Proc S Afr Sug Technol Ass (2008) 81: 486 - 488

POSTER SUMMARY

ECONOMICS OF TRASHING: IMPROVEMENT AND SENSITIVITY ANALYSIS OF THIS DECISION SUPPORT PROGRAM

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Abstract

At present, only about 10% of all cane fields in the South African sugar industry are trashed, and uncertainty of the impact that a switch from burning to trashing at harvest might have on the economic viability of a farm is partly the reason for this. A decision support program (DSP) was developed at the South African Sugarcane Research Institute (Wynne and van Antwerpen, 2004) but needed verification before it could be released to the industry. This poster summary reports on the verification process and the performance of the DSP when estimating real economics on farms, comparing burn with no-burn at harvest.

Keywords: economics, decision support program, burn, trash, sugarcane, model

Introduction

In the South African sugar industry the decision to burn or trash is now more pressing than it was four years ago when this decision support program (DSP) (Wynne and van Antwerpen, 2004) was published for the first time. Four years ago the only use for trash was as a mulch on the soil surface, which is not the ideal for at least 30% of the industry. Areas where it is suspected that a layer of trash could result in yield losses are wet valley bottoms, on soils with a high water table and in Midlands areas where frost is a problem. In 2004, the possibility of growers benefiting from the clean development mechanism (CDM) was just an idea, as was the possibility of growers profiting from supplying trash to the mill for co-generation.

Over the past four years the trash situation has changed significantly. Millers are now prepared to purchase trash from growers and willingly accept trash arriving at the mill with the cane. Growers can now also earn an income from trading their carbon credits. This change in the demand for trash has raised the big question: what is the value of trash? To address this question the Economics of Trashing (ET) DSP was developed, and was recently updated to include a baling option and to cater for trashed fields under irrigation (Purchase *et al*., 2008).

The purpose of this poster summary is to analyse the sensitivity of the ET DSP to selected management and environmental parameters.

Methodology

The ET DSP has about 500 variables, most of which rarely need to be changed to give the user the ability to create a setup that closely represents a particular farm. Normally, about 20 parameters need to be checked to reflect most farms, and about half of these will be used to address 'what if?' scenarios. Parameters that fall into the latter group are, for example, the RV price, the cost of fertilisers and herbicides, and the number of labour units required for a task and their payment. Variables selected for this sensitivity assessment were cane age at harvest, tons cane per hectare per month (TCHM), the number of years that trashing is practised, mean annual ambient temperature, size of the farm and the selling price of baled trash. These variables were kept constant while only one at a time was changed, using 5 to 7 range values.

Intrinsically the model compares burning at harvest with trash retention on the fields, and the output is given for each (Burnt and Trashed) as well as the difference between these two practices. The 'difference' was used to gauge the sensitivity analysis assessment. The model was run for two types of farms (rainfed coastal and irrigated) and two management options (trash retained on the fields, and most of the trash baled and sold). The characteristics of the farms simulated were: (i) rainfed: 313 ha, of which 250 ha is harvested annually; mean annual yield of 60 tc/ha or 5 TCHM; mean annual ambient temperature of 20.5ºC; selling price of the bales R500/ton[1], and (ii) irrigated: 313 ha, of which 250 ha is harvested annually; mean annual yield of 96 tc/ha or 8 TCHM; mean annual ambient temperature of 21ºC; selling price of the bales R270/ton.

Results

Differential (Trash minus Burn (T–B)) trends in the simulated economics (R/ha and R/ton) for rainfed and irrigated scenarios, with and without selling bales of trash, were recorded for a number of environmental factors and management options (see above). Many of the variables analysed for the selected conditions had simple relationships (i.e. linear increase or decrease for both R/ha and R/ton) and will not be discussed here but will be shown on the poster. Only those with less obvious and yet logical trends will be discussed.

Age at harvest

Rainfed: The harvesting area for all simulations was constant at 80% of the farm size. With increasing age at harvest (from 8 to 18 months), cane tonnage increased and so did the T–B difference. The net result was therefore an increase in R/ha. However, when it comes to R/ton, the quality of the product (which determines payment) did not increase at the same rate as the tonnage. This slower rate of increase in quality (due to trashing) resulted in an overall decrease in R/ton (difference between T–B).

Irrigated: The financial benefit due to trashing decreases with an increase in harvesting age because the difference in water use is significant only during the first six months. After this period, the canopy would have developed sufficiently for water use to be the same for burnt and trashed cane.

Selling of baled trash resulted in an ever-increasing T–B difference for both R/ha and R/ton units for both farm types. Sensitivity of the DSP to TCHM was similar to 'Age at Harvest'.

Area for harvesting

Increasing the harvest area (from 50 to 650 ha and 80% of the farm size) resulted in a constant T–B difference in terms of both economic units for both farm types where the trash was left in the field. However, selling most of the trash (leaving only about 5 tons behind) resulted in an ever-increasing T–B difference for both economic units.

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[1]Selling price of baled trash was determined as the point where the profitability of the farm selling the bales was similar to the farm where all the trash was left in the field.

Price per bale

In general, both economic units on both farm types increased with the price of the bales, because farming for trash and selling it made the trash option more profitable, while income from burnt farms stagnated. The R/ha gain for the rainfed farm relative to the irrigated farm was slower, due to the dependency on rainfall to supply available water and the impact this had on final yield.

Conclusions

In the cases of *ambient temperature* and *number of years trashing*, the model showed no difference between the trash retained and baled options for both economic parameters, other than larger differences (benefits, T–B) in favour of the rainfed farm relative to the irrigated farm. This illustrates the significance in the economic response (T–B) due to reduced herbicide costs and improved plant available water resulting in better growth, and therefore higher yields, from the rainfed farm relative to the irrigated farm.

The model proved to be sensitive to all parameters evaluated, although the economic parameter responses were very small for variations in ambient temperature and years of trashing. Increases in these two parameters, however, did result in slightly increased differences (T–B) for both R/ha and R/ton on both rainfed and irrigated farms.

All results obtained could be explained using current knowledge with regard to trashing and cane growth, which leads to the conclusion that the model responds logically.

REFERENCES

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