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Aamir Shahzad
Shakarganj Sugar Research Institute
Toba Road, JHANG
Ph: +92 47 763 1001-5 Ext. 603, 604
Email: aamir.shahzad@shakarganj.com.pk

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CONTENTS

EXPERIENCE OF COST SAVING BY REPLACING 2ND HAND STEAM TURBINE WITH ELECTRIC MOTORS AT CANE CUTTER

Engr. Abdul Aziz Tahir, Technical Director Ranipur Sugar Mills

Introduction

This is general trend in sugar Industry to use 2nd hand machinery, especially electric drives and steam turbines. The option is used to cut down the capital cost at the moment, whereas operational cost is not considered. Ranipur Sugar Mills has also installed 2nd hand single stage steam turbine of un known power at 2nd Cutter. The Cutter is equipped with 36 knives and operated at 600 rpm with option to operate with 2 nos. 550 volts, H.T electric drives of 220 Kw each installed at other end of the shaft. The steam turbine was installed in 2004-5 to reduce the electric load at power house.

B-Material and Methods

During crushing Season 2014-15, mechanical fault was occurred in steam turbine gear and operation of 2nd cutter shifted on electric drives for 11 days. In those 11 days, It was noticed that the average motor power remained 261 kw whereas the steam consumption reduced from 45.88 % (average of 55 continuous good crushing days prior to the gear fault) to 43.30 % on cane(average of 11 continuous days running with Electric Motors). No make steam was provided to process house in those days. (see Exhibit A and B). With average crushing of 3950 tons per day, the steam consumption per hour was observed with:

Description	Calculations	Results
Steam Turbine at 2 Cutter	= 45.88 x 3950/2400	= 75.51 tons per hr
Electric drives at 2nd Cutter	= 43.30 x 3950/2400	= 71.26 tons per hr
Extra Steam Consumption at 2nd	= 75.51 – 71.26	= 4.25 tons per hr.
Cutter Steam Turbine per hr Extra Steam consumption per Kwhr at 2nd Cutter Steam Turbine as compared with Power House Turbines	= 4.25x 1000/261	= 16.28 kg/kwhr

Note: As steam consumption at 2nd Cutter Turbine is compared with Power House Turbines, pressure and temperature loss effect of steam from boiler to 2nd Cutter Turbine is not considered.

C- Cost Saving with Electric Drives at 2nd Cutter:

Considering consumption of 1 ton bagasse to generate 2 tons of 25 bar steam and bagasse sale price of Rs. 2300 per ton:

Description	Calculations	Results
Bagasse saving per day	= (4.25 x 24)/2	= 51.0 Tons
Cost saving per day	= 51.0 x 2300	= Rs. 117,300 per day
Cost saving per ton of cane	=117300/3950	= Rs.29.70 per ton cane

D- Discussion:

During the period of 2nd Cutter operation with Electric Motors, the Power House load in average increased to 261 kw and process house demanded makeup steam for process requirements. No make steam was served to Process House but it was felt tough operation of process during those days.

E- Recommendations:

Cut off application of 2nd hand Single Stage Steam Turbines.
Use multistage efficient Steam Turbines if deem necessary.
For economy run, extend the Power House capacity and replace Steam Turbines with Electric Motors at cane preparation and milling and ultimately switch over to high pressure
Boiler operation with no Steam Turbine other than of Power House.
Replace high steam consumption process house equipments with less steam consumption equipments.
Increase multiple use of steam and vapours at process house.
Adopt secondary sources to cut off supply of 6 bar steam to process house.
Use automation and VFD where is applicable in the plant.

Exhibit- A

Data Sheet of Steam Consumption including Steam Turbines at 2nd Cutter , Power House Load and Mill Stoppages

Date	Power House Load, K.W/TCD	Steam % Cane	Stoppage (Hrs)	Reason
15/12/2014	18.504	47.68	Nil	
16/12/2014	18.408	49.27	Nil	
17/12/2014	18.408	47.48	Nil	
18/12/2014	17.832	46.29	Nil	
19/12/2014	17.448	46.16	Nil	
20/12/2014	18.216	46.02	0.40	
21/12/2014	16.896	42.97	Nil	
22/12/2014	17.304	44.72	0.10	
23/12/2014	17.184	44.86	Nil	
24/12/2014	17.232	44.12	0.10	
25/12/2014	18.12	45.86	1.00	
26/12/2014	18.216	46.46	0.45	
27/12/2014	17.04	45.06	Nil	
28/12/2014	16.584	43.03	Nil	
29/12/2014	16.920	44.15	Nil	
30/12/2014	16.992	43.31	Nil	
31/12/2014	17.64	45.88	2.30	
01/01/2015	16.548	42.57	Nil	
02/01/2015	18.744	42.51	Nil	
03/01/2015	16.368	41.86	Nil	
04/01/2015	16.176	40.74	Nil	
05/01/2015	16.368	40.82	Nil	

Exhibit-A, continued

Date	Power House Load K.W/TCD	Steam% Cane	Stoppage (Hrs)	Reason
06/01/2015	37.320	72.73	16.10	Strike
07/01/2015	No crushing		24.00	Strike
08/01/2015	No crushing		24.00	Strike
09/01/2015	No crushing		24.00	Strike
10/01/2015	No crushing		24.00	Strike
11/01/2015	No crushing		24.00	Strike
12/01/2015	15.948	47.26	0.55	
13/01/2015	23.112	59.37	17.10	No Cane
14/01/2015	17.664	51.68	0.20	
15/01/2015	19.512	53.57	9.45	No Cane
16/01/2015	16.512	47.54	1.00	
17/01/2015	16.896	49.26	0.45	
18/01/2015	17.616	47.54		
19/01/2015	16.584	44.19	Nil	
20/01/2015	17.880	48.14	Nil	
21/01/2015	18.504	51.58	Nil	
22/01/2015	18.504	48.51	0.55	
23/01/2015	18.000	47.41	1.25	
24/01/2015	18.264	48.18	1.30	
25/01/2015	16.776	45.11	0.30	
26/01/2015	17.448	45.41	0.10	
27/01/2015	17.112	44.65	Nil	
28/01/2015	17.56	41.25	Nil	
29/01/2015	17.784	47.70	1.25	
30/01/2015	16.752	45.81	Nil	
31/01/2015	17.304	46.16	0.50	
01/02/2015	16.656	45.7	0.30	
02/02/2015	17.232	45.21	Nil	
03/02/2015	19.776	48.48	0.35	
04/02/2015	18.816	48.31	Nil	
05/02/2015	19.416	48.92	Nil	
06/02/2015	16.46	45.08	Nil	
07/02/2015	16.728	46.08	Nil	
08/02/2015	16.896	45.49	Nil	

Note:- The crop days with more than 8 hrs Mill stoppage are not included in the average.

