The granting of the aerial rat baiting permit (with support from CANEGROWERS and ACTA);
- Improvements in fallow management through mounding and use of fallow crops.

These are some of the notable achievements of **Target 85** to date.
On the environmental front, "the Right to Farm" is continually being challenged. This pressure will not cease soon and if anything, this pressure will escalate further. Food manufacturers are also now asking if the sugar they purchased is produced in an ethical and environmentally sound manner. If you have not considered **undertaking your BMP** yet, well its time you consider taking a step in the right direction. The BMP program will allow you to review what you are doing on the farm and give you the opportunity to show the world that you have addressed environmental and social concerns. Wilmar is offering 15 cents per tonne for the 2017and 18 season to growers who become BMP accredited. Please contact the CANEGROWERS or HCPSL offices to become accredited for BMP. **It is not as hard as you may think.**

The annual **HCPSL data collection form** was mailed out recently. The HCPSL Board and management believe that it is **very important** that good quality data is collected for your farm, we urge you to take the time to complete the forms and get them back to the HCPSL office **by Friday 19th January 2018**.
Why does HCPSL need data from you the grower?

1. Assist you to grow more cane on your farm through improved practices and adoption of new varieties.
2. To allow HCPSL to assist growers to develop specific variety, nutrient and pest management planning, leading to improved practices and increased productivity.
3. Allow HCPSL staff to analyses data to:

A. Defend the industry's position when dealing with government and "green groups". Without sound data HCPSL and your grower collective groups will not have data to defend your "right to farm".
B. Allow HCPSL to attract funding to manage issues like feral pigs.
C. Allow HCPSL to build business cases to obtain permits to allow for cane grub, rat baiting and feral pig management.
D. Investigate what farm and harvesting practices will lead to improved productivity and profitability.

Managing Privacy:

Will HCPSL give your grower data to another party who may use the data against you?
No, HCPSL must operate under the government legislated "Privacy Act" and we will not jeopardize its membership base.

Will the grower see their individual grower data being published without their permission?
Once again "Privacy Act" rules apply here. HCPSL will only publish aggregated data to defend the industry or to seek funding to address an industry issue like pig, rats or grubs.

Our office will remain open throughout the Christmas and New Year break to ensure we service your requirements. Some staff will be taking a well-earned break between early December and late January; on their return, they will attend to your enquires.
On behalf of the HCPSL Board and its staff we would like to thank you for your continued support. Have a Merry Christmas and we look forward to continuing working for you in 2018.

ATTENTION GROWERS

This will be the last edition sent out as a paper version, from this point on "The Cane Stalk" will be sent out via email and at our website www.hcpsl.com. If you do not have access to email or the internet please inform us and we will be able to mail a copy to you.

Requirements for Maintaining Agricultural Chemical Competency— ChemCert

Supplied by Farm Safe Australia

Recently there has been speculation by some organizations and individuals that a primary producer and their workers only have to undertake an agriculture or veterinary chemical course once in a lifetime to maintain competency.

This is misleading information; primary producers and/or their workers following advice such as this could leave themselves exposed to a number of legal sanctions if a chemical incident were to occur involving human and/or environmental incident exposure.

Issues to be considered:

- Training packages and their elements of competency and assessments are updated and or changed at least every five years.
- Chemical labels and Safety Data Sheets are constantly changed to reflect changing industry standards and legal requirements. E.g. the latest Gramoxone 250 SDS contains the following statement *"This product can only be purchased by authorized persons holding a current certificate in the safe and responsible use of agricultural chemicals"* I.e. SafeChem; AusChem or ChemCert.
- The Queensland Government has just significantly changed the Work Health and Safety Act and the status of the underlying Codes or Practice. These codes are reviewed and changed every five years; growers and their workers need to keep themselves informed of these changes by attending courses such as SafeChem. Under the WHSQ Regulations the PCBU (The employer) has an obligation to provide training and advice on the use of hazardous substances. (Includes agricultural chemicals)
- Many chemicals, particularly herbicides have changing requirements for use such as spray quality guidelines etc. Users who fail to keep themselves up-to-date with current information run the risk of legal sanction if they do not abide by the label and safety data sheet directions and current industry best practice.
- Legislation covering Work Health and Safety, The Environment (including reef protection) off-target movement and General Community safety must always be considered. The continued registration and use of a range of agricultural chemicals is always under review and as an industry Agriculture must demonstrate the best possible competency to safely apply these chemicals. If we don't we could find many of our most useful products deregistered.
- Safe and responsible Agricultural Chemical Use requires Agriculture to continue to demonstrate a clean, green image to the community. To do this we must understand the ever-changing world of chemical use and have the skills and knowledge to meet our obligations and maintain our competency at least every five years.
- The National Farmers Federation and its member organizations (which CANEGROWERS is a member) have always supported a verification of competency for the users of agricultural chemicals every five years to support the community perception of clean, green agriculture.

