7th ISSCT AGRICULTURAL MECHANIZATION WORKSHOP

Louisiana, USA
12-17 October, 2003

"BURNT VS. GREEN CANE MECHANIZATION - AGRICULTURAL ENGINEERING CHALLENGES"

Organized & Hosted by
The American Sugar Cane League (ASCL) &
The American Society of Sugarcane Technologist (ASSCT)

- Using small-scale contractors on large sugar estates
- Discounted cash flow as a method of costing operations
- Machinery costing method and standards
- Benchmarking methods

SUGARCANE HARVESTING: IMPLICATIONS OF GREEN VERSUS BURNT CANE HARVEST

C RICHARD

C. Richard & Associates/Sugar Journal, New Orleans, LA.
E-mail: charley@sugarjournal.com

The agricultural community has now realized that the transition to harvesting sugarcane unburned (green) as compared to traditional burnt cane harvest is as difficult as expected and is now a universal concern of utmost importance. This transition brings with it numerous challenges that sugarcane industries are attempting to address. Harvesting green cane brings special challenges to those that continue to harvest manually while mechanical green cane harvesting has been improved due to engineering progress in the combine harvester.

Issues that industries must address include the obvious factors of generally slower harvesting rate in green cane, opportunities for a decreased time interval between harvest and delivery (since burning is eliminated), and potentially poorer overall cane quality given the likelihood of additional extraneous matter in delivered cane supplies. However, among the other agronomic issues that industries find themselves evaluating are the effects of cane trash remaining over the germinating stubble, climatic restrictions, labor issues, soil compaction, cane transport, and the fuel or conservation value of cane trash. The significance of all of these issues is address in this presentation.

New research projects, enhanced existing projects, and future research are required to solve these often-interrelated issues. The ISSCT Workshop on Agricultural Engineering is the ideal forum to discuss these issues and streamline the international research effort to avoid duplication among similar industries and quicken the pace of reaching conclusions on optimal solutions for the varied issues.

Top

SUGARCANE HARVESTING SYSTEMS: AN OVERVIEW

E MEYER

South African Sugar Association Experiment Station, Private Bag X02, Mount Edgecombe, 4300, South Africa.
E-mail: xengem@sugar.org.za

Across the globe, sugarcane is cultivated under a wide range of topographical and climatic conditions, and the harvesting methods employed are extremely diverse. This is not surprising, as the situation and requirements of most sugar industries are unique.

In many countries the entire crop is cut and loaded manually. It is estimated that only about 20% of the more than 1000 million tons of sugarcane produced annually around the globe is harvested mechanically, mostly by combine harvesters. Chopper harvesters are also being used successfully, and can be found operating in more than 20 sugar industries, including Australia, Argentina, Brazil, Colombia, Florida, Guatemala, Louisiana, Mauritius, Reunion, Swaziland, South Africa and Texas. In a large proportion of the crop the two methods of harvesting are combined, with the cutting being done manually and the loading being done mechanically, using a wide range of slewing or non-slewing grab loaders.

There are many factors to be borne in mind when selecting a sugarcane harvesting system. The main factors to consider include burnt versus green cane harvesting, machine and labour availability and cost, transport system, payloads and factory receiving facilities. Topography, soil type, weather conditions, scale of operation and environmental factors and pressures also impact on the final choice of system. In this presentation, the various types of harvesting systems used around the globe are outlined and briefly discussed.

Top

PRESENT SCENARIO AND FUTURE PROSPECTS OF MECHANICAL HARVESTING OF SUGARCANE IN INDIA: AN APPROACH

RNS YADAV

Principal Scientist & Principal Investigator NATP on Sugarcane Mechanization,
Central Institute of Agricultural Engineering,
Nabibahg, Berasia Road, Bhopal 462038 (MP), India
E-mail: rnsyadav@ciae.mp.nic.in

Sugarcane is an important cash crop in India. The area under sugarcane is about 4.02 million hectares, with a total production of about 3 million tons of cane. The average cane yield is about 72 tons per ha. Sugarcane harvesting is the most labor, drudgery and energy intensive cultural operation in the country.

Green sugarcane is harvested manually using locally developed tools, and requires about 850 to 1200 man-hours per ha. Cost of sugarcane harvesting varies from US$ 1.5 to 2.4 per ton. In some areas sugarcane harvesting is done free of charge in exchange for green tops, which are a valuable cattle feed. In other parts of the country, harvesting is done by laborers hired on a contract basis. The supply system of sugarcane also differs from area to area. A labor shortage is normally experienced in the later part of the harvesting season.

During the past five years, mechanical harvesters such as whole stalk tractor operated, self-propelled and chopper combine have been introduced in the tropical regions of the country. There are at present about 40 machines operating in the country. The cost of sugarcane harvesting, and the performance data of different makes and models of sugarcane harvesters in use are given in this paper. At present the cost of mechanical harvesting varies between US$ 2.4 and 4.5 per ton, which is higher than manual harvesting. There is thus a need to design and develop machines suitable for Indian conditions, at a reasonable cost. The cultural practices followed in India for sugarcane production are not compatible with the technical requirements of imported sugarcane harvesters, which limit large scale adoption and use of these machines. The

paper also deals with future requirements, and planning and management of mechanical harvesting of sugarcane in India. Use of sugarcane harvesters is advocated through custom hire and sugarcane co-operative societies. Research and development efforts are ongoing for the development of harvesters suitable for Indian conditions, and the popularization of improved cane knives is the subject of a national agricultural technology project.

Top

THE EFFECT OF MECHANICAL HARVESTING ON THE SUGAR MILLS

HS BIRKETT AND JM STEIN

Louisiana State University, Audubon Sugar Institute, South Stadium Drive Baton Rouge, Louisiana 70803 USA
E-mail: hbirkett@agctr.lsu.edu , jstein@agctr.lsu.edu

Cane harvesting in Louisiana has progressed from burned hand-cut cane, to mechanically cut whole stalk cane that was burned on the heap row, to combine harvested burned billets. Restrictions on the burning of standing cane have recently increased the quantity of unburned combine-harvested billets delivered to the factory. The mechanical harvesting of sugarcane increased the quantity of extraneous matter accompanying cane deliveries. A summary of published data on the effects of trash (due to mechanical harvesting) on cane analysis, cane throughput, sugar yield and sugar quality reported by several cane growing areas is presented. Louisiana data is presented for the analysis and weight fraction of cane stalks leaves and tops for both green and burned cane at various times during the crop. Cane analysis for net cane stalks and whole cane stalks (i.e. Cane with all leaves and tops) were obtained for commercial varieties. Controlled factory trials comparing green and burned whole stalk cane and green and burned billet cane were conducted. These tests provided data on milling performance and cane washing losses, in addition to the cane analysis. The effect that trash has on cane analysis and factory performance can be used to predict factory processing costs. This data can be combined with costs of various harvesting methods to optimize total returns to the industry.