Exhibit – B

Data Sheet of 2nd Cutter Motors and Power House Load, Steam % cane and Mill Stoppages 2014-15

Date	2 Cutter Power House Load	Motor Load Kw/ TCD (Amp)	Steam % Cane	Stoppages (Hrs)
10/02/2015	35.6	19.10	43.3	0.35
11/02/2015	32.7	18.96	44.0	1.55
12/02/2015	31.5	19.14	42.1	Nil
13/02/2015	31.1	19.78	42.1	Nil
14/02/2015	30.4	19.63	45.6	3.15
15/02/2015	29.5	19.67	42.3	0.35
16/02/2015	20.8	19.06	43.4	0.10
17/02/2015	30.6	18.84	42.7	0.10
18/02/2015	31.5	18.71	42.8	0.10
19/02/2015	30.8	18.94	42.6	0.10
20/02/2015	31.0	19.15	45.4	2.10
Average	30.5	19.18	43.3	

PERFORMANCE OF PROMISING SUGARCANE VARIETIES/CLONES AT FARMERS FIELD IN PUNJAB

Muhammad Sarwar, Dr. Arshad Mehmood & Dr. Naeem Ahmad

ABSTRACT

All field studies/ testing was carried out during 2015-16 at eight locations in Feb-march. The promising varieties/clones are comprised of eight varieties viz: S2003-US-127, S2003-US-704 (CPF-249), S2003-US-778, S2006-US-658, S2003-US-633, S2006-US-272, S2008-FD-19 and CPF-248(Std). The trials were conducted at farmers field using RCBD with three replications. The data on germination%, tillers per plant, no of millable cane, Cane yield t/ha and sugar recovery% were recorded during the course of study. The data revealed that out of standard and seven promising varieties/clones S2003-US-704(CPF-249) significantly out yielded rest of the clones be producing 140.6 t/ha stripped cane yield and sugar recovery of 12.6%. The other clones/varieties followed the above referred variety.

INTRONDUCTION

Sugar is an important agriculture commodity for domestic consumption. In Pakistan it is mainly obtained from sugarcane. Though it is a paying crop for the farmer yet its cultivation is expensive. The growers have to increase their productivity per unit area and per unit time along with increase in cane yield per acre. It is only possible if the farmers adopt the new production technology of 8 inch deep trench planting at 4-5 feet apart row planting can help to save the irrigation water up to 50% and sowing of recent high cane yielding varieties/clones can increase the sugar recovery of mill and cane yield of the growers.

MATERIALS AND METHODS

The study was undertaken on eight sugarcane varieties/ clones viz;S2003-US-127, S2003-US-704 (CPF-249) S2003-US-778, S2006-US-658, S2003-US-633, S2006-US-272, S2008-FD-19 and CPF-248(Std) at eight different locations in Punjab during Feb-March 2015-16. The locations as under:

Sr. No.	Locations
1	Chaudhary Sugar Mill Farms.
2	Channar Sugar Mill Farms.
3	Hussain Sugar Mill Farms, Jaranwala.
4	Chak No. 528 GB Samundari.
5	Chak No.51 J.B Sajjadan, Faisalabad.
6	Langhryal Farm, Muzaffargarh.
7	Chak No. 722 G.B Kamalia.
8	Bandyal Farms Khushab

The experiments were laid out in RCBD with three replications and on an area of about half acre. Data on germination %, tillers per plant, millable canes ha^{-1}, cane yield t/ha and sugar recovery % were recorded. Visual observations on disease infestation were also noted. The data was analyzed by MSTAT programme and difference of means were compared with LSD test (Steal and torrie 1990).

RESULTS AND DISCUSSIONS

GERMINATION %

Sugarcane variety S2008-FD-19 gave significantly more germination % i.e; 60.5 while the other two varieties viz; S2006-US-272 and S2003-US-704 (CPF-249) statistically at par with S2008-FD-19 for germination % i.e; 55.0 and 53.6 respectively. The sugarcane variety CPF-248 gave the lowest germination % i.e.; 46.30. These findings are in line with that reported by Afghan et al (1994).

TILLERS/PLANT

The sugarcane varieties/clones viz; S2003-US-704 (CPF-249) and S2008-FD-19 produced significantly higher tillers per plant i.e. 1.66 and 1.50. The other sugarcane varieties viz; S2006-US-272, S2003-US-633, S2003-US-778 and S2006-US-658 are statistically at par with one another. The rest of the varieties viz; S2003-US-127 and CPF-248 produced less number of tillers per plant, however, are statistically at par with each other.

MILLABLE CANES/Ha.

The data of millable canes indicate that sugarcane varieties/clones S2008-FD-19 and S2003US704 (CPF-249) produced more number of canes i.e.; 163715 and 163541 per hectare respectively. Both the cane varieties exhibited same number of millable canes which were statistically significant as compared to other varieties. These two varieties followed by S2003-US-778, S2003-US-633, S2006-US-272 and S2003-US-127 respectively which are statistically at par. The sugarcane varieties/clones viz; CPF-248 and S2006-US-658 produced less number of millable canes as compared to above mentioned clones. These results are correlate with Dr. F. G. ALI et al (2002).

CANE YIELD TON/Ha.

The cane yield data given in table indicate the almost similar trend as was recorded in cane count. The data revealed that sugarcane variety S2003-US-704 (CPF-249) produced maximum cane yield of 140.6 t/ha which was statistically significant. The sugarcane varieties CPF-248 and S2203-US-127 produced lowest cane yield of 92.9 t/ha and 94.4 t/ha respectively. The other sugarcane varieties S2006-US-272, S2006-US-658 and S2003-US-633 produced cane yield of 113.1 t/ha, 105t/ha and 101.7 t/ha respectively which are statistically at par with one another. These finding are correlated with Aslam et al (1981) has expressed variation in different cane yield parameters of cane varieties.

CCS %

It is evident from the CCS % data given in table that sugarcane variety S2003-US-633 produced significantly more CCS% of 13.5 which was followed by S2003-US-704 (CPF-249), CPF-248 and S2003-US-127 are statistically at par with aforesaid variety. The sugarcane variety/clone S2006-US-272 gave the lowest CCS % of 11.6 whereas the other sugarcane varieties S2003-US-778, S2008-FD-19 and S2006-US-658 are statistically at par respectively. These findings are correlated with Dr. A. A. Chattha et al (2002).

The pooled data of eight different sugarcane varieties at eight different locations given in table revealed

Sr. No.	Varieties	Germination %	Tillers/Plant	Canes/ha	Cane yield t/ha	CCS %
1	S2003US127	48.0 bc	0.95 cd	130208 bc	94.4 c	12.8 ab
2	S2003US704 (CPF-249)	53.6 ab	1.66 a	163541 a	140.6 a	12.8 ab
3	S2003US778	50.1 bc	1.10 bcd	148784 ab	100.3 c	12.3 bcd
4.	S2003US633	52.2 bc	1.16 bc	138889 abc	101.7 bc	13.5 a
5	S2006US658	52.0 bc	1.09 bcd	118576 c	105.0 bc	11.9 cd
6	S2006US272	55.0 ab	1.23 b	135243 abc	113.1 bc	11.6 b
7	S2008FD19	60.5 a	1.50 a	163715 a	126.5 ab	12.3 bcd
8	CPF-248	46.3 c	0.85 d	112152 c	92.9 c	12.9 ab
LSD 0.05		6.9929	0.2657	29096	25.231	0.7921

CONCLUSIONS

Recommended practices enhance germinating % and tillers per plant which Ultimately increased number of millable canes and cane yield.

The sugarcane variety S2003US704 (CPF-249) has shown outstanding performance in cane yield and approved for commercial cultivation in Punjab.