To enroll in a Chemcert/Auschem Course, please contact Sandra Coco—47761808

Products to consider for pre-emergence of plant cane

Add Gramoxone® 250 when weeds are present (Directed application)

			GST Inclusive	
Situation	**Herbicide**	**Rate**	**Cost/ha**	**Water Rate L/ha**
Grasses & Broadleaf weeds Add knock-downs for larger weeds (Directed application)	Gesapax Combi® 500 SC	6 – 8L/ha	$76 - $101	110+
	Flame® 240 + Atrazine 900 WG	300 – 400ml/ha +2.2 kg/ha	$28 - $31	200 +
	Flame® 240 + Stomp® Xtra	300 – 400ml/ha +2.2 lt/ha	$43 - $47	200 +
	Balance® 750 WG + Atrazine 900 WG	200g/ha +2.2 kg/ha	$55	250 +
	Balance® 750 WG + Diuron 900 DF	200g/ha +0.5 kg/ha	$41	250 +
	Mentor® WG (Soccer, Tomahawk, Metribuzin)+ Balance® 750 WG	0.64kg – 2.0kg/ha + 150 – 200g/ha	$47 - $98	250 +
	Mentor® WG (Soccer, Tomahawk, Metribuzin) + Stomp® Xtra	0.64kg – 2.0kg/ha +2.2L/ha	$54 - $96	250 +
	Mentor® WG (Soccer, Tomahawk, Metribuzin) +Ametrex® 800 WG	0.64kg – 2.0kg/ha +2 kg/ha	$67 - $109	250 +
	Mentor® WG (Soccer, Tomahawk, Metribuzin) +Diuron 900 DF	0.64kg – 2.0kg/ha +0.5 kg/ha	$26 - $68	250 +
	Bobcat® i-MAXX + Gramoxone® 250	2.9L - 3.8L + 1.6L	$76 -$97	400 – 600
	Krismat® WG + Diuron 900 DF	1.5 – 2.0kg/ha +0.5 kg/ha	$62 - $80	250 – 400
	Metolachlor 960 EC (Clincher Plus, Chaser) + Atrazine 900 WG	2.175 – 2.7L/ha +1.5 – 2.0 kg/ha	$33 - $43	110 +
	Metolachlor 960 EC Clincher Plus, Chaser) + Diuron 900 DF	2.175 – 2.7L/ha + 0.5kg/ha	$26 - $31	250 - 400
	Metolachlor 960 EC (Clincher Plus, Chaser) + Ametrex® 800 WG	2.175 – 2.7L/ha + 1.1kg/ha	$46 - $51	100 +
	Primextra Gold®	4.8 – 6L/ha	$66 - $83	110 +
	DUAL GOLD 960 + Atrazine 900 WG	1.45 – 1.8L/ha +2 - 2.5kg/ha	$45 - $48	110 +
	Amigan® WG	3.1 – 4.6 kg/ha	$43 - $64	200 – 300
	DUAL GOLD 960 + Mentor® 700 WG (Soccer, Tomahawk, Metribuzin)	1.8L/ha +1.5kg/ha	$73	250 +
	Valor®500 WG	350g – 700g/ha	$60 - $120	200 +

Please contact a HCPSL Extension Agronomist for further information

Effects of Phytotoxicity on some of the newer release varieties

By Richard Hobbs

Over the past few seasons some of our newer varieties have been showing effects of phytotoxicity. **Phytotoxicity** is a toxic effect by a compound on plant growth. Such damage may be caused by a wide variety of compounds, including trace metals, salinity, **pesticides,** phytotoxins or allelochemicals**.** The main concern we have is with pesticide damage mainly by Phenoxy based products. **Phenoxy herbicides** are part of a group of chemicals related to the growth hormone, indoleacetic acid (IAA) and a part of the **Group I** herbicides. Phenoxy herbicides work by mimicking IAA or auxin in broadleaf weeds, producing rapid uncontrolled growth, which eventually kills the plant. These group I herbicides include 2,4-D, Starane, Actril DS, Tordon 75-D and MCPA.

Symptoms of phytotoxicity can show up in leaves, crop height differences and plant vigour. Some varieties of cane can display phytotoxicity symptoms in young small cane with no actual stalk showing through to mature cane fully stalked. These symptoms may vary from variety to variety. What to look for are leaves that look lethargic and droopy. They don't have their usual vigour and erectness. You might find leaves with stripes and or blotches on them.

Sometimes the cane will be a lighter shade of green and/or "crankhandling" may occur and/or droopy bent over tops/stalks. In extreme and rare cases the plant can actually die. This may occur in some varieties that are extremely susceptible to phenoxy damage.

Varieties like Q138, Q183, Q226, Q240, Q242, SRA3 and SRA5 (unknown) can all be affected by group I herbicides. (Herbicides that can causing Phytotoxicity).

Spray methods to help minimise phytotoxicity damage to your crop.

- Higher water rates (150 L/ha+).
- Do not spray directly into the heart/ growing point of the plant.
- Spray below the canopy height if possible (not onto green leaves).
- Spray when broadleaf weeds and vines are smaller.
- Avoid periods of high temperatures.
- Consider using MCPA instead of 2,4-D.
- MCPA sprayed as above on to sensitive varieties will have a lower rate of phytotoxicity.
- Below is a copy of the rates that can be found on the MCPA label.