Top

COMPARATIVE TESTING OF CAMECO CH 2500 AND CH 3500 MACHINES IN THE TUCUMÁN SUGARCANE INDUSTRY IN ARGENTINA

J SCANDALIARIS[1], FP ZAMORA[1], E ROMERO[1], JC COSSIO[2], G OLAIZ[2] AND L SOTOMAYOR[1]

[1] Estación Experimental Agroindustrial Obispo Colombres, Tucumán, Argentina. E-mail: direcc@eeaoc.org.ar
[2] Concepción Sugar Mill, Tucumán, Argentina

The sugarcane growing region of Argentina is being subjected to two major changes: an earlier initiation of the harvesting period and increasing pressure to move from burnt cane to green crop harvesting. Green crop harvesting is possible in Argentina due to the fact that 85% of millable cane is already being harvested with combine machines used for that purpose.

However, there are still some problems associated with these changes, such as high extraneous matter contents in billets. Due to the increasing interest in avoiding sugarcane burning and using the trash blanket system, improvements in green crop cleaning were necessary to match the burnt sugarcane quality levels. For this reason, a Cameco CH 3500 harvesting machine was introduced, and showed important improvements, mainly in the cleaning system that reduces extraneous matter levels.

The objective of this test was to evaluate improved cleaning systems, and compare the performance of the new model with the CH 2500 machine. Apart from comparing machine performance, testing was done to determine extraneous matter levels, cane losses and other quality indicators. The tests were replicated in different fields with representative conditions. The new model reduced the extraneous matter levels, increased the quality of the cane sent to the mills and reduced operating costs.

Top

EFFECT OF THREE DIFFERENT BASECUTTER PRESSURES ON CANE QUALITY, FIELD LOSSES AND RATOONABILITY IN EIGHT SUGARCANE VARIETIES

M ULLIVARRI, S TRIDENTE, J GOMEZ, A IRIARTE AND J MIRANDE

Ledesma Sugar Mill, Salta S/N, (4512) Ldor. Gral. San Martín, Jujuy, Argentine Republic.
E-
mail: mullivarri@ledesma.com.ar, stridenti@ledesma.com.ar, jgomez@ledesma.com.ar, airiarte@ledesma.com.ar and jmirande@ledesma.com.ar

At Ledesma Sugar Mill, which is located in the north of Argentina, 92% of the crush is miller-cum-planter cane. It was observed that mechanical harvesting resulted in extremely poor ratooning after the first or second cut, due to stool damage and low numbers of tillers. Tests were conducted to determine the effects of different basecutter pressures on the quality of cane delivered to the mill, infield losses and ratooning. This presentation describes the results of the tests and the implications for future productivity.

Three plots consisting of clay loam soil were planted to the eight main varieties grown in the area. The plant crop was harvested in October 2002, and the first ratoon in September 2003, using the same combine harvester and varying the basecutter pressure from 700 to 1300 psi. Cane samples were collected from each plot for analysis of sediment % cane juice and the trash component of cane delivered to the mill. Infield cane losses were measured and cane quality was compared with previous ratoons.

The results showed that:

- The higher the basecutter pressure, the higher the sediment % cane juice.
- Roots and trash were found only at 1300 psi pressure in the first cut, and at 1000 and 1300 psi in the second cut.
- Infield cane losses were lowest at the highest basecutter pressure, and vice versa.
- There were significant differences in ratooning ability between varieties.

In general, it was concluded that, although high basecutter pressure generates less infield cane loss, the effect on ratooning and future farm productivity can be very severe. Based on these findings, it will be necessary to find equilibrium between the variables that will generate the best combination for each situation. The variables include soil type and properties, humidity at harvest, management practices, cane varieties and harvesting equipment used.

Top

EFFECTS OF CHOPPER HARVESTING ON CANE QUALITY DELIVERED TO THE MILL

J GÓMEZ, A IRIARTE AND G DE CASTILLO

Ledesma Sugar Mill, Salta S/N, (4512) Ldor. Gral. San Martín, Jujuy, Argentine Republic.
E-mail: jgomez@ledesma.com.ar, airiarte@ledesma.com.ar and gdelcastillo@ledesma.com.ar

Ledesma Mill owns 34,000 hectares of canefields, and 88% of this area is harvested by chopper harvesters. The company is analyzing the posibility of increasing the green cane harvesting area. It is known that there are changes in cane quality and quantity during the different stages of the harvest process that can generate significant sugar losses, and which vary between burnt and green cane harvesting. To clarify these issues, trials were conducted during the 2002 harvest season, that included cane quality measurements from:

- Green cane, whole stalks (without tops and leaves)
- Burnt cane, whole stalks (without tops and leaves)
- Clean chopped cane
- Trashy chopped cane
- Shredded cane (at the feeding tape)

Also determined were:

- Extraneous matter levels
- Infield cane losses
  - by primary extractor
  - not picked up by the harvester.

All the trials were conducted under normal harvesting conditions. The samples were shredded and pressed by hydraulic press, and the juice analyzed by NIR method. The results, expressed as % sugar lost, were 16.5% in burnt cane and 18% in green cane. The slightly higher total in green cane was mainly due to the primary extractor losses. Managing the harvest to minimize these losses could allow us to take advantage of the agronomic benefit of the green cane trash blanket, in addition to the benefits from less juice quality deterioration found in green cane harvesting.

Top

CHOPPED CANE TRANSPORT IN EXTREMELY HUMID CONDITIONS IN MAURITIUS – THE MON DÉSERT ALMA SUGAR ESTATE CASE

J ANTHONY [1], V RIVIERE [2] and E JACQUIN[2]

[1] Mon Desert Alma Ltd., Royal Road, St. Pierre, Mauritius. E-mail: jimiant@intnet.mu

[2] Mauritius Sugar Industry Research Institute, Réduit, Mauritius

Wet soil conditions in the super humid zone of Mon Desert Alma at the start of the crop season are a major constraint to mechanized harvesting with wheeled chopper harvesters. This mode of harvest was only made possible as from 1997 with the introduction of a chopper harvester on track. Chopped cane was collected in 5 ton payload infield trailers equipped with low-pressure tyres (280 kPa) and transloaded in 25 m^3 outfield units at the field edge. Average daily harvester output ranged from 230 to 260 tons from 1997 to 1999. As from 2000, economic considerations have led to the adoption of a direct delivery system using the existing outfield units and a lighter-weight trailer of 36 m^3 capacity. This new cane delivery strategy did not affect harvester performance. This paper outlines the problems encountered and solutions adopted with the haulage of 15 ton payloads from extremely humid fields to the mill. The use of large diameter tyres inflated at 150 kPa has allowed continuous harvester operation during the wet months at the start of the crop season.

Top

REGULATIONS ON PRE-HARVEST BURNING OF SUGARCANE IN THE UNITED STATES

JM SHINE, JR[1] AND JW DUNCKELMAN[2]

[1] Sugar Cane Growers Cooperative of Florida, Post Office Box 666, Belle Glade, Florida 33430

[2] Florida Sugar Cane League, Inc., Post Office Drawer 1208, Clewiston, Florida 33440 USA USA. E-mail: jmshine@scgc.org

Pre-harvest burning of sugarcane, as a means of expediting the harvest, has been practiced in Florida, Hawaii, Louisiana and Texas for as long as the crop has been grown in each respective state. There has been increasing pressure on these industries to address air quality issues in the field and factory since the passage of the Clean Air Act in 1963 by the United States Congress. State and local laws and criticism by local affected residents have also increased over time.