The variety S2003US633 has shown prominence in CCS % and is therefore, recommended to be released for commercial cultivation in Punjab.

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HOW TO INCREASE SUGAR YIELD PER HECTARE

Karim Bakhsh Malik, R and D Advisor, Abdullah Shah Ghazi Sugar Mills, Garho

Introduction

Next to cotton, sugarcane has the largest industrial base in agricultural sector of Pakistan. For the last 2-3 seasons economic viability of Pakistan sugar industry is at stake. Low market prices of sugar do not match the higher prices of sugarcane. A number of sugar mills are at the verge of insolvencies. The reason for this situation can be analyzed from the production cost of sugar.

A Layman's Analysis of Production Cost of Sugar

The data is presented to show the impact of sugar recoveries on the production cost of 100 maunds cane at the market prices of Rs. 50, 55 and 60 per Kg. Sugar (Table-1).

Table-1 A layman's analysis of production cost of sugar

Sugar Recovery. %	Sugar produced from 100 maunds cane		Cost on 100 mds cane	Income from sale of sugar at three rates: Rs. Per Kg.		
	Mnds	Kg.	17200	50	55	60
9.00	9.00	360	Minus loss due to 3 % trash -518 = 16684	12,960	14,616	16272
9.50	9.50	380		13680	15,428	17176
10.00	10.00	400		16,272	16240	18080
10.50	10.50	420		14400	17052	18984
11.00	11.00	440		15120	17864	19888
11.50	11.50	460		15840	18676	20792

Deductions

Sale tax @ 8% on sale price of sugar sale.
Loss due to weight of trash (3%) = Rs 516 per 100 maunds cane.
Milling & processing cost @ Rs. 10/- per kg sugar.
Considered on negotiations with concerned persons of various sugar mills; it varied from Rs. 7/- to Rs. 10/-.per maund.

The data in Table-1 indicate that the Sugar mills having sugar recovery around 11.5 % are in a position to market sugar at Rs. 50 per Kg., while sugar mills having recovery of less than 9.5% are entirely at loss, even at market price of Rs. 60 per Kg. sugar. Eventually, higher recoveries fetch considerably better cash returns than lower recoveries. It thus indicates that Economic viability of sugar industry is mainly affected by sugar recovery. Where our sugar industry stands can be checked from the Table-2:

Comparing production cost of sugar in Table-1, the economics of the sugar industry can be adjudged from the recoveries obtained by various sugar rmills. So as to sustain the economic growth of the industry sugar mills recoveries have to be increased

Table-2 Periodic sugar recoveries of different sugar mills during 2014-15

Sugar Mill	Nov	Dec	Jan	Feb	Mar	Average
Mehran	-	10.57	11.17	11.77	12.42	11.42
JDW	-	10.47	11.06	11.51	11.78	11.16
Matiari	-	10.13	10.92	11.18	11.57	10.52
HSM	-	9.39	10.46	10.91	10.90	10.40
Dewan	-	9.16	9.58	10.35	11.47	9.95
Ittefaq	8.07	9.37	9.34	9.51	9.91	9.94
Haq Bahu	-	9.74	9.62	10.08	9.94	9.80
Chenar	8.10	8.97	9.34	9.69	10.19	9.37

Factors Affecting Sugar Recoveries

Growing high sugar varieties

Fertilizer management- Balanced dose of fertilizer

Irrigation management

Reducing losses in cane sugar recovery

Reducing losses in milling and processing

Cane procurement strategies

Cane payment policies

1. Growing High Sugar Varieties

Cane variety is the single most dominant factor in improving sugar mills recoveries. A number of high sugar varieties have been released by Sugarcane Research Institutes, during the past decades.

Main varieties under cultivation in Sindh

BL 4, Triton, BF 129, Th. 10, SPSG 26, NIA 2004, HS 12, SPF 234, CPF 237, CPF246

In Abdullah Shah Ghazi Sugar Mills, Bl 4, Triton and BF 129 are the main varieties under cultivation. Since their recoveries are low, average recoveries could not be enhanced to desired level. Efforts were made to collect most promising varieties from different Research Stations for screening and selection under local conditions; the 45 varieties so collected were planted at Madina Agri. Farm, Ghorabari, during October, 2013 (Table-3). The laboratory tests were performed for assessing their juice quality in the sugar mills from October 20 to November 21, 2014, the data for which is reproduced in Table-4.

Table-3 Introduction of new cane varieties at Madina Agri. Farm

Source	Varieties introduced	Total
SRI, Faisalabad	CPF 237, CPF 246, CPF 247, HSF 242, US 272, US 469, US 633, US 658, US 824, AUS 134, AUS 133, AUS 138, SP 18, SP 30, SP 93, CP 77-400	16
SCRI, Thatta	Th 127, Th 311, Th 318, Th 326, Th 344, Th 409, Th 910, Th 2109, YT 53, YT 55, BL 4, BF 129, Triton	13
SSRI, Jhang	CSSG 676, CPSG 12, HOG 33, CSSG 2416, CSSG 2453, CPSG 2713, CPSG 2923	7
NIA, Tando Jam	NIA 2004, NIA 12, NIA 13	3
HSM, NWS	HS 21, HS 22, HS 24, HS 32, HS 98	5
NARC, ISD	NARC 2	1
	Total	45

The data in Table-4 represents the average Brix, Pol, Purity and Sugar recovery contents recorded for multiple samples during 20th October to 21st November, 2014. It could be noted that a number of cane varieties have shown sugar recoveries over 11 percent during October-November period against 8.5% in our existing cultivars. With advance in maturity period the varieties are likely to reach a recovery level of 12.5 to 13.0%. In case these varieties are get adapted and multiplied on a large area, can bring revolution in this tract.

Table-4 Quality performance of cane varieties planted at Madina Agri. Farm, (20 Oct-15 Nov)

S No.	Variety	Brix	Pol	Purity	S. Rec.	Samples
1	Th 2109	21.70	18.80	86.77	12.06	5
2	AUS 133	21.26	18.16	85.33	11.52	4
3	CSSG 676	20.99	17.63	84.03	11.24	7
4	Th 326	20.85	17.40	83.49	11.19	4
5	Th 910	20.40	17.29	84.69	11.16	5
6	NIA 13	19.12	16.31	85.31	11.15	1
7	AUS 138	20.51	17.42	84.93	11.01	5
8	CPF 247	19.38	16.45	85.07	10.99	2
9	CPF 237	20.07	16.83	83.79	10.72	7
10	YT 53	19.96	16.95	84.88	10.71	3
11	US 824	20.67	16.93	81.93	10.63	4
12	Th 344	20.09	17.04	84.32	10.60	1
13	CPF 246	19.97	16.56	82.90	10.42	8
14	Th 127	19.26	16.39	85.11	10.38	1
15	NIA 12	19.16	15.75	82.34	10.29	2
16	Th 311	18.36	15.47	84.26	10.29	2
19	YT 55	19.89	16.33	82.07	10.08	2
20	Th 318	18.99	15.55	81.92	9.97	2
23	US 658	19.05	15.56	81.65	9.84	4
21	BL 4	19.45	15.71	80.84	9.60	4
22	AUS 134	18.76	15.22	81.08	9.82	4
24	NIA 2004	20.04	15.98	79.51	9.67	2
25	BF 129	17.47	14.28	81.74	8.79	2
26	Th 409	17.68	13.34	75.20	8.10	2
27	Triton	16.84	12.55	74.52	7.69	2

The data in Table-4 show the cane yield parameters' of some of the selected varieties. It indicate the potential of cane growth and yield in this cane field. We have plans to multiply these varieties at growers' fields in the season to come.