Adama
MCPA® 750
Herbicide

Sugarcane	Blue Top, Chinese Burr, Flannel Weed, Gambia Pea, Bell Vine, Streaked Rattle Pod, Bindweed, Pink Convolvulus, Cupids Flower, Merremia Vine, Morning Glory	Qld only	930 mL	**Post-emergent:** Apply as a directed inter-row spray. DO NOT exceed rates with phenoxy sensitive varieties.
	As above plus Fat Hen, Noogoora Burr		1.45 L	

The Role of Calcium and pH in Sugarcane

By Adam Royle & Michael Sefton

Calcium

Calcium is critical in the development of a healthy sugarcane crop. It plays an important role in soil health by helping to improve soil structure, which in turn improves things such as water holding capacity and nutrient availability. The addition of calcium can also remediate issues of salinity and pH.

In the crop, calcium's main role is to provide structure and improve the function of plant cells. This is particularly critical in the growth stages of the crop. Calcium also assists with the availability and uptake of nutrients and a lack of calcium will inevitably lead to a reduction in crop yield.

Calcium is not particularly mobile and is therefore relatively stable in the soil. Its stability also means that the crop cannot readily move calcium from one part of the plant to another and therefore needs a good supply to maintain healthy growth. This is also the reason why the quality, or particle size, of the calcium product is important. Products that supply larger calcium particles first need to be broken down into finer particles before they can be transported to various parts of the plant.

Excess magnesium, iron and aluminium can affect the plants ability to access calcium. Ensuring there is a good supply of calcium when these other elements are present in high amounts is important. There are currently a number of calcium based products available including lime, Ozcal, Calciprill and liquid limes. Mill mud and ash are also good sources of calcium, which should be taken into account when applied.

Soil pH

Soil pH is the measure of acidity in the soil. Typically soils in the Herbert have slightly acidic characteristics with the average for the district between 5 to 5.5pH. While most soils in the wet tropics are traditionally acidic in nature, the addition of nitrogen based fertilisers have greatly increased the rate at which they acidify.

Soils that fall below a pH of 5.5 need to be corrected using products such as lime, dolomite or other similar alkalines. Lime is highly alkaline and therefore is most suited to raising soil pH. However, if soil pH is marginal and requires magnesium then dolomite is a good alternative as it too is slightly alkaline. Mill mud and ash are also good at buffering or maintaining soil pH.

If not corrected low pH soils can run into a number of issues including high concentrations of aluminium, which is much more mobile in low pH soils. Reduced availability of nutrients such as nitrogen, potassium, calcium and magnesium can also be encountered when soil pH is low.

Variable rate application of ameliorants (lime, dolomites etc) is helping to improve the supply of calcium and pH by placing the right amount in the right place.

Contact Michael Sefton 0428 746 079 or Rod Nielson 4776 1808, if you are interested in undertaking variable rate lime applications.

Let's Mix It Up—Mixed Fallow Cropping

By Megan Zahmel & Lawrence Di Bella

It's that time of year again when we in the sugarcane industry start thinking about fallowing blocks on farm. Have you ever thought about mixing your fallow crops up?

HCPSL is currently running a trial under Project Catalyst to assess the benefits of having a mixed bio-diversity of legumes in a fallow rotation crop.

Farmers globally are looking at ways to improve soil health and with good reason.
We all know that a continuous monoculture, year after year is causing great strain on our agricultural soils. This is the reason for fallowing in the first place, but if our fallow crops go from one mono-culture to another, are we really rejuvenating our soils like we think?
The idea for mixing up of species in the fallow crop is a simply one solution.

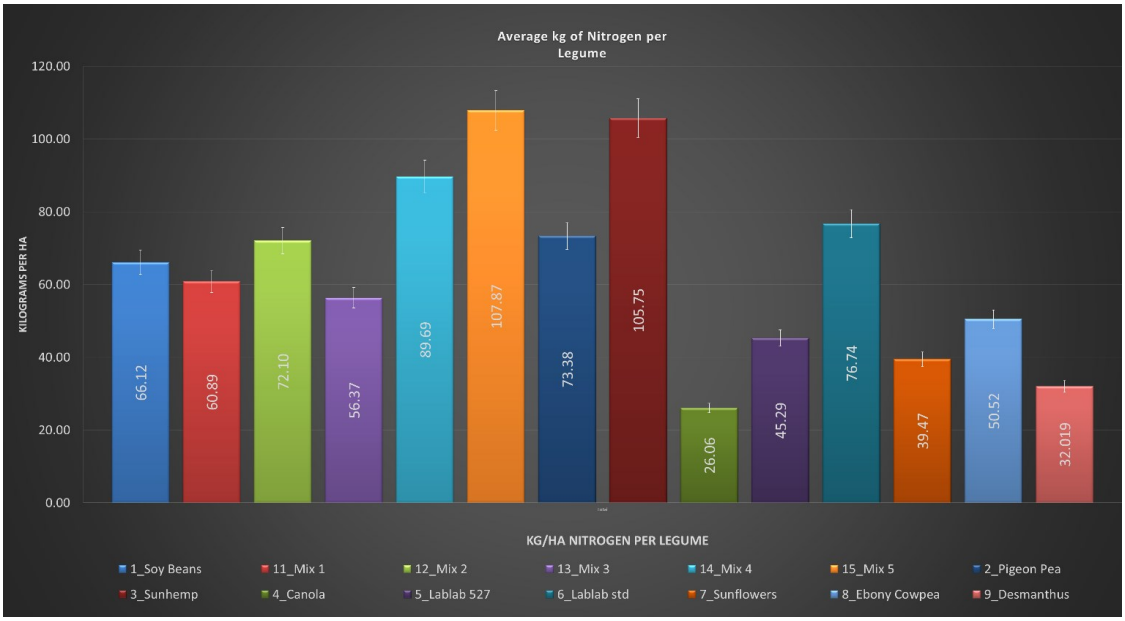
BREAK the monoculture and make our soils more healthy.