An outline of the progression from the passage of the Clean Air Act until today is presented to show the increasing level of regulation on the sugar industry with respect to pre-harvest burning. An outline of existing laws affecting pre-harvest sugarcane burning in Florida, Hawaii, Louisiana and Texas is presented. Current burn management plans and record-keeping requirements for Florida and Louisiana are discussed. Information related to the smoke and ash modeling used to regulate burning is presented. The next level of regulation for agricultural burning in Florida is described with specific emphasis on pre-harvest burning of the sugarcane crop.

The increasing interface of agricultural lands with residential communities, and increasing public concerns with health and nuisance issues, has driven regulatory agencies to scrutinize agricultural practices more closely. This presentation outlines the progression from a loosely regulated fire management program to one that is tightly controlled.

Top

ENHANCING CHOPPER HARVESTER FRONT END PERFORMANCE: AN EXERCISE IN OPTIMISINGMACHINE-CROP INTERACTIONS

RJ DAVIS[1] AND CP NORRIS[2]

[1] Bureau of Sugar Experiment Stations, Bundaberg, Australia. E-mail: rdavis@bses.org.au

[2] Booker Tate Ltd Thame, UK. E-mail: Chris.Norris@booker-tate.co.uk

Successful mechanization relies on successful interactions between the crop and the machine, and harvesting of sugarcane is no exception. Machine cane interactions in traditional 'soldier' wholestalk harvester designs can be seen to emulate the manual processes of gathering the cane into near-upright configuration, holding it while severing the base and the tops and feeding the product for placement with the stalks aligned. These operating concepts limited the scope of machines to successfully operate in recumbent crops, and also restricted the typical range of stalk lengths that could be manipulated by any specific machine design.

While early chopper harvesters utilized the soldier concept, the development which allowed chopper harvesters to successfully harvest a wide range of crops was the incorporation of the concepts of stalk 'knockdown' prior to basecutting, butt-first feeding into the machine and billeting the stalks. Reliability of feed in difficult harvesting conditions, e.g. recumbent crops, can then be effectively achieved by more aggressive knockdown. The more difficult characteristics of unburned crops were also able to be accommodated by aggressive knockdown and providing adequate length of 'throat' to ensure alignment of stalks before basecutting.

The moves towards green cane harvesting and the focus of manufacturers and machine operators on effective feed of the cane into the machine and high machine output has resulted in trends of increasing power and more aggressive knockdown. Unfortunately, this focus on operational reliability has generally resulted in damage to both the cane stalk (resulting in direct losses) and the stool (resulting in indirect losses). The compromise in machine configuration between reliable feed in recumbent crops and acceptable damage in upright crops has also been difficult.

The presentation describes the research programs undertaken in Australia to better understand the machine-cane interactions which occur and the processes of the feeding of cane by harvesters. From this, parameters impacting on the performance of the gathering system, the 'forward feed' components of the harvester and the feedtrain could be hypothised, and 'retro-fit' components to enhance machine performance in recumbent and upright crops successfully developed and tested.

These advancements led to the development of more radical concepts, on an experimental basis, such as 'modular' machine forward feeding systems. The developments combine an understanding of the limits of the crop with the component interactions necessary to ensure reliable feed, thus achieving operational reliability as well as reduced direct and indirect losses.

The outcome of this work is the clear demonstration that reliable feed of large unburned crops does not by necessity equate to machine designs that result in high direct and indirect losses, particularly when harvesting large standing crops.

Top

ACF-SIMON, A WHOLESTALK GREEN CANE HARVESTER FOR USE IN LA REUNION ISLAND

J-C DAGALLIER

CIRAD - Sugar Cane Program – Mechanization
E-mail: jean-cyril.dagllier@cirad.fr

In La Reunion Island, wholestalk green cane harvesting is done on small scale farms with steep slopes, according to the schedule of the transloading stations and according to the age and maturity of the cane on those farms.

Because of the lack of workers, we designed a machine able to cut and top green cane, making piles regularly dropped onto the field. The machine is able to work in small fields where geometry and slope can prove difficult. To improve performances we have to:

- gather surfaces together to provide the machine with cane throughout the day (80 t/d).
- plan the field organisation to limit manoeuvres and avoid wasted time and cost overruns.
- schedule the harvester operations with the farmers, according to their transport capacities and the maturity of their cane during the crop season.

On-board loggers and specific software is used to monitor harvester performance, provide references for organisation and scheduling, and reduce costs.

At the moment, the average work rate of the machine is 9-11 t/h. Cane tops and leaves are used for cattle feed after being rolled by roll-balers. About 12% of the leaves remain in the cane delivered to the mill. Costs are settled at 8-10 €/t, according to the balance of the sugarcane economy in La Reunion.

The AFC-Simon harvester is able to work on steep slopes, cutting 50-100 t of green cane per day, without any damage to roots and stools, thus ensuring good ratooning. This harvester is used by groups of planters organised to work in unison with the sugar factory recommendations.

Top

AN ECONOMIC ASSESSMENT OF GREEN VERSUS BURNT CANE HARVESTING ON KENANA SUGAR COMPANY ESTATE

OE MIRGHANI

Kenana Sugar Company Ltd, 39 Fitzroy Square, London, W1T 6EZ, United Kingdom
E-mail: omirghani19@yahoo.com

Burning cane prior to harvesting is the practice that Kenana Sugar Company has adopted since its inception in 1981. However, for generating more revenue while at the same time sustaining friendly environmental policies, the company investigated the economical viability of green cane harvesting.

A series of field trials and two factory trials were conducted on the Kenana sugar company estate and the data collected were analyzed using descriptive analysis and t-test. Green cane harvesting results showed a reduction in machine throughput, and increases in fuel consumption and trash in cane delivered to the factory. A mass of about 35 tons/ha trash was left in the field. A baling trial was also conducted, but could not be completed due to the unavailability of a suitable machine to bale the cane trash. The trials revealed the fact that immense revenue could be generated from the trash of the green cane. Moreover, the trials showed a steady improvement in machine throughput and harvester fuel consumption because of acquired experience and skills gained.

The trash left on the field after the green cane harvesting is the potential source that is expected to turn the economics of the technique around. The region is very poor in animal feed and the country suffers acute power insufficiency; nevertheless, the cane trash proved good animal feed and a valuable fuel for power cogeneration. In addition, the pulp, paper and plywood industries could all benefit from the trash. The estimated cane trash generated in one season if the green cane harvesting technique is adopted on Kenana Estate is approximately one million tons.

The subject of green versus burnt cane harvesting and its consequences will only be revealed through numerous trials over many crushing seasons.