Table-4 Cane yield and quality parameters of some promising varieties

Sr. No	Cane variety	Cane stalk			Cane quality			Sugar Recovery %
		Length (Ft)	Thickness (cm)	Weight (Kg)	Brix	Pol	Purity	
1	Th-2109	9' - 7"	2.88	1.68	22.46	19.54	87.00	12.55
2	Th-910	8'- 7"	2.84	1.31	21.86	19.26	88.11	12.47
3	AUS-133	11'- 8"	2.86	2.22	22.42	19.55	87.20	12.50
4	AUS-138	10'- 5"	2.74	2.15	22.36	18.95	84.75	11.96
5	CSSG-676	11' - 2"	2.81	2.20	21.66	18.65	86.10	11.9
6	US-824	9' - 8"	2.56	1.45	20.79	16.97	81.63	10.44
7	CPF-237	9' - 2"	2.65	1.54	21.06	18.03	85.61	11.46
8	CPF-246	10' - 3"	2.82	1.92	21.06	17.56	83.38	10.96

Fertilizer Management

Fertilizer, its dose and time of application to the crop has a leading role in enhancing or reducing sugar recoveries. It must be applied in a balanced dose of N P and K. Balanced fertilizer dose for Pakistan conditions has been worked out as under.

Fertilizer requirements of cane:

N P K
Kg per ton of cane
1.20 0.46 1.49

The generalized recommended dose is 2 bags of DAP, 2 bags of Potash and 2 to 3 bags of urea. But unfortunately, our growers pay least attention to the recommended doses. Usually DAP is applied almost half the recommendations, Urea rather more than the recommendation and K application is altogether avoided. Only quite a few growers take pain but at half the rate. The importance of the balanced doses can also be checked from the NPK requirements of cane in other countries (Table-5).

Table-5 Fertilizer requirements in some other countries

'K' Nutrients required per ton of cane

N	P2O5	K2O	Reference
1.83	0.70	2.12	Naido etal, 1999 (India)
2.50	0.50	2.75	Hunsigi, 1993 (India)
1.54	0.37	2.76	Calcino, etal, 2000 (Australia)
1.20	0.46	1.49	Anon, 2003 (Pakistan)

Nitrogen Management

'N' fertilization delays maturity

 If applied in excess of the required dose and if applied late

 The excess N make room for uptake of more moisture, that too delays maturity

 For inducing maturity 'N' must be exhausted by the end of growth period

 Symptoms: leaves turn pale yellow.

'K' Essential for Crop Maturity

It must be realized that 'K' has very important role in synthesizing sugars in plants and its storage in cane stalk.

Important functions

 Help in chlorophyll synthesis

 Translocation of sugar from leaves to sites of storage in cane stalks

 Regulates uptake of 'N' and its utilization by plants

 In 'K' deficient plants, 'N' accelerates growth and plant do not tend to maturity

In view of the facts given above the Potash fertilizer must be applied as per recommendations. The sugar recovery can also be improved by spray application of 'K' fertilizer (Table-6).

Table-6 Sugar yield as affected by foliar spray of potassium, 60, 90,120 DAP

Spray treatment	Sugar yield tha-1
Potassium Chloride @ 2-5%	6.93
Potassium Chloride + urea 2.5% each	7.47
No spray	6.60

3. Irrigation Management

Irrigation management, during various growth stages, is a main tool to improve cane yields. During growth stages the objective is to improve biomass through accelerated vegetative growth. With onset of maturity period irrigation is controlled to check vegetative growth and reduce excessive moisture in cane stalks and leaves. To achieve crop maturity there are certain parameters to be observed.

 Irrigation to cane crop to be withheld 3 weeks prior to harvesting. This is practiced to reduce leaf sheaths moisture from 82-85 to 72-73%.

 No of leaves per plant must be reduced: From 12-15 to 6-8 leaves.

 Leaf color is the indicator of leaf moisture and cane maturity. Crop not to be harvested with dark green leaves. Crop to be harvested when cane leaf color changes from dark green to pale yellow Observations on the impact of leaf sheath moisture and leaf color on juice Brix is given in Table-7. These observations ere recorded in cane fields of Habib Sugar mills area. Color observations we rerecorded in various fields, leaf sheaths of the concerned crop were cut wrapped in plastic bags, clipped in pieces n the laboratory, weighed on electronic balance and kept in a convectional oven at 65o C for draying at constant weight. Observations are as per recommendations. The data indicate that the samples showing green color of leaves with leaf moisture around 78% show juice Brix of 18-19o while pale green color with leaf moisture less than 75 show brix figure of 20-23o.

Table-7 Leaf color an indicator of leaf moisture and crop maturity

Sr. No.	Cane variety	Leaf moisture %	Leaf color	Brix
1	SPF 234	78.74 Green	Green	18.19
2	SPF 234	78.51	Green	19.25
3	SPF 234	79.88	Green	19.30
4	SPF 234	74.33	Light green	20.25
5	SPF 234	69.64	Pale dry	21.50
6	HS 12	74.05	Green	20.40
7	HS 12	75.44	Green	20.30
8	HS 12	75.07	Green	20.20
9	HS 12	73.80	Pale	22.25
10	HS 12	68.84	Pale	21.22
11	HS 12	73.76	Pale	23.20

4. Reducing Losses in Sugarcane Recoveries

 Losses due to presence of trash in cane

 Losses due to post harvest staling in cane

 Losses in milling and processing operations

Losses Due to Cane Trash

In normal practice sugarcane harvested from the cane field should be de-trashed and quite clean cane to be supplied to sugar mills. Unfortunately sometimes things get out of the control of sugar industry staff and cane is supplied partially and sometimes completely with trash. The composition of trash varies from 1 to 20 percent. The sugarcane supplied with trash induces two types of losses to sugar industry.

 Extra payment on the weight of cane trash

 Reduction in sugar recover during mill processing\

This exercise is conducted considering 3% trash brought to the factory with cane.

Trash Weight

 Cane supply: 100,000 maunds

 Includes trash weight @ 3% trash: 3000 mds

 Payment to grower on the weight of trash @ Rs. 172/- per maund: Rs. 516,000

 Loss per maund of cane: Rs. 5.16

Loss in Sugar Recovery

 One percent trash reduces Sugar recovery by 0.12 unit, so 3% trash losses by 0.36 units

 Cane Supply: 100,000 mds

 Actual crushing: 100,000-3,000 maunds as weight of trash =97,000 maunds

 Sugar loss : 97,000 x 0.36% = 349.2 maunds

 Financial loss @ Rs. 55 per Kg sugar.= Rs. 768,240

 Loss per maund of cane : Rs. 7.68

 Total losses; (trash weight and sugar recovery) = Rs. 12.80 per maund of cane

Cane fully covered with trash and being supplied to a sugar mill

Post Harvest Staling Losses

Supply of stale cane has become a great menace in Pakistan sugar industry. In most of the cases. It takes 3-4 days to complete harvesting for one trolley/truck load of cane for supply to sugar mills. In case there is rush on cane carrier it may take further 24-48 hours to wait for unloading. This staling causes considerable losses in sugar recovery. The sugar mills face two types of losses.

