Serious economic loss for growers and millers

Phil Patane

Development Officer – Harvesting

Professional Extension and Communication Unit

A prototype infield sucrose loss measurement system (ISMS) developed by the SRA engineering team has been successfully tested over the past four harvesting seasons from Mareeba down to NSW.

This season MAPS are using their own ISMS built to SRA's design, to work with local growers and harvesting contractors to identify where losses occur and to suggest changes to reduce these losses.

The development of the ISMS

For harvest loss trials in the past, the biggest problem was the lack of an accurate cane loss measurement technique. The traditional 'blue tarp method' of measuring cane loss and mass balance cane loss were two key measurement techniques. A more accurate method that could provide rapid feedback to growers and operators was developed and is known as the ISMS.

Harvesting losses are a major cost to the sugar industry; in particular, the loss of millable cane via the cleaning system during green cane harvesting. Losses as high as 20 per cent have been recorded, but 5–15 per cent is more common.

The ISMS prototype has measured losses of $200/ha to more than $1500/ha.

The field trial data in **Table 1** shows the percentage loss at different fanspeeds as well as the financial cost of losses for a 1000-hectare harvesting group. For example, at a 90 t/ha average yield, this would represent a 90 000 tonne harvesting group.

Measuring harvest loss in the field with the ISMS

Field residue (trash blanket) is collected either directly from the harvester or from a measured area (quadrat) and weighed to measure total tonnes per hectare of trash blanket. The trash contains shattered billets and lost juice.

The field residue is mulched and mixed to provide a representative sub-sample which is then washed/blended and a liquid extract obtained in a juice press. This liquid contains sucrose/glucose/fructose resulting from shattered billets and juice in the field residue.

During the development of the prototype, hundreds of samples were analysed using a handheld digital brix refractometer in parallel with the highly accurate high performance liquid chromatography (HPLC) machine at the SRA Indooroopilly laboratory.

The strong correlation between the brix and the total sugar content of the samples (as shown in **Figure 1** on the next page) provided an important link in developing the mobile system.

Fanspeed rpm	% loss	$ loss/1000 ha
950	7.1	475 000
1050	16.0	1 080 000
720	3.6	210 000
900	9.6	560 000
760Primary	3.4	220 000
760Primary and secondary*	10.5	680 000

Table 1 (left): Percentage cane loss and financial loss at different fanspeeds. Note: Some losses are unavoidable. On average, the process of cutting cane (basecutters and chopper knives) results in losses of three to five per cent.

* Bigger secondary blades can cause excess cane loss.

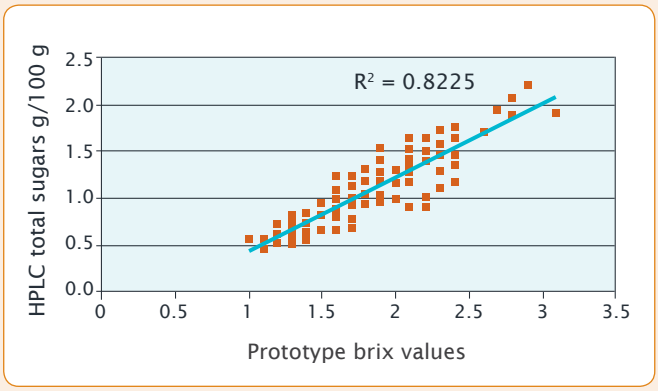

Figure 1: Prototype brix versus HPLC total sugars.

The outcome of this project is a fully functional sugar loss measurement tool which is being used by researchers to boost awareness of harvesting losses. In addition, data on harvester performance has been generated to provide guidelines for the industry to reduce harvesting losses.

Sweet success

With the knowledge MAPS gained through being involved with the ISMS over a number of seasons, they recently purchased their own ISMS and are currently running trials in the Mackay and Plane Creek areas.

Initial 2014 field assessments in Mackay show losses of 0.25–2.5 tonne of sugar per hectare equivalent to $200–$1000/ha loss to the industry. Currently, 12 contracting groups have been assessed.

The Tully and Herbert industries are also interested in and want to be more actively involved in harvest performance monitoring. The SRA engineering team has provided equipment details and protocols to their local productivity services so they can collect and process harvest residue samples themselves after some training from SRA staff.

Fertilising the 2014 ratoon crop

David Calcino
Development Officer – Nutrition
Professional Extension and Communication Unit

With the planting for 2014 well advanced, attention needs to be paid to the nutrition of the ratoon cane.

Why a soil test is essential

Sugarcane needs 17 nutrients for growth. For the crop to reach optimal production, each of these nutrients must be in adequate supply. Therefore, it is important to know the amount of each nutrient to be applied because the excessive application of one nutrient, for example, nitrogen, will not compensate for the lack of another nutrient.