Top

EVALUATION OF METHODS OF REDUCING NON-CANE MATERIAL IN COMBINE HARVESTED DELIVERIES TO LOUISIANA SUGAR MILLS

W JACKSON[1], C RICHARD[2], H WAGUESPACK, JR[1] AND EP RICHARD[3]

[1] American Sugar Cane League, PO Drawer 938, Thibodaux, Louisiana 70301, USA

[2] C Richard & Associates/Sugar Journal, New Orleans, Louisiana

[3] USDA-ARS, Southern Regional Research Center, Sugarcane Research Unit, Houma, LA. E-mail: wjackson@amscl.org

For nearly 50 years, the Louisiana sugar industry harvested its crop of erect growing varieties with an ever-improving whole-stalk harvester. This method of harvest was low-cost and in most cases delivered relatively high quality cane to the mill. With the release of a recumbent high yielding variety, LCP 85-384, the use of the Louisiana soldier harvester ended for most growers, and use of the cane combine escalated. Many field trials have been conducted to compare the advantages/disadvantages of the two harvesting systems, including the economics of each system. As the combine harvester gained in popularity, further experiments were conducted to evaluate the influence of extractor fan speed on harvesting efficiency. During these test trials, delivered sugar per hectare was the main variable examined. In the initial years of combine usage, many sugar mills receiving chopped cane complained about the amount of non-cane material that was being delivered to them. As the use of combine harvesters rapidly increased, growers realized that it was more cost effective for them to send some level of leaf material and immature tops to the mill. By delivering some leaf trash and tops, per hectare sugar yields increased because the decreases in recoverable sugar associated with increases in fiber did not offset the increases in cane tonnage. Recently, a new formula has been employed by the Louisiana mills to reflect more accurately the impact of higher fiber on recoverable sugar yields.

In another approach to evaluating the economics associated with the delivery of non-cane material to the mill, a ground speed study was established. In this study, the effects of four different ground speeds (7.2, 5.6, 4.0 and 2.4 kmph) were examined. The extractor fan revolutions per minute were maintained at a constant rate for all ground speeds. Data was collected under varying field, weather and pre-harvest conditions, with about half of the fields burned prior to harvest. In this series of tests, the amount for sugar paid to the growers by the mill was not significantly different for the high or low ground speed. However, quality of the cane was better at the lower speed, whether the cane was harvested green or burned prior to harvest. Once again, if only the profitability of the grower was considered, it was often more lucrative for the grower to deliver additional tonnage of the slightly lower quality cane. As one studies the results of data since the introduction of the variety LCP 85-384 to Louisiana and the transition of the industry to combine harvesting, the quality of cane deliveries can be improved, but there must be a financial reward (motivation) for the cane growers.

Top

BURNT VERSUS GREEN CANE HARVESTING: BEST PRACTICE MACHINE HARVESTING FOR SUSTAINABLE PRODUCTION IN A DEVELOPING COUNTRY

S VAUX[1], P CHAPPLE[2] AND C NORRIS[3]

[1] Formerly Ramu Sugar Ltd, Papua New Guinea: E-mail: SGMVaux@hotmail.com

[2] Ramu Sugar Ltd, Papua New Guinea: E-Mail: pchapple@ramusugar.com.pg

[3] Booker-Tate Ltd, UK: E-mail: Chris.Norris@booker-tate.co.uk

Green cane chopper harvesting was used successfully at Ramu Sugar in the 1980s and early 1990s to assist in the control of vigorous weeds and for soil conservation purposes. A substantial benefit was also seen in the control of damage caused by cicada nymphs. The continuing evolution of farming systems, agronomy and harvester capacity instigated gradual changes in strategy. This resulted in the greater use of pre and post harvest burning to facilitate cultural operations such as centre-busting (compaction relief) and re-hilling, to enhance yields and re-form the row profile to minimise harvesting losses. Burning was also used to facilitate the tillage operations associated with the planting of fallow legume crops and re-establishment of the new cane crop.

The presentation describes the recent refocusing of efforts to develop an appropriate and sustainable machine harvested sugarcane cropping system for the Ramu Valley, and discusses the results of the changes. Pivotal to the change was the move to a dual row cropping system incorporating controlled traffic. This facilitated the wider adoption of minimum tillage cropping strategies, and allowed the maintenance of high levels of green cane trash blanketing as a component of integrated pest management programs. All were considered essential strategies for a lower cost, sustainable cropping system.

Central to these changes was the need to adopt harvest best practice (HBP) strategies to minimise direct and indirect, visible and invisible harvesting losses, and to reduce the need for row profile maintenance during the crop cycle. HBP involved major changes to harvester set-up and operating strategies. Similarly, the move to minimum tillage involved the rapid evolution of tillage and planting machinery, with much of the equipment being successfully developed on site.

On the basis of available data, the changes have been positive on many fronts, including enhanced cane quality and reduced cane losses being indicated. Crop establishment and early crop growth has been pleasing and land preparation and tillage costs have been significantly reduced.

Top

FIELD INVESTIGATION INTO GREENSTAR AUTOSTEERING OF A CAMECO 3500 TRACKED HARVESTER

J LARSEN AND A PETERS

United States Sugar Corporation, Clewiston, Florida, USA.
E-mail: jlarsen@ussugar.com

The ability to accurately steer a tracked type harvester down the center of a row has long been a desired condition for a quality harvest that will minimize losses and promote regrowth. A Cameco 3500 tracked harvester was outfitted with a John Deere Autosteer system and used in both green and burnt harvested fields. Tests were run on both conventionally planted and RTK planted fields using known headings and coordinates. Significant findings show the machine runs straighter than all operators.

Top

SOIL COMPACTION DUE TOMECHANICAL HARVESTING IN WET SOIL

J TORRES[1] AND JE PANTOJA[2]

[1] Colombian Center for Sugarcane Research, Cenicaña, Colombia. E-mail: jtorres@cenicana.org

[2] Mayaguez Sugar Mill, Colombia

The Cauca Valley of Colombia is a semi-humid region with mostly fine textured soils, on which cane is planted and harvested year round; therefore, compaction problems and direct cane stool damage may arise during mechanical harvesting operations. The present study was undertaken to quantify cane field damage caused by mechanical harvesting equipment under wet soil conditions. A field planted to variety MZC 74275 on a Mollisol soil, was harvested after a 50 mm rainfall event. The controlled and combined traffic of a fully mechanical harvesting system was compared with the traffic of a semi-mechanized harvesting system. A zero traffic treatment, where the cane was manually cut and removed from the plot by hand, was included as reference. A nearby commercial plot was mechanically harvested without traffic supervision.

Results showed that direct stool damage by infield machinery is reduced to a minimum when cane fields are planted at 1.75 m row spacing, and compaction is limited to the top 0.25 m soil depth. Current ratooning practices, including one pass of a double-shank subsoiler, were sufficient to restore soil physical properties. The cane yield of plots under controlled traffic of mechanical harvesting equipment resulted in similar cane yields to the plots without infield traffic. Uncontrolled traffic of mechanical and semi-mechanical commercial harvesting induced a cane yield loss of 30 t/ha as a result of increased stool damage. Controlled traffic of infield machinery is important to sustain production in any harvesting system.

Top

HARVESTING BEST PRACTICE MANUAL FOR CHOPPER-EXTRACTOR HARVESTERS

G SANDELL[1], J AGNEW[1], G STAINLAY[2], C WHITEING[3], R DAVIS[3], M JAMES[4], C NORRIS[5], J POWELL[6] AND B ROBOTHAM[3]

[1] BSES Limited, Mackay

[2] Tully Cane Productivity Services

[3] BSES Limited, Bundaberg. E-mail: brobotham@bses.com.au

[4] BSES Limited, Brisbane

[5] Booker-Tate (formerly BSES, Bundaberg)

[6] Queensland Caneharvesters BSES Limited, PO Box 86, Indooroopilly, Queensland 4068, Australia

Field and harvesting machine interactions are complex and significantly influence both the quality and quantity of sugarcane harvested from our fields. A manual has been published that brings together, from BSES Limited and other sources, the current knowledge on green cane harvesting using late model chopper-extractor machines, to increase understanding of the harvesting process and improve operations in the field. Production of the manual was funded by the BSES and the Sugar Research and Development Corporation and was completed in 2002. The manual is written in an easy to understand style and examines:

- Harvester fundamentals
- The harvesting process
- Farm layout and its effect on harvester efficiency
- Farming for harvesting, implementing harvesting best practice (HBP)
- Harvesting for efficient milling and high sugar quality
- Harvester modifications and research.