Two fold losses

Loss in cane weight: due to moisture loss and drying

Loss in sugar recovery: due to biochemical changes in cane juice

Main causes

- Over harvesting – unplanned or undirected
- Large sized trolleys – takes more days to complete load for haulage to sugar mills.
- Unavailability of vehicles for cane transport
- Sugar mills shut down-occasional

The post harvest staling data shown in Table-8 indicate that after 96 hours of harvest CCS dropped by 1.38 units. Simultaneously, the cane juice undergoes deterioration, showing a rise in invert sugar from 0.65 to 1.06. The magnitude of loss is worked out to be Rs. 27.94 per maund of cane crushed.

Table-8 Post harvest sugar recovery losses - 96 hours after harvesting

Month	CCS %		Reducing sugars	
	Initial	Fall	Initial	Rise
November	8.46	1.11	1.20	0.60
December	9.42	0.52	0.78	0.46
January	10.90	1.16	0.43	0.91
February	11,84	1.04	0.41	1.17
March	12.8	2.40	0.46	1.38
April	12.94	2.04	0.62	1.82
Average	11.06	1.38	0.65	1.06

Post harvest staling losses

- CCS loss (average) = 1.38
- Sugar recovery loss=1.27 %
- Cane Weight =100,000 mds
- = 1270 maunds

Sugar loss

- Value f sugar @ Rs. 55/- per Kg= Rs. 2,794,000
- Financial Loss per maund of cane: Rs. 27.94

How to avoid Post harvest staling losses?

- Should use vigilance in cane supply permit. Cane supply permit = for within 24 hours crushing.
- Cane harvesting and supply to correspond with crushing capacity of mills.
- Harvesting program of growers to be watched.
- Proper education to growers on quality cane harvesting.
- Sugar mills to have prompt cane transport system. Should arrange flat of trucks/ trolleys to meet full cane procurement requirements.

5. Reducing Losses in Milling and Processing

The Pakistan sugar industry depicts a sugar recovery loss of about 2.5% during its milling and processing operation. Though there are units showing losses of less than 2% and more than 2.5%. It means the margin for recovery improvements is around 0.7o. On the other hand margin for improvement in sugar recoveries due to improved varieties and planting practices is 2.5 units.

- Scope for reducing losses in the factory = Existing 2.5% loss can be reduced to 1.8 %
- Scope for improving recovery in a factory = 0.7 units
- Scope for improving recovery in cane field = Existing 9.5% can be increased to 12.0 %.
- Scope for improving recovery in cane field = 2.5 units
- Production cost ratio in cane : sugar = 65 : 35; Cane has more share, so should need more attention. The point of concern is that the industrialist is not paying due attention make improvements in cane fields.
- The owner's Tendency to invest for improvement:

In the factory = always inclined/ready

In the field = always reluctant

For bringing improvement in sugar recoveries the mills owners shall have to review their priorities

6. Cane Procurement Strategies

 Cane department should be vigilant about its cane quantum in mills zone and around.
 Cane staff should be aware of cane variety position in different sectors
 In its cane procurement programme preference should be given to high sugar early maturing varieties.
 For cane purchase middlemen in no case be involved. This group is least concerned about quality of cane.
 While making cane procurement, targets should be the maximum sugar recovery and not the maximum cane weight, during the season.

7. Cane Payment Policies

 It pertains to the cane price linked to cane quality or flat rate.
 At present we have flat rate system, the minimum fixed by the GOVT.
 The cane price should be one that assures some incentives to cane growers.
 There could be two systems:
 Cane price linked to market price of sugar, and worked out according to sugar recoveries of individual consignment; as prevailing in most of advanced countries.
 The other option is the incentive on the average sugar mills recovery for the season.
 The system has already been approved for Pakistan as well and has been operative for a number of years in Punjab.
 But unfortunately due to some mistrust of both millers and growers the matter is held in abeyance by the Supreme Court. This policy should be revived.

Conclusion

 The economic viability of Pak sugar industry is at stake due to low sugar prices against higher prices of cane.

 Economic viability of the sugar industry can be enhanced by the increase in sugar recoveries and reducing the sugar losses in cane.

 The sugar yields are enhanced by judicious application of irrigation and balanced dose of fertilizer so as to attain peek maturity in time.

 Attention should be focused to meet the required dose of ‘K’ nutrients

 The sugar recoveries are improved by propagation of high sugar varieties.

 Efforts should be made to bring maximum area under early maturing high sugar varieties.

 The sugar industry should support growers to propagate high sugar varieties.

 A profitable sugar harvest programme can be launched when harvest initiates with 10% recovery in Oct and terminate the season with over 12% recovery n March.

This can be achieved by growing high sugar varieties and harvesting according to cane maturity.
 In order to maintain a desired recovery level sugar losses due to trash and post harvest staling should be minimized.

 A well planned cane procurement programme is a key to the success of profitable harvesting.

 For bringing improvement in sugar recoveries the mill owners shall have to change his priorities.

 Incentives on quality varieties assure the adoption of good sugar varieties leading to economic viability of sugar industry

SUGAR INDUSTRY NEEDS JUSTUCE

Syed Muhammad Shifaat Zaidi, Former Presidient,
Pakistan Society Of Sugar Technologists (PSST)

It was in the year 2000 that the World Bank advised the Government of Pakistan to close down the following industries: Sugar, Oil Refining, Chemicals, Auto, Fertilizer and Steel. Studies sponsored by them on these industries in all likelihood state that these were inefficient industries and should therefore be closed down. It is a fact that sugar industry of Pakistan was never inefficient. It was in the backdrop of this advice that the then Government of Pakistan decided to face this challenge and revived various boards like Sugar Advisory Board, Cotton Advisory Board, Wheat Advisory Board, Rice Advisory Board etc. after more than 20 years. How is the industry replying to this challenge? After 15 years of the World Bank advice we can see that Steel Mill is closed for the last so many years and we all know the condition of Sugar industry. So, the Boards started functioning and after a lot of efforts, we were able to see the National Sugar Policy 2009-10. Salient features of National Sugar Policy are reproduced below.

2.2: SUGAR CANE PRICING AND SUCROSE CONTENT
Currently the 'Sugarcane Price Notification' ignores the sucrose content of sugarcane. Farmers growing high sucrose content sugarcane are not rewarded with higher price. The farmers producing low sucrose content sugarcane have no incentive to cultivate better varieties. Instead of using 'quality content criteria in terms of sucrose all sugarcane varieties are still priced on weight. Even though Pakistan ranks sixth in terms of area harvested under sugarcane out of 16 major cane producing countries, we are placed at fifteenth on the list, in terms of both cane yield and sugar yield. This shows that the sugarcane cultivation in Pakistan is faced with many problems and the situation needs to be addressed on priority.

3.21: The Federal and Provincial governments have been periodically introducing policy measures to facilitate sugar millers and sugarcane growers.