What are we looking at?

Under Project Catalyst, HCPSL has been running trials to see what results and benefits come with having mixed fallow crops. In the past year, we have trialled many legumes which include: cowpeas (Ebony), canola, sunflowers, lablab (cv. Rongaii), lablab (cv.527), *Desmanthus* (cv. Sugarbush), soybeans (cv. Leichardt), pigeon pea, sunnhemp and a combination of the species.
So what benefits did we see by having these mixed species growing together?

While the cover crop was on field, there was a deep layer of organic matter in plots that had mixed legume crops. This helps retain moisture, reduces weeds and was a food source for microbial biodiversity. We saw visible fungal hype and mushrooms in the trial; this is a positive sign for healthy soils. Fungihas great symbiosis with soil life and roots systems and responds with a *"I'll scratch your back, if you scratch mine"* approach with his plant neighbours.

There is the potential to reduce inorganic fertiliser application, after a mixed green manure crop, due to the high amount of nutrients (especially nitrogen) returned back to the soil for the subsequent cane crop to utilise. Below is a graph highlighting the differences in nitrogen caused by the fallow crops.



When green manure is left on top of the row profile to decompose this provides soil benefits like increasing the availability of some nutrients, organic matter and carbon. It will also reduce weed populations, while improving the water holding capacity of soils. Below is a photograph of a mixed fallow legume crop being slashed out.

Some plant species like Sunnhemp and canola are known bio-fumigant effects on the soil. Biofumigation has a positive effect by naturally controlling pathogens and plant parasitic nematodes numbers (like:.root-knot and lesion nematodes).

Some plant species can break compaction layers in hard clay profiles. Leaving organic matter from these legumes deep in the soil profile helping to improve soil structure. Hayden Di Bella showing the deep rooting nature of *Desmanthus* (cv. Sugarbush).

Key learning from the trial

While we found many benefits to mixing fallow crops, we also learnt what did and didn't work to our advantage.

Canola, while having bio-fumigant effects and a good nutrient return according to literature, didn't handle the heat or the wet conditions (in the tropics) and subsequently died off before any benefits could be realised.
The presence of root knot nematodes populations increased in the sunflower treatments to a level high enough to affect sugarcane production on the next crop.

When mixed with other species such as Sunnhemp, (natural bio-fumigant), the root-knot nematode issue significantly reduced to a level, that levels were low enough that they were no longer a problem for the subsequent cane crop.

We recorded data that showed us that both the lablab species performed well in a monoculture and they were beneficial when both varieties were planted as a companion crop (Mix 5 treatment)

Let's Mix It Up—Mixed Fallow Cropping Cont.

Most of the mix species crops performed better than soybean or cowpea monocultures. The mix species plots had higher biomass, great weed coverage, showed improvements soil structure and fungal hype, and had abundance of organic matter.

Mix 2 which consisted of Ebony cowpea, Leichardt soybean and Sunnhemp had the greatest biomass out of the mixed species treatments.

Mix 3 which consisted of Ebony cowpea, Leichardt soybean and the standard lablab, had a high population of free-living (good) nematodes that help plants access nutrients within the soil.

Desmanthus (cv. Sugarbush) has a deep tap root that equals in size to above ground biomass. Sugarbush was slow to germinate and was out competed in the mix species plots, but more work will be done in this space as *Desmanthus* (cv. Sugarbush) holds nitrogen in ammonia form longer (which is subject to less losses to the environment), than other species like soybeans and cowpea.

Pigeon pea showed significant promise in the trial and has the potential to be incorporated into a mix species crop. It has a high biomass, high nitrogen and potassium returns for the subsequent cane crop to utilise. The species is deep rooted which can break up compacted layers.

The magic of mixing your fallow species.
For example:
Sunflowers mixed with Sunnhemp and cowpeas, soybeans or lablab, are benefical because they give an overall health boost to our soils.

Sunflowers have many positives when used in a mixed fallow crop. Sunflowers have the ability to pull up phosphorus and zinc from deep in the soil profile, making it available to the cane crop. Sunflowers have a symbiosis effect with mycorrhizae fungi that makes crops more resilient to pathogens and disease. Sunflowers also appear to attract earthworms, can break up compacted soils and have many other benefits on soil health.

The Sunnhemp controls the sunflower/nematode issues through its natural bio-fumigant effects, while getting many of the benefits from the sunflowers. The Sunnhemp provides large amounts of biomass in green manure and has a high return value of nitrogen, potassium, phosphorus and sulphur, allowing you to possibly reduce the amount of chemical fertiliser inputs.

Mixing the above with species like lablabs, soybeans or cowpeas, adds a full ground cover which shades out weeds, improves water holding capacity, helps to improve soil structure, while making nutrients bioavailable to the subsequent cane crop.

By mixing the species we can gain multiple benefits for soil health and subsequent cane crop.