The aim of the manual is to:

- Highlight the major HBP issues
- Show how these factors can affect profitability
- Encourage growers, harvester and transport operators, millers and other industry players to adopt HBP principles.

The manual has been provided to many Australian cane growers and harvester operators as part of Harvesting Best Practice training courses, and it can be purchased separately. Further training courses are planned and industry awareness of the benefits of adopting HBP is rapidly increasing. This manual is a dynamic document and regular updates will ensure that it remains the current source of information on sugarcane mechanized chopper harvesting and transport.

Top

TOWARDS THE ADOPTION OF MECHANICAL HARVESTING OF GREEN CANE IN MAURITIUS

D PILOT[1], JA LAGESSE[2], E JACQUIN[3] AND E ROUSSET[4]

[1] Belle Vue Mauricia Se, Mapou, Mauritius. E-mail: dpilot@harelfreres.com

[2] Mon Tresor Se, Plainemagnien, Mauritius

[3] Mauritius Sugar Research Institute, Reduit, Mauritius

[4] Beau Champ Se, Grande Riviere Sud-Est, Mauritius

With external threats of sugar price reduction, production costs have to be drastically reduced in Mauritius. After the application of a Voluntary Retirement Scheme (VRS), reducing employed labour by 30% in 2002, the percentage area harvested mechanically has reached 19%. A study carried out in 2002 by the Mauritius Sugar Industry Research Institute revealed that the potential area under cane suitable to mechanized harvest is about 74%.

The percentage weight of burnt cane harvested mechanically has gradually decreased to 35% in 2002. Even if the tendency, with regards to the environment, is to avoid burning, this practice is nevertheless believed to be advantageous for mechanical harvesting in certain cases.

A survey carried out among different categories of planters to quantify the area to be mechanically harvested green or burnt revealed that most producers prefer to burn high yielding fields (>120t t/ha) to reduce pick up and extractor fan losses. In lower yields, machine performance is better and fuel consumption (l/ton) decreases. The risk of armyworm infestation is also lower. Reasons for harvesting green range from environmental ones to better weed control, as well as organic matter and water conservation.

With the availability of chopper harvesters designed to handle heavy crops, the tendency will be to favour green cane harvesting. Based on an output of 40 t/h, about 50 choppers, with a few operating at night, will be needed to harvest mechanically 31% of an annual mean production of 5.8 M tons of cane for the island.

Top

IMPLICATIONS OF GREEN CANE HARVESTING ON PLANTING AND CROP RE-ESTABLISHMENT: AN OVERVIEW

EP RICHARD, JR

USDA-ARS, Southern Regional Research Center, Sugarcane Research Unit, Houma, LA
E-mail: erichard@srrc.ars.usda.gov

As the world's sugarcane industries switch from burnt to green cane harvesting and even more increasingly from manual to mechanical harvesting, management practices will have to be modified. There are a number of advantages to harvesting the crop green and leaving a blanket of residue on the soil surface. These include fresher cane supply to the mill, reduced soil erosion, moisture conservation, increased infiltration of soil water, decreased run-off of agricultural chemicals, soil buffering against temperature extremes, improved soil health, increased levels of soil organic matter, nutrient recycling, increased numbers of beneficial microorganisms, reduced cultivation and weed suppression. Unfortunately, these benefits are often heavily countered by the residue's suppressive effect on ratoons, its harboring of diseases and insect pests and the need for tillage - for the residue can be an enemy of the disk. In many instances, these negatives force growers to either burn the residue or, where feasible, harvest the residue to produce ethanol and electricity.

Growers must be able to make informed decisions before choosing to switch to a green cane harvesting system, particularly where this includes the mechanical harvesting of an established crop. To this end, research is needed to:

- Identify and minimize factors that affect subsequent ratoon yields, such as the effects of infield machinery on stubble longevity and soil compaction, and the suppressive effects of the residue (amount, removal dates, crop age, ripener usage, soil type)
- Develop, if needed, residue removal techniques (complete removal via mechanical harvesting and/or partial removal from the planted line of sugarcane either mechanically or by microbial decomposition)
- Assess the actual economic gains (short- and long-term) to be realized from managing these residues in place. This would include reductions in irrigation, fertilization, pesticides (insecticides and herbicides) and cultivation requirements.

When designing layouts and replanting fields in anticipation of a switch to green cane harvesting, a number of interacting factors must also be considered. These include field layout (row spacing, profile, length and number); crop harvesting and loading practices (hand harvesting and loading, hand harvesting and mechanical loading, or mechanical harvesting and loading); post-harvest residue management strategy (harvest and sell, leave in place, or partial removal); tillage requirements (seedbed preparation and in crop); and the need for a fallow period to minimize the risk of reduced stands associated with the release of allelochemicals during the decomposition of the residue.

Addressing these issues will require inputs from agricultural engineers, agronomists and economists. It will also require acceptance of green cane harvesting by the millers after weighing the benefits of a fresh cane supply against the obvious disadvantage of more fiber and sediment being brought to the mills. Success of these endeavors will ultimately ensure the sustainability of the world's sugarcane industries, for there are true, long-term benefits to be gained by returning crop residues to our soils.

Top

FIELD DESIGN FOR GREEN CANE HARVESTING IN COLOMBIA

J CRUZ

Colombian Center for Sugarcane Research, Cenicaña, Colombia
E-mail: jrcruz@cenicana.org

The Colombian Sugar Industry, in complying with a decision to reduce cane burning, is experiencing increased harvesting costs because manual cane cutting productivity has reduced from 6 to 2 tons per day. This shift to green cane harvesting therefore requires increased mechanical harvesting, which in turn requires appropriate field designs in order to obtain higher machine efficiencies and to prevent direct stool damage and soil compaction.

A study was undertaken to establish the appropriate field design criteria for mechanical green cane harvesting. Several furrow lengths were evaluated for mechanical harvesting, and also for irrigation and drainage. Traffic patterns and the turning radii of equipment were measured in relation to row spacings, irrigation and drainage ditches and field road specifications.

The presentation describes appropriate field design criteria for green cane harvesting. These include: furrow lengths of 90 to 150 m for surface irrigation and drainage; co-linear furrows to harvest 3 to 5 fields of 400 to 600 m without turning; use of flexible fluming or PVC pipes with gates instead of irrigation ditches; construction of bowls to serve as tertiary drainage ditches and the hilling up of furrows 10 to 15 cm with flat inter-rows.

The main benefits of the new criteria for field design were a 32% decrease in time lost by harvesting machines, the reduction of the soil content transported with the cane harvested and the reduction of the stool damage caused by the loaders.