4.2: Long Term Policy:

4.21: Sugar Market Pricing
The domestic market will be integrated with the international market by providing necessary tariff protection. A study may be undertaken to redefine details of achieving fully competitive market for sugar trade.

4.22: Price of Sugarcane to be fixed according to Sucrose content
Mechanism of pricing sugarcane on sucrose content shall be introduced in all provinces. As recommended by the Sugar Advisory Board the prices be fixed variety wise initially and afterwards the pricing methodology shall be upgraded in phases in accordance with the best international practices. To achieve this purpose as test case two to three mills in each province will be encouraged to subscribe to this practice during 2009-10.

4.23: Research and use of high yield/ high recovery varieties
Provincial Agriculture Research Institutes in collaboration with the private sector should evolve site/ area specific sugarcane varieties through Research and Development of high yield/ high recovery characteristics. To supplement the existing initiatives two dedicated projects with latest technology based on public-private partnership are being set up to be executed by Ministry of Food and Agriculture.

However, it was unfortunate that soon after this policy was issued/notified, 18th constitutional amendment was passed by the parliament. As a result various ministries including Food & Agriculture was abolished & powers were

delegated to the provinces. In the absence of Federal Ministry of Food & Agriculture, all important issues explained at 4.22 & 4.23 could not be achieved. This resulted in a tug of war between the stakeholders. Arbitrary increase in the price of Sugar cane without any consideration for the cost of Sugar Production has turned most of Sugar mills in Pakistan sick with the exception of those located in South of Punjab & Ghotki district in Sindh. This area is dependent on only one variety of sugar cane. God forbid if due to an unforeseen natural calamity, this particular variety meets any threat would be disastrous for the industry of this particular area. So, we should make all out efforts to bring at least one more variety to save the interest of sugar industry in this area.

Sir, it is not possible to reduce the price of sugarcane. However, the implementation of National Sugar Policy in letter & spirit can save the industry from total disaster. It is always difficult to increase the price of Sugar & reduce the price of sugarcane. Sugar price in the international market remained stable at around US$450/tonne for about 3 years but dropped by about 25% during the first 8 months of 2015. Current price of sugar in the international market ranges between US$330-US$345/tonne. We can not compete in the international market because of this low price until Government gives heavy subsidies. Sugar price in the domestic market is not sufficient to meet the cost of cane purchased by most of the sugar mills what to talk of other manufacturing expenses. We have to look after the interest of all the stakeholders. Farmers & millers cannot survive without realizing each other's problems and difficulties. A number of sugar mills could not clear their sugarcane payment due to financial crises. Following table gives a clear picture of share of cost of sugar cane per Kg sugar produced at various recoveries ranging between 8.0 and 12.0.

Sr. No.	Price of Sugar cane/ 40 Kg (Rs.)	Sugar Recovery % Cane	Sugar Produced Kgs / 40 Kg cane	Sugar Cane Required /Kg Sugar	Cost of Sugar Cane / Kg Sugar
1	182.00	8.00	3.20	12.50	56.88
2	182.00	8.25	3.30	12.12	55.15
3	182.00	8.50	3.40	11.76	53.53
4	182.00	8.75	3.50	11.43	52.00
5	182.00	9.00	3.60	11.11	50.56
6	182.00	9.25	3.70	10.81	49.19
7	182.00	9.50	3.80	10.53	47.89
8	182.00	9.75	3.90	10.26	46.67
9	182.00	10.00	4.00	10.00	45.50
10	182.00	10.25	4.10	9.76	44.39
11	182.00	10.50	4.20	9.52	43.33
12	182.00	10.75	4.30	9.30	42.33
13	182.00	11.00	4.40	9.09	41.36
14	182.00	11.25	4.50	8.89	40.44
15	182.00	11.50	4.60	8.70	39.57
16	182.00	11.75	4.70	8.51	38.72
17	182.00	12.00	4.80	8.33	37.92

The above table indicates that the price of sugar cane fixed by the Provincial Governments is not justified rather detrimental to the interest of sugar industry.

Sugar industry is perhaps passing through the most crucial period. Most of sugar mills are bleeding. A highly prosperous industry is now struggling for its survival. A few Sugar Mills did not operate last year. A few more may not operate this year. There are shadows of unemployment. Most of the people associated with this industry seem to be frustrated. Most of Investment is adding to liabilities. Sugar price in the international market is merely US$ 330 per tonne. Where have we gone wrong? Is it bad planning or some other reason but one thing is sure, interest of all the stake holders particularly that of Sugar industry needs to be reviewed carefully.

Sugar industry has the right to survive & therefore, needs justice. Sugar industry is in a big problem and sugar cane growers are also not happy due to payment issues. To resolve this issue sugar industry needs support from the Government, State Bank as well as Commercial Banks. Sugar industry urgently needs a special package. Special credit lines at very low markup rate say about 5% must be offered to sugar industry only for sugar cane payment. This will enable the industry to make prompt payment to farmers.

Sir, it is already, too, late we have not implemented the recommendation of National Sugar Policy 2009-2010. Time has come that the recommendations of this policy are implemented in letter and spirit without any further delay. I feel that there is a dire need to study and analyze the factors which are making industries in this country unviable. We need a forum comprising of highly capable economists, agricultural and industrial experts at this critical juncture that might offer a solution by building a bridge between the industry and farmers. This forum can undertake industry related work and try to respond to this challenge in a professional way. Our existing research centers can deliver but are unfortunately unable to respond to this challenge as various factors have taken their toll. We must focus on a one point agenda that we have to protect the interest of all the four stake holders, I mean Farmers, Industry, Government and Consumers. Neither farmers nor industry can survive without protecting the rights of each other.

SUGAR INDUSTRY ABSTRACTS

Evaluation of the juice quality of six sugarcane varieties resistant to water deficit conditions

Delgado, H. Jorge, J. R. Gómez, F. R. Díaz, H. González and Y. Fernández

Most of the sugarcane released varieties have been evaluated for production and juice quality under optimum conditions, but not under drought conditions. This study was carried out at the Sugarcane Research Station of Villa Clara. Plant cane and first ratoon harvest started in 2008 during the winter cycle under non-irrigated conditions. Experimental design was a randomised complete block with three replications. Data measurements were performed for brix, pol % in juice, sucrose content, purity, pol % cane, tonnes cane per hectare, tonnes of pol per hectare, juice inorganic phosphorus, ash and reducing sugar. Results showed that genotype C86-156 should be harvested at the beginning of the harvesting season (December–January) because of its high values of inorganic phosphorus and high sugar content. Varieties C85-102, C90-530, C89-147, C89-148 and C86-56 should be harvested during mid-season (February-March), since they offer low sugar yields and high values of ash and reducing sugar at the initial and final stages of the harvest period. It is recommended that all analysed variables should be used as indicators of the juice quality to evaluate sugarcane varieties.