Possible mixed species fallow options to consider:
Option 1. Soybean, cowpea, lablab, sunflower
Option 2. Soybean, cowpea, *Desmanthus* (cv. Sugarbush), Sunn hemp
Option 3. Lablab, Sunn hemp, cowpea (cv. Ebony or Calypso)
Option 4. Sunnhemp, soybean, cowpea, *Desmanthus* (cv. Sugarbush)
Option 5. Soybean, cowpea, *Desmanthus* (cv. Sugarbush), lablab
Option 6. Soybeans, Sun hemp, cowpea (cv. Ebony)
Option 7. Pigeon pea, cowpea, soybean, lablab
Option 8. Pigeon pea, cowpea, soybean, Sunnhemp

Note: Sunnhemp will not be available to Herbert growers for the 2017-2018 fallow cropping period.

Other management practices to take into consideration when growing mixed fallow crops are:

- Ensure that the soil pH is greater than 5 to allow for legume growth and to improve soil biota.
- Avoid early incorporation of fallow crop stubbles (especially legumes).
- Terminate crop growth early enough to maintain soil moisture (especially in dry areas).
- Reduce tillage as much as possible. Heavy cultivation of your blocks will result in burning off carbon and killing beneficial soil life, which you have just spent three to four months building.
- Manage compaction through controlled traffic systems to gain the full benefits.

Watch this space!

There is plenty of action in research field, so keep your ears open for new and exciting developments in mixed fallow cropping.

HCPSL will be continuing with mixed fallowing cropping trials in 2017-18, to further investigate the benefits and how we can gain the most benefits for our cane crop.

In the 2017-18 fallow period HCPSL will conduct further trials to investigate the benefits of a mixed fallow crop in a sugarcane farming system. New plant species to be assessed are:

- Tillage radish, known for its deep tap roots and effectiveness at breaking up of compacted soils.
- Beefmaker and Siran stylo.
- Velvet bean, known for its large biomass and its ability to decrease nematode number in soil.

Summary of benefits due to a mixed fallow crop:

- Increases soil biodiversity.
- Increased levels of organic matter and carbon.
- It can effectively control weeds in the fallow period, which has positive benefits in the subsequent cane crops.
- It can provide nutrients back to the following sugarcane crop.
- It will provide protection from wind and water erosion.
- Provides protection to the soil, due to issues caused by rain drop splash.
- It can reduce populations of pathogenic nematodes, while increasing the numbers of free-living nematode which improve soil health.
- Improves overall soil health.

Megan Zahmel.
HCPSL extension agronomist

HCPSL Herbert Cane Productivity Services Ltd.

Project Catalyst

Regenerating a soil food web capable of improving soil health and reducing losses from soilborne pests and pathogens of sugarcane

Dr Graham Stirling
Biological Crop Protection Pty. Ltd. Brisbane

Soil degradation problems (variously termed 'declining productivity', 'sick soil syndrome' and 'yield decline') have been apparent in the Australian sugar industry for more than 100 years. Research conducted by the Sugar Yield Decline Joint Venture (SYDJV) showed that the following factors were contributing: long-term monoculture; uncontrolled traffic from heavy machinery; excessive tillage; practices that deplete soil organic matter; and damage caused by root pests and pathogens. Results obtained by the SYDJV also showed that economic and soil health benefits could be obtained by adopting a farming system that had four key components: legume rotation crops; minimum tillage; crop residue retention; and controlled traffic using GPS guidance.

Although the farming system advocated by the SYDJV provides many benefits, the scientists involved in the research also noted that root pathogens such as plant-parasitic nematodes quickly returned to pre-break levels and that in situations where the SYDJV farming system had been in place for only a few years, there were few signs of improvement in soil biochemical or biological properties. Since there was a need for further research in these areas, the objectives of this project were to assess root health on farms where the SYDJV farming system had been in place for 7-12 years; determine whether soil carbon levels had increased to the levels required to generate an active and diverse soil food web capable of suppressing pests such as plant-parasitic nematodes; obtain a better understanding of the key organisms responsible for suppressing nematode pests; and understand the effects of management on suppressiveness. This knowledge was then to be used to provide practical guidelines on what should be done to improve the biological health of sugarcane soils.

Photo above is of a high carbon source green manure crop in the Herbert 2017

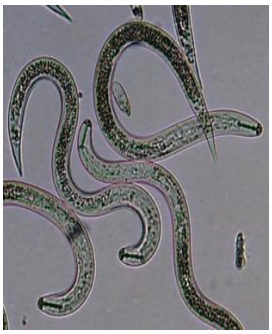


Photo of nematodes in a cane crop.

Soil carbon, root health and nematode pests in best-practice farming systems

Soil and root samples were collected from five farms in the Bundaberg/Maryborough region where best-practice farming systems had been in place for 7-12 years. The results showed that root health was excellent near the soil surface but declined rapidly with depth. Root biomass was 2.5 times higher in soil just under the trash blanket than at a depth of 5-10 cm and the roots in the upper layer of the soil profile were also much healthier. The soil where the roots were healthy had much higher carbon levels and this had flow-on effects to the soil biology. Microbial activity and numbers of beneficial nematodes were much higher in the topsoil than at 5-10 cm whereas populations of plant-parasitic nematodes were much lower, presumably because the topsoil was biologically suppressive.