Top

DEVELOPMENT OF AN AUSTRALIAN SUGARCANE FARMING SYSTEM BASED ON CONTROLLED TRAFFIC, MINIMUM TILLAGE AND LEGUME FALLOWS

AL GARSIDE[1], BG ROBOTHAM[2] AND MJ BELL[3]

[1] Sugar Yield Decline Joint Venture, c/- CSIRO Davies Laboratory, PMB Aitkenvale Townsville, Queensland 4814, Australia
E-mail: Alan.Garside@csiro.au

[2] BSES Limited, Private Bag 4, Bundaberg,Queensland 4670, Australia.

[3] Agency for Food and Fibre Science, Queensland Department of Primary Industries, Kingaroy, Queensland 4610, Australia.
E-mail: brobotham@bses.com.au

Sugarcane production in Australia has traditionally been undertaken as a monoculture for logistical and economic reasons. For much of its 150 year history, the intensity of the monoculture has been controlled by an assignment system that prevented growers from harvesting all of their assigned area in any one year, thus imposing a fallow period. The lifting of assignment restrictions during the 1970s resulted in many growers not fallowing, and intensification of the monoculture. The 1970s also saw the adoption of mechanized harvest and transport. The result was a productivity plateau that has lasted for more than 20 years. A component of this productivity plateau is a phenomenon known as yield decline ... the loss of productive capacity of sugarcane growing soils under long-term monoculture ... which is associated with degradation of soil chemical, physical and biological properties.

Research into yield decline over the past decade has shown that no specific factor is entirely responsible, and that yield decline is a result of a range of factors being sub-optimal in the cropping system. Consequently, the development of a cropping system, which addresses these sub-optimalities, has received substantial attention in recent times. Features of the cropping system include:

- breaking of the monoculture, primarily through the use of well managed legume fallows
- adoption of minimum/no tillage and planting
- adoption of controlled traffic principles, applicable to all machinery but particularly for the harvest and transport machines
- planting into pre-formed raised beds, or mounds/beds that are retained for several crop cycles.

This presentation discusses the major reasons for soil degradation and describes how they are being addressed through changes to the cropping system. This new farming system is not prescriptive, but provides the general principles that growers can adopt. Full adoption of the current system is currently limited, but many growers are trialing various system components and adoption can be a step-by-step process. We believe the new sugarcane farming system being developed will be robust, with sufficient in-built resilience for crops to better adapt to adverse conditions, be more profitable and sustainable and be more environmentally acceptable.

Top

COMMERCIAL IMPLEMENTATION OF THREE-ROW PLANTING ON 2.3 M WIDE BEDS IN NORTH QUEENSLAND

L ROBERTSON[1], T WATTERS[2] AND A GARSIDE[3]

[1] Sugar Research and Development Corporation, PO Box 12050, George St, Brisbane, Qld 4003, Australia

[2] PO Box 172, Gordonvale, Qld 4865, Australia

[3] Sugar Yield Decline Joint Venture, c/o CSIRO Davies Laboratory, PMB Aitkenvale, Qld 4814, Australia. E-mail: lrobertson@srdc.gov.au

Despite improved cane varieties, sugarcane yields have been relatively static for the past 30 years in north Queensland. The row spacing of north Queensland cane is commonly about 1.5 m, while harvester and cane transport wheel track centres are typically about 1.8 m, and this results in traffic and soil compaction on up to 90% of the cane field surface during harvest. In addition, the practice of intensive tillage to replace old ratoons without a fallow break has also resulted in soil degradation.

With financial support from an Australian Government Farm Innovation Program, six commercial cane growers in north Queensland implemented a new cane farming system that integrated recent research on overcoming cane yield decline and on high-density planting and harvesting. Following a fallow crop of soybeans over the wet season, beds were formed between wheel tracks on 2.3 m centres, and three rows of cane were planted 55 cm apart into the beds using a purpose-built planter. An Austoft harvester was modified to feed and cut the three rows of cane. In the 2002 harvest season, yields and gross returns were depressed with the three-row system compared to conventional 1.5 m rows on all six farms, due to sub-optimum crop establishment on the 2.3 m beds caused by an exceptionally dry season. Higher plant crop yields are expected in 2003 following good crop establishment in 2002. However, stalk count and biomass yields of the plant crop 260 days after planting indicate that the three rows on 2.3 m beds are unlikely to out-yield standard 1.5 m rows in 2003.

Top

FIELD RESULTS OF A UNIFORMITY TEST OF FIVE DIFFERENT MECHANICAL PLANTERS USED FOR BILLET PLANTING

J LARSEN AND A PETERS

United States Sugar Corporation, Clewiston, Florida, USA
E-mail: jlarsen@ussugar.com

Mechanical planting has gained in popularity in the Florida area over the past two years, replacing hand dropped cane as the method by which most commercial cane is planted. Uniformity tests were conducted on five different mechanical planters (three drum and two elevator slat types) to see the differences down the row in terms of uniformity. Results show a significant advantage with some types over others in terms of amount of cane used and uniformity.

Top

COMPARING WHOLE STALK, BILLET AND NO-TILLAGE PLANTERS UNDER AUSTRALIAN CONDITIONS

BG ROBOTHAM

BSES Limited, Private Bag 4, Bundaberg, Queensland 4670 Australia
E-mail: brobotham@bses.com.au

Australia's entire sugarcane crop is mechanically planted. Although planting is the most expensive single field operation, crop establishment can still be unreliable. Planting rates have increased from 4-5 tons/hectare with wholestalk planters to in excess of 10 tons/hectare with billet planters. This increase in planting rate has not been accompanied by a corresponding increase in crop yields.

The physical components of the various planter types have been analysed and deficiencies highlighted. Current wholestalk and billet planters produce significant levels of soil disturbance. This results in high levels of soil moisture loss, and reduces sett to soil contact. The problem has been exacerbated by the poor metering systems on the billet planters and the use of wide row planting in order to improve sett to soil contact. Billet quality was immediately identified as a major impediment to reliable billet planting. Researchers have improved billet quality and reduced planting rates, thus enabling reduced soil disturbance planting techniques to be trialed.

The performance of a double disc no-tillage planter is compared to the current commercial wholestalk and billet planters. Advantages of no-tillage planting include reduced cane planting rates, improved crop establishment, improved timeliness of field operations and increased cropping flexibility, as break crops can be easily included in the crop cycle. Although there has been a significant reduction in the number of tillage operations undertaken to establish commercial sugarcane crops, there is potential to further reduce the number of operations. Leading growers are currently trialing double disc planters, and to date single, dual, three and four row versions have been constructed. Commercial results have been very positive.

The adoption of minimum and no-tillage planting as part of an improved cropping system is seen as the next major advance for the Australian sugarcane industry.

Top

EVALUATION OF TOTAL CROP RECOVERY VERSUS GREEN HARVEST

B EILAND, R PERDOMO, G POWELL AND G MONTES

Florida Crystals Corporation, PO Box 86 South Bay, Florida 33493, United States of America
E-mail: Barney_Eiland@floridacrystals.com

The concept of recovering most of the above ground cane biomass has been advanced by many as a harvesting option to supply excess fiber for utilization in electrical power generation. Few operational data, if any, for this type of harvesting have been collected in Florida to make any economic assumptions about its validity.