Genetic diversity in sugarcane cultivars assessed by DNA markers and morphological traits

M. F. Perera, M. E. Arias, D. Costilla, C. Luque, M. B. García, J. Racedo, M. I. Cuenya, M. P. Filippone and A. P. Castagnaro

Better knowledge of sugarcane genetic diversity will provide useful information concerning genotypic value for breeding programs and should contribute to improving the use and conservation of genetic resources and the protection of sugarcane varieties by intellectual property rights. Morphological descriptors are traditional tools to characterise varieties; however, they vary phenotypically caused by environmental effects. Therefore, molecular markers are increasingly more important for genotype identification and diversity estimation due to their accuracy and abundance, and they are not affected by environment. The aim of this research was to evaluate genotypes used as parental materials in the Breeding Program at Estación Experimental Agroindustrial Obispo Colombres (EEAOC), Argentina, using molecular markers (AFLP and SSR), morphological traits and comparing the data obtained with two statistical softwares (NTSys and InfoStat). All cultivars grouped in one main cluster of the dendrogram by both softwares used with at least 150 data points. Local Argentinean genotypes grouped together with US varieties and no clear genetic differentiation was found, probably due to regular germplasm exchange. Although morphological traits reflected external resemblance only, the dendrogram topology was not modified with the molecular and morphological data. These results suggest that both characterisation methods should be used to estimate genetic diversity. Molecular markers should be included internationally for sugarcane variety protection.

Bagasse drying in high pressure boilers

C. Cruz, F. J. Franck Colombres, M. A. Golato, W. D. Morales and D. Paz

A preliminary study of a system consisting of a 45.7 bar boiler supplied with a bagasse dryer as heat recovery equipment was conducted to increase the energy efficiency of high pressure bagasse boilers and reduce fuel consumption and emissions, by significantly improving bagasse

combustion. Two modes of drying gas application were considered: case 1: a percentage of the combustion gases leaving the boiler before entering the economiser (temperature of 380 oC) and case 2: the total end gas at the air preheater exit (temperature of 135.1 oC). Through industrial measurements and mass and energy balances, the operational conditions of the boiler without the dryer were determined (base case). On this basis and with additional calculations, the operational conditions of the systems with the dryer attached were estimated. Dryer exit gas temperature was assumed to be 90 °C. From an initial 52.94% bagasse moisture, results showed that in case 1, deviating 26.8% of combustion gases to the dryer dried bagasse to 47.42% water content, which results in 11.5% efficiency increase and 10.07% net fuel saving with respect to the base case, which is equivalent to 26 783 396 tonnes of bagasse per harvest. This represents USD 1 792 870 saving per harvest. In case 2, bagasse was dried to 50.00%, with a 11.1% system efficiency increase and 7.51% net fuel saving in relation to the base case, which amounts to 19 978 784 tonnes of bagasse per harvest. This represented savings of USD 1 337 372 per harvest. Applying either of the schemes (cases 1 and 2) would lead to significant benefits. Using case 1, more bagasse is saved and equipment costs are less, since a lower gas flow has to be handled.

Evaluation of uncertainty for determination of sugarcane fibre content in sugarcane quality test

Ye-Geng Fan, Tian-Shun Wang, Lei-Xing Mo, Jie Liao, Yu Ya, Zhong-Liang Chen and Wei-Zhong

Measurement uncertainty is defined as the dispersion of values that is reasonably characterised by the measured quantity. As a standard of evaluating the accuracy and reliability of tested results, it is an important parameter that is associated with the measured values. Fibre content is an important index of sugarcane quality. The purpose of this study was to evaluate measured values of fibre content in the laboratory. According to JJF1059-1999 Evaluation and Expression of Uncertainty in Measurement, the error of sugarcane fibre content test was analysed with 20 repeats and then we evaluated and combined the uncertainty of every component. The combined standard uncertainty, the expanded uncertainly and the confidence interval of the test results were 0.0423%, 0.0846% and (12.679±0.0846)% k=2, respectively. The evaluation of uncertainty could provide scientific support for the sugarcane quality test.

Nitrogen response in sugarcane and changes in chemical and biological properties in an andisol due to vinasse application in Guatemala

O. Perez, J. Acan, C. Ufer and M. A. Alfaro

A long-term experiment was carried out in Guatemala from 2005 to 2011 to assess the effect of various levels of vinasse on the nitrogen response in sugarcane variety CP72-2086 and its effects on cane yield and juice quality. The study was established on a soil derived from volcanic ash with high organic matter content. The chemical and biological properties of this soil were monitored throughout the experimental period in order to evaluate the impact of vinasse application. Vinasse was applied at five levels (0, 10, 30, 60 and 90 m3/ha) combined with three rates of nitrogen (0, 50 and 100 kg N/ha). One additional treatment of 120 m3/ha of vinasse without nitrogen was also included. The experiment was conducted in a randomised block design in factorial arrangement (5 × 3 + 1) with four replications. Vinasse was applied once a year, from 2005 to 2011. Results showed that nitrogen application at a dose of 100 kg N/ha in absence of vinasse caused a statistically significant increase of eight per cent in sugarcane yield. However, when vinasse was applied at any level, no nitrogen effect was found. In all vinasse treatments, the cane yield was higher compared with solely chemical fertiliser application. Vinasse increased the K content in cane juice but at acceptable levels. Furthermore, vinasse increased exchangeable K in the soil linearly with dosage to 75 cm depth, while Ca and Mg contents remained relatively constant. Microbial activity was not affected significantly due to vinasse applications. This study indicates

that the vinasse is an excellent liquid fertiliser, increases cane performance, improves soil fertility and crop nutrition and allows a reduction in mineral nitrogen fertiliser application from 50 to 100% depending on the dose used.

Analysis of sugarcane disease screening trials over years with a mixed model to improve ratings of varieties

J. Stringer, B. Croft, E. Deomano and S. Bhuiyan

Providing growers and plant breeders with accurate disease resistance ratings for new varieties is important to assist them to manage the varieties correctly. Most new varieties are screened for disease resistance in multiple trials over a number of years during the different stages of the breeding program. At the time of release, a new variety may have been assessed three or more times for important diseases. In the past, BSES has analysed each trial independently and taken an average of the ratings to calculate the final rating for a variety. However, using a mixed model analysis of variance allows multiple trials to be combined to obtain improved analysis of disease screening trials. A set of standard varieties with known field resistance ratings is included in all disease screening trials. A mixed model was used to analyse the data for standard varieties across many trials and the number of resistance groups that can be separated based on the LSD test was determined. For most diseases, we found that the number of resistance groups that can be separated is less than the 1–9 scale used by sugarcane pathologists. This analysis was used to review and refine the ratings of the standard varieties. The data for all trials in which the new variety has been tested and the standards in the same trials are then analysed with a mixed model and the trial score for each of the varieties is compared with a LSD. A correlation is performed on the score of the standards in the sub-set of trials against the average score from previous trials to determine if this sub-set of trials can be considered to provide a reliable estimate for the standards. The new variety is compared to the standard varieties to which it most closely resembles and a rating is assigned based on this comparison and the separation of the groups within the analysis. In this paper, a new variety, Q248, was tested in seven smut resistance screening trials and the combined analysis of these trials showed it was not significantly different to the standard variety Q188 which is rated as 7 for smut resistance. This analysis was used to advise growers in regions conducive to smut not to grow this variety.