A pot experiment in which sugarcane was grown in soils collected from different depths in the soil profile showed that there was an inverse relationship between soil carbon levels and the number of root-lesion nematodes. Data from two quite different soil types showed that increasing the soil carbon content by 0.5% decreased the number of root-lesion nematodes per gram of root by about 80% and 35% in sandy loam and clay loam soils, respectively.

The impact of organic amendments and intercropping on the biological health of sugarcane soils

Since carbon levels in cane-growing soils are 50-80% lower than attainable levels, growers, millers and researchers have established a range of replicated trials to determine whether organic amendments and intercropping could play a role in rectifying the situation. Eleven of these trials were sampled in an attempt to assess whether carbon levels, root health and soil biological health had improved.

Amendment of surface soils with organic matter. Composts and locally-available organic wastes were applied in field trials at five sites. Various amendments were used in the trials and they were applied at different rates and incorporated into the soil in different ways.

- In a field trial at Harwood, NSW, mill mud/ash and compost produced from mill mud/ash, bagasse and wood waste were applied at rates of 13-90 dry t/ha. Both amendments improved sugarcane yield, with the response increasing as the application rate increased. Results obtained 4 years after the amendments were applied showed that soil carbon levels in the amended soils had increased by 8-10%, populations of root-lesion nematode had declined and populations of microbivorous nematodes were much higher than in non-amended soil.
- Three growers established replicated trials on their farms to determine whether locally-available organic wastes applied at 8-12 t dry matter/ha improved the health of their soils. Pre-plant application of compost significantly increased microbial activity in one of the trials but it did not increase soil carbon levels, presumably because the application rate was relatively low and the quality of the compost was poor. The data also showed that plant-parasitic nematodes remained the dominant component of the nematode community in compost-treated soils at all three sites.
- In another grower-initiated trial, a range of soil health benefits were obtained when double-disc openers were used for three successive years to slot mill mud into furrows on either side of the cane row. Soil carbon levels in the zone where the amendment was placed were almost double the levels in the untreated zone; microbial activity and numbers of free-living nematodes increased significantly; numbers of plant-parasitic nematodes declined by about 67% and there was a profusion of healthy roots in the area where the amendment had been placed.

These results suggest that when sugar growers are using amendments for soil-building purposes, composts must be well-cured and of good quality, and should be applied at the highest possible application rate. Regardless of the amendment being applied, equipment similar to that used to apply amendments in V-shaped furrows should be developed because it provides growers with the option of incorporating amendments into soil with minimal soil disturbance and applying them throughout the crop cycle. Ideally, such equipment should be constructed in such a way that the distance of the furrow from the cane row can be varied.

Photo on left is an example of encapsulating the zonally applied mill mud/ash, in the Herbert

Subsoil amendments. In 2011 a grower group in Maryborough established a field trial to test the effect of slotting organic matter into the subsoil at depths of 30-40 cm. Samples collected after the fourth ratoon crop was harvested showed that soil pH, total C, labile C, total N, microbial activity and the number of free-living nematodes were all significantly higher in the slot where the amendment had been applied. However, despite these improvements in soil chemistry and biology, root biomass and root health was no better in the slot treated with compost than the non-treated zone. In contrast, samples collected from two trials where organic materials had been applied to the subsoil only 6 and 13 months previously showed significant improvements in root biomass and parameters such as root length, root surface area and the number of tips and forks. Also, numbers of root-lesion nematode were significantly reduced by mill mud in one of the trials. Although more work is required to confirm these findings, these results suggest that subsoil ameliorants initially improve root biomass and function and reduce pathogen loads. However, the root health benefits provided by the ameliorants may decline with time.

Intercropping. Three trials were sampled where sugarcane was intercropped with various plant species in an attempt to improve soil health.

- In a trial in the Herbert, soybean and mungbean were planted 3-4 months after sugarcane was harvested. Analyses of soil samples taken after two successive years of intercropping indicated that the treatments had not changed the nematode community.

Regenerating a soil food web capable of improving soil health and reducing losses from soilborne pests and pathogens of sugarcane cont.

- In the second trial at Mackay, a mixture of plant species was sown immediately after cane harvest and grown for 10-12 weeks. Results obtained in three successive years indicated that intercropping generally reduced populations of plant-parasitic nematodes and increased populations of free-living nematodes. The 8-species mix increased soil carbon levels by about 15% after 3 years but the effect was not quite significant ($P = 0.086$).
- Sunflower was the intercrop species in the third trial and root colonisation and DNA tests for arbuscular mycorrhizal fungi showed that sugarcane roots associated with sunflower roots were more heavily colonised and supported a more a diverse range of these fungi than roots from an adjacent site that was not intercropped.

Collectively, these results suggest that intercropping improves the biological health of sugarcane soils. However, long-term field trials are required to substantiate the benefits obtained and better understand the effects of intercropping on soil carbon levels and various components of the soil biological community. The effect of intercropping on productivity and profitability must also be determined.

Intercropping trial conducted in the Herbert. mungbean intercropped with sugarcane.