Three paired fields of uniform cane were selected in the organic cane production area at Okeelanta Corporation. Operational and cane quality data were collected during the harvesting and hauling of the green cane with and without the extractor fans operating on the combine harvesters. Three paired comparisons were completed during the organic cane harvest. From the collected data, various performance operational parameters were calculated for each field and summarized for the three comparisons.

The trash content of the cane varied between harvesting with extractor fans on and off which affected many other operational parameters. The trash content without extractor fans operating averaged 20.67% compared to 8.41% with extractor fans operating. This additional trash level reduced the highway trailer weights from 25.02 tons in regular unburned harvest to 15.43 tons or 38% lower. By recovering the trash, the number of highway trailers increased from 1.36 trailers/acre to 2.96 trailers per acre which significantly increased the hauling cost on a net ton basis. Recovering all the trash resulted in more net cane per acre being recovered which resulted in more theoretical recovered sugar. Juice quality was similar for both harvesting approaches. Many other operational parameters were measured.

Results can be used to do a feasibility economic analysis for recovering trash with the cane and to estimate equipment requirements for harvesting, hauling, and recovering the trash at the mill.

Top

MACHINERY ADVANCES FOR MULCH MANAGEMENT IN THE LOUISIANA SUGARCANE INDUSTRY

RM JOHNSON AND EP RICHARD

USDA-ARS-SRRC, Sugarcane Research Unit, 5883 USDA Road, Houma, LA, 70360
E-mail: rjohnson@srrc.ars.usda.gov and erichard@srrc.ars.usda.gov

Burning of post-harvest sugarcane residue is done in response to research conducted in Louisiana which shows a potential for reduced cane and sugar yields in ratoon crops where the residue is not removed after harvest. However, the continued use of this method has come into question due to increased pressure from government and citizen groups concerned over health and environmental issues. If sugarcane producers are prohibited from burning, the residues must be removed either mechanically or through other cultural practices. It was the purpose of this research to investigate the utility of several new pieces of machinery that have been designed or modified to aid in the management of post-harvest residues. Several residue experiments were conducted in the Bayou Lafourche and Bayou Teche sugarcane production regions. Experiments were designed to evaluate a modified street sweeper (Dean Gravois Brush) and an Orthman residue remover, both of which collect the trash from the row top. Also evaluated was a Lawson Canemaster, which incorporates the residue into the inter-row. Treatments were applied immediately after harvest and consisted of the machinery alone or, in some tests, in combination. All plots were harvested using a single row chopper harvester, with weights determined using a weigh wagon. A random sample of cane billets was taken from each plot for sugar

quality analysis. The highest sugar yields were obtained when the residue was removed mechanically from the row top and incorporated into the inter-row. The lowest yields occurred when the residue was not removed. Results from these studies should prove useful to producers who are unable to burn trash and are looking for alternative residue management techniques.

Top

AN INTER-ROW DEVICE TO REPAIR RUTS ON FLAT PLANTED BEDS AND ITS EFFECTS ON MAINTAINING SURFACE RUN-OFF AND RATOON YIELD

NW FRIDAY, AD DEY, HB DAVIS AND A PAUL

Guyana Sugar Corporation, Agricultural Research Centre, Lbi Estate Compound, Guyana
E-Mail: Haroldd@Guysuco.com

In Guyana, sugarcane is planted traditionally on 8-12 meter wide cambered beds. This culture favors surface run-off in this high rainfall environment dominated by impermeable clay soils. The layout constrains cultural activities and harvesting to predominantly manual methods.

To provide scope for mechanization, these fields have been modified to ridge and furrow culture after flattening and leveling. In other instances, multiple beds are joined to form cambered beds 32 to 48 meters wide. On these wide beds, cane is maintained in a flat, long-row culture with the use of locally developed tools.

However, infield movement of loaded trailers especially in wet conditions tend to create deep ruts and produce long duration compaction which can severely impair “cross-the- bed” surface drainage. This is a major problem on the wide cambered beds.

To counter these effects an inter-row device to repair ruts was developed. This consists of a combination tool with components to affect off-barring, para tilling and scarifying to level depressions and promote aeration in the upper soil horizons. Data is presented on the implement structure, and mode of operation as will impact on soil physical conditions and root development following its use in post harvest cultivation.

Top

BEST PRACTICES FOR PLANT CANE HARVESTERS

J LARSEN AND A PETERS

United States Sugar Corporation, Clewiston, Florida, USA
E-mail: jlarsen@ussugar.com

A ranked list by importance was produced of what to do (and not to do) to produce the best possible seed cane using billet type harvesters. Results of an investigation into modifications of billet type harvesters led to a ranking of results obtained for each modification. Modifications included forward travel speed, primary fan speed, secondary extractor fan (on/off), spacing of elevator slats, solid floor versus slotted floor, timing of hydraulic motors, chopper blade setting, coated rollers, length of billet, and pour rate. Machines including Toft and Cameco models were tested in Florida during the 2001-02 planting season on several commercial varieties.

Top

TRASH AND IRRIGATION IN GREEN CANE MECHANISATION

D BOSQUET AND JP FORGET

Medine Sugar Estate, Medine Banbos, Mauritius
E-mail: didierb@mru.com

Medine Sugar Estate is on the western part of the island of Mauritius, and has dry climatic conditions due to a leeward situation (average rainfall 800 mm). Sugar cane is grown on 4200 hectares, of which three-quarters is under irrigation. The rainy season starts in December and extends until March-April. Harvesting takes place during the dry months from July to November. The distribution of the various irrigation systems that we opted for is as follows:

- Dragline 48%
- Center pivot 25%
- Surface
- ‘Wild’ 0.5%
- Furrow (lay-flat and perforated PVC pipe) 1.5%

At Medine Sugar Estate we believe that green harvesting of sugar cane is a very promising solution for cane growers, provided the conditions of success are well in line with the objectives set forth. Changes always bring new solutions with a holistic approach, but also set a number of opportunities with their respective technical problems. One of these is the irrigation regime and timing.

The method put in place is based on observations made just after harvest under three different irrigation regimes, i.e. no irrigation, 35 mm and 70 mm applications at the initial growing stage. An irrigation frequency of 10 days is used.

The time of emergence of cane shoots for each treatment will be recorded for the presentation.

It seems that the trash cover has restrained the interaction between the soil continuum and the atmosphere. We think that the soil humidity in the presence of trash blanketing is enough to establish a good crop stand in the early stages. By delaying the application of irrigation water, it is assumed that we will not only prevent the diseases that are associated with damp conditions, but also hope to observe limited action of army worms on newly emerging shoots. With delayed irrigation treatment, we also expect faster emergence of cane shoots and slower decomposition of the trash, which in turn will limit the growth of weeds.

Top

MANAGEMENT OF HEAVY CANE TRASH

JS TORRES, F VILLEGAS AND JH COCK

Colombian Center for Sugarcane Research, Cenicaña, Colombia
E-mail: jtorres@cenicana.org

The Colombian sugar industry and the government signed an agreement to eliminate preharvest burning of cane fields before year 2005. After green cane harvesting of current commercial varieties, the amount of fresh residues left behind can vary from 50 to 150 t/ha, making it necessary to find short-term methods for green cane management under heavy trash conditions.