Visacane: an innovative quarantine tool for the exchange of pest and disease-free sugarcane germplasm

I. Guinet-Brial, J.-c. Girard, P. Roumagnac, J.-h. Daugrois, E. Fernandez and P. Rott

Sugarcane varietal improvement requires the introduction of vegetative propagation material (cuttings, tissue-cultured plantlets). The continued increase of international and intercontinental trade of plants has led to the enforcement of quarantine measures in many countries before the introduction of vegetatively propagated material because many plant pathogens can be carried and transmitted by them. Visacane is the new name of CIRAD's sugarcane quarantine. It covers three main quarantine procedures: detection of pests and pathogens, elimination of pests and pathogens, and transfer of plant material free of pests and pathogens. Visacane has been devoted to sugarcane quarantining for several decades. Besides phytosanitary constraints, this quarantine structure also takes into account legal constraints and ensures, through appropriate contracts, that plant breeders' intellectual property rights over the transferred material are respected. Visacane can import and export varieties from and to most sugarcane growing countries in the world, ensuring that the material is free from any important pest and disease causing agent. Until recently, the sugarcane quarantine process was aimed at detecting known pathogens harboured by the plant material, and at eliminating these pathogens whenever possible. This process takes into account the pathogens that have been previously described and for which efficient detection

tools exist, or have to be developed. However, during the last three decades, several new viruses infecting sugarcane have been discovered, including Sugarcane yellow leaf virus, Sugarcane streak mosaic virus and the virus associated with Ramu stunt. Therefore, it can be assumed that unknown pathogens are still to be discovered in sugarcane, especially if these pathogens do not cause symptoms that can be easily observed. For these reasons, the research team associated with Visacane is setting up a new strategy of diagnostics, the so-called sequence-independent approach which aims at deciphering the genomes of all the viruses that inhabit a particular organism. This metagenomics approach will help to improve our routine quarantine diagnostics.

Industrial optional route for sugar molasses conversion in sugarcane biorefinery: kinetics analysis and pre-economic viability

J. P. F. Vieira, J. L. Ienczak, C. E. V. Rossell, J. G. C. Pradella and T. T. Franco

The main feedstock for biodiesel is triacyl glycerides, which can be obtained by submerged fermentation of oleaginous yeast fed with carbon-rich sources, known as SCO (single-cell oil). This process is considered a candidate for the production of "2nd generation biodiesel" (biodiesel 2G). The residual sugar from sucrose crystallisation and refining processes from sugarcane can be used as raw material for the production of SCO. The economic viability of this fermentation route to produce biodiesel 2G is investigated here and the suitability to comply with the legal requirements for biodiesel was studied. There is also an unmet demand for bio-jet fuels for the aircraft sector due to their physicochemical characteristics. This study aimed to evaluate the performance of 2G oleaginous yeasts to convert sugars into lipids. For this, a mathematical model for describing such a bioprocess needed to be developed. Also a flow sheet of the SCO production, including fermentation and by-product recovery, was constructed and, finally, with these data, a preliminary economic assessment of the conceptual design process was initially created. For this study, computational tools AnaBio 1.0 and SuperPro Designer v.8 were used. SCO production was achieved in a bench bioreactor (2 L), controlled for pH, temperature and dissolved oxygen, in culture medium consisting of molasses supplemented or not with micronutrients. Fermentation behaviour of Lipomyces starkeyi DSM 70296 and Rhodoturala glutinis CCT 2182 were compared. Yeast growth was modelled on Monod kinetics considering reducing sugar molasses as the only limiting substrate. The steps involved in the production of SCO were sterilisation of the culture medium, fermentation in aerated bioreactors, mixing, flotation, cell lyses, solvent extraction, leaching of cellular debris, solvent recovery, filtering, drying the extract and storage of lipids and extract. A preliminary economic assessment of the SCO industrial plant conceptual project with a capacity of 17058 tonnes/year of microbial lipids and 11686 tonnes/year of cellular debris may offer revenues of $27 243 786.00/year.

Biogas production from vinasse as an alternative to develop biofuels

Jorge Byron Meneses González

This paper describes the project for a biogas production unit located at the Mag-Alcoholes S.A. distillery in Guatemala. The ethanol plant is based on sugarcane molasses feedstock. The project maximises methane production from vinasse treatment and mitigates the negative environmental impacts. The design of the Anaerobic Treatment Digestion Plant includes both floating membranes to capture methane and are circulation system for sludge to maximise biogas production. The treated vinasse is removed from the process and sent to the sugar fields. The solids are properly separated in the process and the biogas is captured by the reactor roof membranes. Despite the negative pressure, the biogas is sent to the boilers to produce high pressure steam to congestion and low pressure steam for the distillation plant. The result of this process is a balanced treated effluent, with a neutral pH and rich in minerals and nutrients for use in fertigation. A rich methane gas is produced which is a source of renewable energy enabling significant substitution of fossil

fuels, and reduction in greenhouse gas emissions. The controlled anaerobic biodigestion of the vinasse contributes to the reduction of COD and BOD in the treated effluent. Environmental viability and an efficient use of energy are based on proper use of methane gas, since methane has a greenhouse gas emission intensity 23 times greater than carbon dioxide gas.

Batch pan automation and its impact on energy conservation in cane sugar factories
B. Morgenroth, H. Max, M. Mogalle and H. Singh Bola

In many sugar plants batch pans are still operated manually. The pan station is usually the largest vapour consumer of the plant and therefore its impact on the energy demand is high. Experience with pan automation system installations in Brazil, India and Pakistan has been gained in the last couple of years and results are presented. Pans operated manually usually require 2–5 t water per strike depending for example on pan size, feed brix and other parameters. The steam demand for this water addition is typically within a range of 2 to 16% exhaust steam on cane for the raw house pans and, if present, even larger for the refinery pans. The targets of modern pan automation systems are good crystal quality, capacity maximisation, smooth operation and low water/steam consumption. In general, it is possible to operate batch pans with no water addition at all. Apart from the control of single pans, it is also important to interlock the pans and optimise the speed in relation to the feed tank storage volumes, thus reducing vapour flow fluctuations in the plant. Modern pan automation systems allow a considerable reduction of the steam demand by eliminating, or at least reducing, the water additions. Another important aspect apart from the technical requirements is to overcome old operational habits that often cause drawbacks in practice.

INTERNATIONAL EVENTS CALENDAR

November 30-December-4

ISSCT Co-Products Workshop MauritiusISSCT Co-Products Workshop

February 1-3

Louisiana Division of American Society of Sugar Cane Technologists (ASSCT) Lafayette, LA USA ASSCT.org

February 21 - 24

Sugar Processing Research Institute (SPRI) Walnut Creek, CA USA SPRI.org

May 15-18

Sugar Industry Technoligists 75th Conference, New York, NY USA SIT.org

December 5-8

XXIX International Society of Sugar Cane Technologists' (ISSCT) Congress, Chiang Mai, Thailand ISSCT Thailand 2016

STORY OF SWEETS

Bananas in Caramel Sauce

Melt butter in a large, heavy skillet over medium heat. Stir in sugar and cook, stirring, until sugar is melted and light brown. Slowly stir in the cream (mixture will bubble up).

Let mixture boil 1 minute, then reduce heat to low. Place the bananas in the pan and cook until heated through, about 2 minutes.

Best Peanut Butter Cookies Ever

Beat the butter in a large bowl until soft. Add half of the icing sugar and beat until smooth.

Add the remaining icing sugar and one tablespoon of the milk and beat the mixture until creamy and smooth. Beat in the milk, if necessary, to loosen the mixture.

Stir in the food colouring until well combined.

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