Photo- Application of fertilisers in the Herbert cane growing region

Management effects on the suppressiveness of sugarcane soils to nematode pests

Plant-parasitic nematodes multiply to high population densities in sugarcane soils because the practices used to grow the crop have weakened the natural regulatory forces that should be keeping them under control. Excessive tillage, compaction caused by harvest machinery and low levels of soil organic matter are probably the primary reasons this has occurred, as they all have a negative impact on natural enemies of nematodes. However, it is also possible that nitrogen fertilisers and the pesticides used to control cane grubs are contributing, as predatory nematodes are particularly sensitive to nitrogenous materials; nematode-trapping fungi tend to most active in N- limited habitats, and insecticides are known to have side-effects in terrestrial ecosystems. Consequently, studies were undertaken to assess the effects of nitrogen and selected pesticides on some of the organisms that prey on nematodes.

Effects of nitrogen. The nitrogen study was done at a trial site in central Queensland where high and low rates of N fertiliser (160 and 40 kg N/ha, respectively) had been applied to sugarcane for three years. Immediately after the second ratoon crop was harvested, nematode analyses indicated that numbers of lesion nematode and total numbers of plant-parasitic nematodes were significantly higher in the high than the low N treatment. There were also negative effects of N on beneficial omnivorous and predatory nematodes, and a trend towards lower populations of a nematode-trapping fungus when N inputs were high. Also, the results of a bioassay indicated that the soil with higher N inputs was less suppressive to plant-parasitic nematodes than soil from the low N treatment. Collectively, these results indicate that high inputs of N fertiliser are detrimental to some of the natural enemies of plant-parasitic nematodes.

Effects of pesticides. This study aimed to determine whether two pesticides widely used in the cane industry are detrimental to soil microarthropods, particularly the mesostigmatid mites that rely on nematodes for food. An experiment with liquid formulations of imidacloprid (found in Confidor®) and bifenthrin (found in Pyrinex Super®) was established at one site while the effects of a controlled release formulation of imidacloprid were examined at two other sites. In all experiments, the pesticides were applied to the planting furrow in a band 20-cm wide that was located 2-4 cm above recently-planted setts. Microarthropods were extracted from soil samples collected 9 weeks after the liquid formulations were applied and about 15 months after the experiments with a controlled-release formulation of imidacloprid were established. In all cases, the number and diversity of the microarthropods recovered from the samples was similar in the pesticide-treated and untreated plots. Also, populations of mesostigmatid mites and their nematode prey were not affected by either bifenthrin or imidacloprid.

These results indicate that the non-target effects of imidacloprid and bifenthrin on soil microarthropods are negligible, possibly because the pesticides are applied in a band in the centre of the row and much of the profile (vertically and horizontally) remains as an untreated reservoir that can be used as a safe refuge by soil organisms.

Conclusion.
Collectively, these results indicate that although the farming system developed by the SYDJV has improved the soil's physical and chemical health, the soils are still in poor condition from a biological perspective. Pathogens dominate the soil biological community and this means that roots are continually being damaged or destroyed. The research clearly highlights the importance of maintaining soil carbon to ensure improvements in soil health and management of detrimental pathogens in sugarcane farmed soils.

FINANCIAL COUNSELLING SERVICE

There are times in business when things get a bit tight or you just want to discuss things with someone neutral.
Planting, harvesting, pricing as well as the business side of things and sometimes we are not really sure of where the business is going in the long term.

Rural Financial Counselling Service North Queensland

The Rural Financial Counselling Service is a FREE and CONFIDENTIAL service.

Where do you think your business will be in five or ten years?
How can I assure we will be viable?
Do I need to start planning now for the next ten years?

The Counselling Service analyse and help you understand your business, your financial statements and your cost structure and help you determine where you are at. They can also assist you develop options as you go forward.

It could be that you wish to explore various options such as expansion, diversification or general succession issues we can help you 'crunch the numbers' to see if it is viable or how you can make it happen.

It could be that you need to deal with a financier or creditor and need some assistance. (Most counsellors have a banking background and understand finance).

You need a cash flow budgets and the counsellors can do that with you. We can also do cashflows of different sensitivities or 'What If's' so you can see what can happen under certain business stresses These may include lower price or reduced production.

Counsellors can deal with banks and help build a relationship where you both work toward a positive outcome for the business.

Essentially the counsellors give you good data about your business so you can make valued business decisions.
The Counselling Service can also work very closely with your accountant and other business advisors.

Nick Birchley is the Rural Financial Counsellor for the Herbert district.
Contact Nick on Mobile 0448 460 309 or **Email nick@rfcsnq.com.au**

HCPSL SOIL TESTING GUIDELINES

Why do I need to do soil tests?

Soil testing is required prior to planting to calculate the optimum amount of nutrients to apply to your farm. This will inform the nutrient requirements of your crop, save money and reduce the risk of surplus nutrients ending up in waterways. It is a legal requirement to undertake soil testing of blocks to be planted.

What do I need to do?

The most effective time to sample is just after harvest of the last ratoon of the previous crop cycle. You can also have soil samples analysed from late crop cycle ratoons to indicate the presence of any agronomic issues to be corrected prior to establishing a fallow crop.