When it rains after the harvest, it is common to observe excess moisture on the soil surface causing stool rotting and therefore poor germination of commercial fields. In Colombia, year round harvesting is practised, which may have a negative impact on cane production due to impaired stool germination and stunted stalk growth caused by the presence of residues. Several field trials were conducted on Mollisol, Inceptisol and Vertisol soils, using varieties that produce large amounts of biomass. Directly after green cane harvesting of the plant crop on a commercial plantation, different trash management treatments were imposed. The treatments were discarded if they proved to be impractical according to results.

The cane yields from the first and second ratoon crops were similar in all trash management treatments, including burnt cane. The third ratoon cane yields from the 0x0, 0x1 and 1x1 trash treatments, where there had been no chance to conduct cultural practices, were 40% lower than the other treatments. Under Colombian conditions, it is therefore essential to conduct green cane trash management treatments that allow for mechanized cultural practices; otherwise cane production is affected

Top

FERTILIZATION AND VERTICAL TILLAGE IN TRASH BLANKET MANAGEMENT IN TUCUMÁN, ARGENTINA

J SCANDALIARIS[1], FP ZAMORA[1], J MELIAN[2], E ROMERO[1], R FIGUEROA[2] AND H MARTINEZ[2]

[1] Estación Experimental Agroindustrial Obispo Colombres, Tucumán, Argentina

[2] Concepción Sugar Mill, Tucumán, Argentina. E-mail: direcc@eeaoc.org.ar

Trash blanketing is being gradually adopted in the Tucumán sugar industry in Argentina. Low winter and spring rainfall during the harvesting season makes this technique successful. For appropriate green crop management, special equipment for fertilization and vertical tillage is required.

Over the past five years, equipment for fertilization and vertical tillage has been developed to meet the requirements of this sugarcane growing area. The equipment described in this presentation can apply fertilizer to both sides of the row and at a proper depth, and vertical tillers can be added when breaking of a compacted subsoil layer is required. Other equipment with similar characteristics adopted in the region can fertilize and vertical till simultaneously, at operating costs similar to those of burnt cane.

This equipment is an alternative for use in trash blanketed fields and promotes an increase in green crop area, which is expected to continue over a period of years. This presentation gives performance records, descriptions and operating costs of the equipment.

Top

AGRICULTURAL MACHINERY MANAGEMENT IN A HYPER-INFLATIONARY ENVIRONMENT

E ESTON

Triangle Estate, Box 801, Triangle, Zimbabwe
E-mail: agriceng@triangle.co.zw

Agricultural machinery is becoming more and more expensive to own and operate, presenting a huge challenge to machinery managers. Major decisions are made based on complex costing exercises whose accuracy heavily depend on the soundness of assumptions made.

Sensitivity analysis was used to review the conventional costing systems employed on the estate to check the robustness of machinery costs to changes in costing variables. The effect of high inflation on important cost ratios such as repairs and maintenance costs versus initial capital costs and break even point of ownership versus outsourcing was also considered.

Costs were found to be highly sensitive to fluctuations in utilization levels, interest and inflation rates. Cost parameters such as repairs and maintenance were highly distorted making it virtually impossible to use as a guide in directing the estate's machinery replacement policy. The highly volatile pricing environment made it difficult to make meaningful cost comparison of alternative sources of machinery. The estate resorted to the use of absolute quantities as opposed to application of inflation factors in the development of budgetary cost projections.

Top

USING SMALL-SCALE CONTRACTORS ON LARGESUGAR ESTATES

D WEEKES

Booker-Tate Ltd, Church Road, Thame, United Kingdom.
E-mail: david.weekes@booker-tate.co.uk

When setting up new sugar mills and estates, Booker-Tate have traditionally established in-house agricultural equipment fleets. However, as the estates matured and the local infrastructure developed, it was often found advantageous to use small-scale contractors (often owner-operators) rather than estate-owned equipment.

This paper seeks to analyze why the small-scale operators can be cheaper, and give a more satisfactory service than in-house equipment fleets or large-scale contract organizations. The benefits to local development of using a large number of small-scale contractors is also discussed.

Top

DISCOUNTED CASH FLOW AS A METHOD OF COSTING OPERATIONS

TJ MURRAY

South African Cane Grower, PO Box 155, New Hanover, 3230, South Africa
E-mail: Tim@fatacre.com

This presentation will show how Discounted Cash Flows (DCF) can be used as a technique to determine the cost of mechanised operations on sugarcane farms. The principles involved in DCF techniques will be outlined and the practical applications of the procedure to determine the expected costs of specific cane farming operations will be explained. It will be shown how DCF can assist in evaluating capital equipment replacement decisions. The DCF procedures take into account factors such as the effect of inflation and interest on the time value of money, as well as the implications of various income tax considerations. An example will be given of evaluating the complete life cycle of a truck and semi trailer using DCF and comparing that to traditional methods.

Top

MACHINERY COSTING METHOD AND STANDARDS

E MEYER

South African Sugar Association Experiment Station, Private Bag X02, Mount Edgecombe, 4300, South Africa.
E-mail: xengem@sugar.org.za

On both small scale and larger commercial farms and estates, the cost of machinery is often the highest single farming input after land and buildings. Machinery costs are escalating due to inflation, currency devaluation and increasing levels of technology. The ability to report, analyse and forecast these costs accurately, will therefore always remain a key management function in any farming enterprise.

There would be significant advantages to be gained from achieving uniformity in the method used to estimate and report these costs. A universal method of calculating machinery and equipment costs would simplify this function, and would also enable accurate and meaningful comparisons to be made between different systems and different sugar industries. Furthermore, a standard costing method would ensure that benchmarking exercises between local farming enterprises and regions would be more meaningful.

The ‘Classical’ method of costing is proposed for use by all sugarcane growers and contractors. The manner in which depreciation, interest on capital investments and repairs and maintenance are calculated is described. In addition, the cost centres which should ideally be included in such estimates, as well as suggested standard work rates, are discussed.

Top

BENCHMARKING METHODS

PW LYNE AND E MEYER

SASA Experiment Station, Private Bag X02, Mount Edgecombe, 4300, South Africa
E-mail: peter.lyne@sugar.org.za

The costs of harvesting and transporting sugarcane accounts for a large proportion of the crop’s production cost. In a sector where profitability continues to decrease, this area becomes a prime target for cost reduction. To ensure sustainability of the industry, it is vital that performance in the harvesting and transport processes be optimised to reduce their costs to a minimum. One technique to achieve this is to use benchmarking as a tool to maximise performance in terms of productivity and cost. Benchmarking is more than a buzzword - it is a mechanism whereby one can measure oneself against a standard to establish whether this can be improved or not.

Much thought has gone into how one implements benchmarking, particularly when one is attempting to compare across different systems in different conditions and even between countries. A number of organisations have carried out their own internal benchmarking exercises, but these were usually tailored for their own needs and make “across organisation” benchmarking difficult. It is therefore proposed that ISSCT develop a set of standard processes and procedures for use when carrying out a benchmarking exercise to ensure portability and effective comparisons between systems.

The benefit of this exercise will be that each organisation that participates and contributes to the standard will augment the database and make the benchmark more valuable and more useful - and provide an improved target to aim for.