

Growers can take a number of steps to improve their soil health and see substantial benefits.

Project details

Key Focus Area: 2

Soil health and nutrient management

Project name

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

Project number

2014/004

Principal provider

Biological Crop Protection

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A look into the biology of sugarcane soils reveals lost yield potential

A research project currently underway is looking at the complex collection of living organisms in sugarcane soils and their relationship to productivity. By Brad Pfeffer

In addition, the research is revealing important details about how the current sugarcane farming system is affecting this living environment in the soil and having a negative knock-on impact on yields.

The SRA-funded research is being driven by Biological Crop Protection, and one component of the work is being done in partnership with the University of the Sunshine Coast.

Principal researcher Dr Graham Stirling has sampled a range of soils in different sugarcane farming systems and looked at specific issues such as soil carbon levels and how they affect the predators that attack nematode pests and therefore reduce their numbers.

The research is finding that serious yield potential could be regained if growers look at the whole picture of what is living in the soils beneath their cane.

In addition to considering pests such as nematodes, canegrubs and Pachymetra, Dr Stirling said growers need to recognise that there are also beneficial organisms in cane-growing soils.

Dr Stirling has looked closely at soil health in relation to tillage, trash blanketing, soil compaction, and nitrogen inputs.

"The clear message from this work is that when steps are taken to sequester carbon in the soil, natural enemies of nematode pests will increase, and they will help keep these pests under control," Dr Stirling said.

Dr Stirling and his colleague (Dr David Walter from USC) are finding that having greater soil carbon levels increases the populations of small organisms called arthropods, some of which are predators of nematodes.

He said that tillage and compaction were a "disaster" for these arthropods. The disturbance associated with tillage kills many predators while compaction caused by farm machinery eliminates the spaces that they inhabit.

"Everything that we do in farming has a knock-on impact," he said.

"And unfortunately the end result of many current practices is a soil health problem that is evident throughout the industry."

Dr Stirling said that his research reinforced the need for growers to look at all their farming practices and recognise that many were detrimental to beneficial organisms.

He listed five top-tier practices that are the foundation for building a healthy, biologically-active soil.

These are:

- A diverse rotation sequence;
- Continuous inputs of organic matter;
- Permanent plant residue cover;
- Minimum tillage; and
- Avoidance of compaction through traffic control.

“Under the practices usually used to grow sugarcane, levels of soil organic matter have declined to the point where soils are conducive rather than suppressive to soilborne diseases. We need to increase carbon inputs and reduce carbon losses so that we begin to build a soil biological community capable of competing with pests and pathogens,” he said.

“The data obtained from a field trial with organic amendments at Harwood, NSW, suggest that the increases in yield obtained with high rates of mill mud

and compost were at least partly due to their effects on the soil biology. Two years after applying the amendments, these treatments had the highest levels of soil organic carbon and the lowest populations of lesion nematode.”

Other work has shown that in the biologically-active soil just under the trash blanket, roots are healthy and carry relatively few pest nematodes. Roots further down the profile are in poor condition because low soil carbon levels at depth mean there are fewer natural enemies to keep pests and pathogens at bay.

Future research will also be looking at earthworms and how their presence – as well as the burrows they dig in the soil – affect predatory arthropods.

“We already know that we get better rainfall penetration when earthworms are present, but over the next two

years we will be looking at whether the burrows made by earthworms are ‘highways’ that enable arthropods to move down the profile to regions where most pest nematodes are located.”

Other research will be looking at the impact of canegrub pesticides on beneficial biology, as Dr Stirling said there is little point in using a chemical against one pest if it increases the population of another pest.

Dr Stirling says that modifying sugarcane farming systems to reduce disturbance, minimise compaction and increase soil carbon levels will provide many benefits over time. However, he added that while improving soil health was an important part of improving farm productivity and profitability, it takes time and patience for results to be seen.

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New focus for breeding program to deliver optimum cane varieties into the future

An industry reference group has worked with Sugar Research Australia’s (SRA) sugarcane breeding program to ensure that future sugarcane varieties deliver characteristics that will improve grower and miller profitability.

The group of 12 people, appointed by the Australian Sugar Industry Alliance (ASA), has reviewed how individual traits of sugarcane varieties (such as CCS, tonnes of cane, disease resistance, and others) are weighted in the industry’s variety development program.

Selecting and delivering the best possible varieties are based on each of these traits having an economic value.

“Growers and millers have come together through this group to consider the weightings of traits for the breeding program, and this group has now told

SRA what they want implemented as part of these changes,” SRA Executive Manager for Development, Dr Peter Allsopp, said.

“This group has told us that the breeding program must maximise profitability for the entire industry and, with this as their focus, they have endorsed specific changes to the weightings of traits.”

Notable changes to the weightings are the inclusion of a ratoonability index and more emphasis on cane yield.

“This reflects the different production environment to the early 2000s, where now many mills have excess capacity and it makes economic sense to utilise that capacity,” Dr Allsopp said.

“The overall focus is on maximising profit to the industry.”

The review considered a range of important issues and specific traits and the weightings have been tailored to the specific needs of local industry (Northern, Herbert, Burdekin, Central, and Southern Queensland, with northern NSW yet to be finalised).

This information is being communicated with growers and millers throughout the second half of 2015.

The SRA plant breeding program continues to be a core component of SRA’s R&D investment and has the aim of delivering optimum economic outcomes for sugarcane growers and millers.