A soil test is the only way to determine the exact amount of each nutrient to be applied to your crop. The sample should be analysed at a reputable laboratory that is aware of the sugar industry's nutrient recommendations. This point is critical to the development of a sound fertiliser program.

Nutrients required for cane growth

Carbon (C), Hydrogen (H), Oxygen (O)

C, H and O are all provided by air and water so we never have to worry about applying them. Over 99 per cent of the fresh weight of millable cane is made up of C, H and O. The remainder, made up of all the other 14 nutrients, is obtained from the soil and applied fertiliser.

Major elements: Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg), Sulfur (S), Silicon (Si)

- All growers in all years will apply some or all of the 'big three' nutrients – N, P and K.

- Instances of Ca, Mg and S deficiency are now reasonably common in all regions.
- Many regions now report cases of low soil Si levels.

Minor (trace) elements: Copper (Cu), Zinc (Zn), Iron (Fe), Boron (B), Manganese (Mn), Chlorine (Cl), Molybdenum (Mo)

- Cu is deficient in isolated small areas and Fe is deficient in pockets in all regions.
- Zn deficiencies can be found in most regions.
- Deficiencies of B, Mn, Cl and Mo have, to SRA's knowledge, never been positively identified in the Australian sugar industry.

Fertiliser types

Two forms of fertiliser are suitable for sugarcane nutrition – solid and liquid. Liquid fertilisers are increasingly being used these days. However, growers should consider a number of factors when selecting this product for use on their crop.

Liquid fertilisers can be applied consistently, evenly, easily and safely to a crop. If used correctly and at rates that apply the same quantity of nutrients as a granular fertiliser, the only disadvantage of liquid fertiliser might be the cost.

Nutrient rates

The industry has long adopted SRA's SIX EASY STEPS nutrient application rates. These recommendations have been tailored for each of the sugarcane-growing regions. And no matter what form of fertiliser is used, the rates apply.

Placement of fertiliser

Generally, most ratoon blocks are treated with a single fertiliser application. As a standard recommendation, fertiliser should be applied subsurface in the middle of the drill or in a band on each side of the drill – but never in the interspace. This applies both to solid and liquid fertilisers.

Subsurface placement ensures that volatilisation of nitrogen and runoff losses of fertiliser are avoided. Volatilisation losses occur when the nitrogen in surface-applied urea or urea-based products, including liquid fertilisers, is converted to ammonia that is lost to the atmosphere.

However, surface application may be acceptable under certain circumstances – when the new ratoon cane canopy is about 50 cm high, or the crop is on steep, erodible slopes.

Advanced canopy development signals the stage where the new root system has formed sufficiently to use the applied fertiliser. The canopy itself also provides some protection from the elements that cause volatilisation.

On erodible slopes, heavy rainfall after the fertiliser is applied can scour the fertiliser tine furrow, resulting in fertiliser runoff.

Timing of application

After harvest, the old cane root system dies. A new root system takes up to eight weeks to develop. Therefore, fertiliser should not normally be applied to ratoons soon after harvest as the fertiliser is subject to environmental losses until the roots are able to absorb the nutrients.

Of course, it is not always practical to delay fertiliser application for an extended period, such as for cane harvested in the final round. Seasonal storms and wet-season rain could prevent any fertiliser application at all. In such situations, fertiliser should be applied, with possible wet weather consequences in mind.

Other ways to minimise environmental losses from N application

- Split applications of nitrogen may reduce N losses. Instead of a single fertiliser application, two applications separated by a period of weeks might help to cut nutrient losses and maximise cane yields. It is not possible to be prescriptive because weather conditions have a huge bearing on the outcome of splitting applications. Splitting applications is more expensive than a single application.
- Ammonium-stabilised fertilisers may reduce nitrogen loss through denitrification. All N fertilisers are subject to denitrification losses where N is broken down under waterlogged conditions and lost to the atmosphere. Ammonium-stabilised fertilisers, such as the Entec range, are more expensive than the traditional products.
- Controlled release (CR) N products, such as the Agrocote range, release N over a longer period than the standard fertilisers. Slower release will potentially minimise N losses. While these products are relatively expensive, current research using a 25:75 mixture of CR product:urea is showing promise as an economic alternative.

Helpful hints

- Base your fertiliser program on soil test results
- Always stick to the SRA SIX EASY STEPS nutrient recommendations
- Fertilise ratoons four or more weeks after harvest, if practical
- Subsurface-apply fertiliser into or beside the stool, but never in the interspace
- Surface application on the row may be warranted under some circumstances
- Never broadcast-apply fertiliser
- Both solid and liquid fertilisers are acceptable, depending on cost and other factors
- Other nitrogen products and split applications of fertiliser might be useful as part of a nutrient management program

Additional nutrition resources available on the SRA website www.sugarresearch.com.au:

- SIX EASY STEPS regional recommendations
- Extension videos on Nitrogen Use Efficiency, The Story of Mud and Ash, and Liquid Fertilisers