For soil testing services and nutrient recommendations, contact a HCPSL fertiliser industry advisor who meets the national competency standards provided in *The method for soil sampling and analysis for sugar-cane properties regulated under the Environmental Protection Act 1994.*

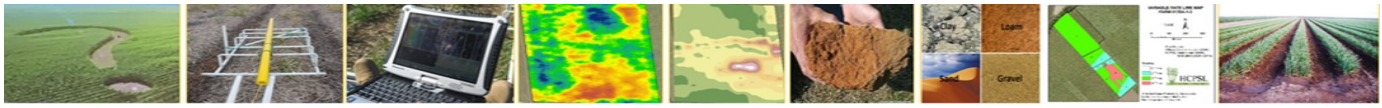
	**Obtain a soil map** Use a map to define and record the soil sampling locations. Maps can be obtained from HCPSL or the Wilmar grower web.
	**Select representative blocks for sampling** select areas for soil sampling that represent the soil types and nutrient management regimes of the blocks being planted.
	**Sample collection** Soil cores should be collected from the shoulder of the cane row, making sure no trash is included in the sample. Avoid sampling handlands and poorly drained areas. If possible record a GPS location for each soil test.
	**Send samples for analysis** Drop soil samples into HCPSL for nutrient analysis. Pachymetra rootrot and nematode testing can be done at the same time.
	**Record keeping** Keep your soil test results and a map identifying farm blocks and sampling locations for five years.

Before you carry out a soil test, you can refer to:

The method for soil sampling and analysis for sugarcane properties regulated under the Environmental Protection Act 1994 which describes the tools and method in full required to sample your soils correctly.

It is available at www.qld.gov.au/FarminginReefCatchments

Queensland Government



HCPSL takes a Giant leap into the Precision Agriculture World

This year with the help from Project Funding and support from the HCPSL Board, saw HCPSL purchase a Dual EM 421 which was showcased at the Herbert Walk and Talk day at Macknade in March. This machine is towed behind a vehicle and records Soil Electrical Conductivity and linked GPS data on a laptop.
The Dual EM has mapped quite large areas already and HCPSL is associated with a UNSW funded three year research trial which includes Mossman, Herbert, Burdekin and Proserpine.

Rod Nielson and Michael Sefton on invitation from Associate Professor John Triantafilis attended UNSW for one week at the beginning of the year to work with Soil Scientists and PhD students looking at advanced data analysis and soil mapping methods.

Capitalising on this soil mapping knowledge we were able to start prescription variable rate lime and gypsum applications in conjunction with Miriwinni Lime.

In other words; once a Dual EM soil zone map has been created and some soil samples correlated with these zones – a map varying the Rate of Lime or Gypsum can be loaded into the trucks on board computer which talks to the variable rate controller. The truck equipped with GPS and rate control will then vary the rate of product on the fly according to the map. Typical rates can vary from 2 tonnes per hectare to 8 tonnes per hectare on Sodic patches.

HCPSL can map Herbert blocks with the Dual EM for $25 per hectare preferably on trash blanket however smooth worked ground is also suitable for the fragile instrument.

7 blocks had variable rate applications in 2017.

Some growers have had experience with this type of mapping previously as “Farmacist” has been doing this type of work for some time now using a Veris.

The HCPSL Board also purchased a Drone for rapid data acquisition which in its’ first year has added significant value; in particular; to various variety and strip trials. Included in this purchase was a multi-spectral camera which will allow HCPSL to quickly assess plant health and vigour using vegetation indices such as NVDI and GNDVI (normalised difference vegetation index and GreenNDVI). The UAV allows the acquisition of very high resolution imagery over a target area and the ability to take advantage of timing and good weather to collect imagery.

Given the limited area able to be covered in a flight, HCPSL will be primarily flying over trials and cane blocks ‘of interest’ where a particular issue has been identified.

Picture on left; Prescription Map &
Hi resolution drone photo

of Variety Trial on the right

Herbert Cane Productivity Services Ltd

Website: www.hcpsl.com

Main Office	***4776 1808***	***4776 5660***	***4776 1811***

Manager
Lawrence Di Bella **0448 084 252**

Office Support
Sue Beccaris **Senior Admin Officer**
Sandra Coco **Resource Officer**

Spatial Systems & Precision Agriculture
Mike Sefton **0428 746 079**

GIS Officer
Rod Nielson **4776 1808**

Field Agronomist
Tony McClintock **0447 304 963**
Sam Sellick **0417 622 129**

Extension Agronomist
Graeme Holzberger **0428 761 808**
Richard Hobbs **0400 544 301**
Adam Royle **0417 610 446**
Megan Zahmel - Project Catalyst **0447 317 102**

WTSIP—Extension Officer
Jarrod Sartor **0499 034 968**
Leanne Carr **0490 077 176**

Hot Water Treatment Tanks **0437 017 805**

SRA Herbert Staff

Vince Blanco	**Farm Manager**	**0408 450 686**
Casey Venables	**Station Support Officer**	**4776 8206**
Melanie Adams	**Variety Officer**	**0476 809 493**
Laura McIntosh	**Plant Breeding Technician**	**0428 611 567**
Fengduo Hu	**Plant Breeder**	**0427 024 094**
Phil-Anthony Patane	**Adoption Officer**	**0431 818 482**
Joseph Bonassi	**Agricultural Engineer**	**0472 873 599**
Glen Park	**Senior Research Technician**	**0428 720 930**
Andrew Memory	**Research Technician**	**0472 872 371**

Feral Pig Management Officer

David Bacchiella (Hinchinbrook Shire Council) 0458 764 660

HCPSL
Herbert Cane Productivity Services Ltd.

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